PROCEEDING
1st Banten International Conference on Health Advancement & Research
binar@poltekkesbanten.ac.id
https://binar.poltekkesbanten.ac.id/

DETERMINANTS OF PRECANCEROUS CERVICAL LESIONS IN FEMALE SALTED FISH ARTISANS

Lusi Andriani[1], Zamharira Muslim[2], Sri Yanniarti[3], Agnestya Nurul Fergita[4]

[1]Department of Midwifery, Poltekkes Kemenkes Bengkulu, lusi@poltekkesbengkulu.ac.id
[2]Departemen of Pharmacy, Poltekkes Kemenkes Bengkulu, muslim@poltekkesbengkulu.ac.id
[3] Department of Midwifery, Poltekkes Kemenkes Bengkulu, sri123yanniarti@gmail.com
[4] Department of Midwifery, Poltekkes Kemenkes Bengkulu, agnestyanurulf25@gmail.com
Corresponding author: lusi@poltekkesbengkulu.ac.id

ABSTRACT

Cervical cancer is the second leading cause of death in women, with 36,633 cases or 9.2% of total cancer cases. Risk factors for cervical cancer include age, age at first marriage, duration of hormonal contraceptive use, parity, smoking, family history of cancer, unhealthy diet, exposure to hazardous substances, and unhealthy lifestyle. The aim of this study was to determine the factors contributing to the incidence of precancerous cervical lesions in women who work as salted fish artisans. A cross-sectional study was conducted involving 70 women who work as salted fish artisans in the Padang Serai Community Health Centre working area who met the criteria. Data were obtained through questionnaires and VIA (Visual Inspection with Acetic Acid) tests. The results showed that 51.4% were under 20 years old and over 35 years old, 55.7% were married under the age of 20, 64.3% were multiparous, 77.1% had used and were currently using hormonal contraceptives, 57.1% had used hormonal contraceptives for more than 2 years, 96.8% did not smoke, 80% of the respondents' husbands or family members smoked, 98.6% had no history of cancer in their families, 98.6% consumed processed salted fish, 100% had negative formalin test results, and 8.6% had precancerous cervical lesions. Variables associated with the occurrence of precancerous cervical lesions were age with a p-value of 0.025 and duration of hormonal contraceptive use with a p-value of 0.034. It is recommended to provide continuous education to women about the dangers of cervical cancer, motivate them to undergo early detection of cervical cancer, maintain vulvovaginal hygiene, and use contraceptives rationally.

.

Keywords: "Cervical Cancer; Salted Fish Artisans; Cervical Cancer Risk Factors"

INTRODUCTION

Cancer is a type of disease characterised by abnormal and uncontrolled growth of body cells (Hembing, 2015). Cervical cancer is the growth of abnormal cells in the cervix (Nasir, Rachmad Yuliadi. 2018). Cervical cancer is the second most common cancer after breast cancer in women worldwide, with approximately 371,000 new cases diagnosed each year or 9.8% of all female cancers, with 78% of cases occurring in developing countries. Additionally, invasive cervical cancer is the leading cause of cancer-related deaths among women in developing countries, with approximately 250,000 deaths per year (Suheimi, Irham. 2016).

According to Aziz (2013), deaths from cervical cancer at RSCM from 1990 to 1994 were very high, accounting for 66.1% of 327 cases of gynaecological cancer deaths, followed by ovarian cancer at 22.6%, PTG at 7.3%, uterine cancer at 2.4%, vulvar cancer at 0.9% and vaginal cancer at 0.6%. In Western Australia, 85 women are diagnosed with cervical cancer each year, and in 2015, 40 women died from this deadly cancer (IARC Globocan 2018). More than 70% of cervical cancer patients in Indonesia come for examination at an advanced stage, resulting in many deaths due to late detection and treatment. This is due to low levels of knowledge and socio-economic poverty among the population (Manuaba, 2019) (Densmore Ryan, Hajizadeh

Mohammad, Min Hu. 2019). Many medical experts predict the spread of this disease because many women lack understanding of the disease caused by the Human Papilloma Virus (HPV).

Knowledge about this disease includes information about symptoms and risk factors. Lack of knowledge about cervical cancer has led to an increase in the number of people suffering from this cancer (Wulandari, 2018). Cancer can be cured if detected at an early stage; the earlier it is detected, the easier it is to treat and the greater the chances of recovery (Anugerah, 2015). Most guidelines recommend the first screening within the first three years after becoming sexually active, or no later than the age of 21 (Mubarok, Husnul, 2018).

Cervical cancer in Indonesia is the most common cancer, with an incidence rate of 23.4 per 100,000 population and a mortality rate of 13.9 per 100,000 population (Ministry of Health, 2018). These deaths are linked to the fact that the majority of cervical cancer cases (80%) are invasive, advanced, and even terminal at the time of diagnosis (Nindrea RD, 2017). The proliferation of normal cells or tissues into abnormal or cancerous cells does not happen as quickly as one might imagine. This means that before cancer develops, it is preceded by a condition known as precancerous lesions or Cervical Intraepithelial Neoplasia (CIN), which takes approximately 10-20 years to progress into cancer. CIN is the initial stage of changes leading to cervical carcinoma (Dewi IGAAN, 2017). In advanced stages, cervical cancer can cause death rapidly. Cervical cancer is classified as a non-communicable disease; it does not appear suddenly and is the result of multiple risk factors (Aziz MF, et al. 2013).

To address the issue of cervical cancer, the government has stated that the key to the success of the cervical cancer control programme is screening followed by adequate treatment (see and treat), one of which is the Visual Inspection with Acetic Acid (VIA) method, as well as controlling risk factors (Nindrea RD, 2017). VIA is chosen because it has sensitivity and specificity that are not significantly different from the Pap test and is relatively inexpensive, easy to perform, and provides rapid results. Research in South Africa by Makuza et al concluded that the risk factors for cervical cancer are sexual activity under the age of 20 (OR=3.29) and parity (OR = 0.42) (Makuza JD, et al, 2015). A study in Europe concluded that risk factors include smoking, age <20, number of sexual partners, family history, and long-term use of hormonal contraception (WHO, 2018).

The strategy adopted to evaluate the success of the detection programme is to assess the achievement of coverage targets. Early detection coverage with VIA of at least 85% over five years can significantly reduce the incidence of cervical cancer by up to 83.6% (WHO, 2018). The minimum target expected to be achieved within five years from 2015 to 2019 is at least 50% (Ministry of Health, 2018). The early detection programme of VIA examinations at the community health centre level on a periodic basis and controlling risk factors is one effective way to prevent pre-cancerous cervical lesions from developing into cervical cancer.

Based on various previous studies, risk factors that can increase a person's likelihood of developing cervical cancer include age, age at first marriage (Fitrisia Citra Ayu, et al. 2019), duration of hormonal contraceptive use (Yuniar Isma, Saryono, Rohani Fitri, 2009) (Alvarez Antoine, Borch Kristin Benjaminsen, Rylander Charlotta. 2021), parity, smoking, family history of cancer (Aziyah, Sumarni Sr, Ngadiyono. 2017), unhealthy diet, exposure to harmful substances, and unhealthy lifestyle (Densmore Ryan, Hajizadeh Mohammad, Min Hu. 2019) (Sriyono. 2015).

The Padang Serai Community Health Centre area in Bengkulu City, Bengkulu Province, which was the location of the study, consists of three sub-districts where the majority of the population works as fishermen, especially in the Sumber Jaya sub-district, where the highest number of cervical cancer cases was found in 2022. In Sumber Jaya neighbourhood, the community typically processes salted fish at home, which is suspected to involve the use of unknown preservatives. It is unclear whether chemical exposure occurs during the processing of these preservatives and whether the community also consumes the salted fish products.

According to Sriyono (2015), the level of education and understanding of the community is one of the indicators that can affect the degree of public health, especially in the case of foods containing preservatives such as formalin, which has a negative impact on the digestive system, causing gastritis, diarrhoea and even cancer. There are still traders, fishermen and home industries that use formalin as a preservative in food, especially fish. The lack of public understanding about fish containing formalin makes it difficult for people to distinguish between formalin-free fish and fish containing formalin. Formalin is very dangerous if ingested and can cause cancer. The significant benefits of formalin in industry have been misused for food preservation. This is often found in home industries, as they are not registered and are not monitored by the local POM (Indonesian Food and Drug Monitoring Agency).

Foods preserved with formalin are usually wet noodles, tofu, meatballs, salted fish and several other foods. Salted fish containing formalin does not spoil for more than 1 month at room temperature (25 degrees Celsius). The fish is bright in colour and does not have the characteristic smell of salted fish. High levels of formalin in the body cause stomach irritation, allergies, are carcinogenic (cause cancer) and mutagenic (cause changes in cell or tissue function). Formalin is chronic in nature, as its effects on health are only apparent after prolonged exposure. According to research in Tuban district, the highest concentration of formalin found in processed salted fish was 1162.5 ppm, while the lowest concentration was 3.55 ppm (Ichya'uddin. 2014). The recommended use of formalin should not exceed 0.66 ppm.

MATERIALS AND METHODS

This study used an analytical observational design with a cross-sectional design using direct interviews with questionnaires as a reference and observation, examination of formalin levels in salted fish products, and VAI examination. The sample consisted of 70 people (Lemeshow formula) selected purposively. Inclusion criteria were women aged 20-50 years who made and consumed home-processed salted fish and were willing to be respondents. The exclusion criteria were women who were pregnant, had an invisible SSK so that IVA examination could not be performed on them, and women suspected of having cervical cancer during visual inspection using a speculum.

The variables studied in this research were dependent variables, namely the incidence of precancerous cervical lesions, while the independent variables were the amount of home-processed salted fish consumption, the formalin content in the salted fish consumed, age, age at first sexual intercourse, parity, exposure to cigarette smoke, family history of cancer, and duration of hormonal contraceptive use. The analysis used univariate and bivariate Chi-square statistical tests and multivariate Multiple Logistic Regression. This study received ethical approval from the Research Ethics Committee of the Health Polytechnic of the Ministry of Health Bengkulu with certificate number (KEPK.BKL/659/07/2025). The participants in this study were provided with informed consent and received an incentive of Rp.200.000,- per individual. Data were collected using a questionnaire that had been tested for validity and reliability. This study was carried out for two weeks, starting from socialisation, data collection through questionnaires, followed by VAI tests and formalin level examinations.

RESULTS AND DISCUSSION

Table 1 Frequency distribution of age, age at first marriage, parity, history of hormonal contraceptive use, duration of hormonal contraceptive use, smoking, family members who smoke, family history of cancer, consumption of processed salted fish, and IVA test results.

No	Variable and Category	Number	Percentage
1	Age		
	<20 and >35 years	36	51.4
	20–35 years	34	48.6
2	Age at First Marriage		
	Under 20 years old	39	55.7
	≥ 20 years old	31	44.3
3	Parity		
	Nulliparous and Primiparous	15	21.4
	Multipara	45	64.3
	Grand multipara	10	14.3
4	History of Hormonal Contraceptive Use		
	Ever	54	77.1
	Never	16	22.9
5	Duration of Hormonal Contraceptive Use		
	≤ 2 years	30	42.9
	> 2 years	40	57.1
6	Smoking		
	Yes	1	1.4

	No	69	98.6
7	Husband/Family Member Smokes		
	Yes	56	80
	No	14	20
8	Family History of Cancer		
	Yes	1	1.4
	None	69	98.6
9	Processed salted fish consumption		
	Yes	69	1.4
	No	1	98.6
10	Formalin Test Results		
	Positive	0	0
	Negative	70	100
11	IVA Test Results		
	Positive	6	8.6
	Negative	64	91.4
	Total (n)	70	100

Based on Table 2, more than half of the respondents (51.4%) were under 20 years old and over 35 years old, more than half (55.7%) were married under the age of 20, most (64.3%) were multiparous, most (77.1%) had used and were currently using hormonal contraceptives, more than half of the respondents (57.1%) had been using hormonal contraceptives for more than 2 years, almost all respondents (96.8%) did not smoke, most (80%) husbands or family members of respondents smoked, almost all respondents (98.6%) had no history of cancer in the family, almost all (98.6%) consumed processed salted fish, all (100%) had negative formalin test results, and a small portion (8.6%) of respondents had positive IVA test results.

Table 2 Relationship between age, age at first marriage, parity, history of hormonal contraceptive use, duration of hormonal contraceptive use, smoking, family members who smoke, family history of cancer, consumption of salted fish processed and formalin level test with precancerous lesions (VAI positive).

Variable	VAI Examination Results				Total		*OR*	*P Value*
	Positive		Negative					
	N	%	N	%	N	%		
Age								
Under 20 and over 35 years old	6	16.7	30	83.3	36	100	0.833	**0.025**
20–35 years	0	0	34	100	34	100		
Age at First Marriage								
<20 years	4	10.3	35	89.7	39	100	1,657	0.687
≥ 20 years	2	6.5	29	93.5	31	100		
Parity								
Nulliparous and Primiparous	0	0	15	100	15	100	-	0.215
Multipara	4	8.9	41	91.1	45	100		
Grand multipara	2	20	8	80	10	100		
History of Hormonal Contraceptive Use								
Ever	6	11.1	48	88.9	54	100	0.889	0.325
Never	0	0	16	100	16	100		
Duration of Hormonal Contraceptive Use								
> 2 years	6	15	34	85	40	100	0.850	**0.034**
≤ 2 years	0	0	30	100	30	100		
Smoking								
Yes	0	0	1	100	1	100	1,095	1,000
No	6	8.7	63	91.3	69	100		
Husband/Family Member Smokes								
Yes	6	10.7	50	89.3	56	100	0.893	0.337
No	0	0	14	100	14	100		

Family History of Cancer								
Yes	0	0	1	100	1	100	1,095	1,000
None	6	8.7	63	91.3	69	100		
Processed salted fish consumption								
Yes	6	8.7	63	91.3	69	100	0.913	1,000
No	0	0	1	100	1	100		
Formalin Level Test								
Positive	0	0	0	100	0	100	0.989	1,000
Negative	6	8.7	64	91.3	70	100		

Based on Table 2, it is known that 6 respondents who had positive IVA test results s were under 20 years old and over 35 years old (16.7%). The *Chi-Square* test results showed a value of p=0.025 (sig≤0.05), which means that there is a relationship between age and IVA test results. The OR value of 0.833 means that being under 20 and over 35 years of age has an 0.833 times greater influence on positive IVA test results. Of the 6 respondents with positive IVA test results, 15% had been using hormonal contraceptives for more than 2 years, with a p-value of 0.034 (sig≤0.05). This indicates a relationship between the duration of hormonal contraceptive use and positive IVA test results. An OR value of 0.850 indicates that the duration of hormonal contraceptive use has an 0.850-fold influence on positive IVA test results.

Relationship Between Age and IVA Test Results

Based on Table 2, the bivariate test results show that there is a relationship between age and IVA test results with *a p-value* of 0.025 (p<0.05)**.** Based on the IVA test results, 16.**7%** of the <20 and >35 age groups tested positive**.** The results of this study are in line with the study from (Fitrisia, Khambri, Utama, & Muhammad, 2020) which shows that there is a significant relationship between age and the incidence of precancerous cervical lesions with p = 0.037 (p<0.05). Biologically, age is one of the important risk factors in the development of precancerous cervical lesions. In the younger age group (<20 years), the risk increases because the cervical epithelium is not yet fully mature, especially in the transformation zone, making it more susceptible to infection by Human papillomavirus infection (HPV). At this age, if HPV exposure occurs through sexual activity, the likelihood of persistent infection is greater. Meanwhile, in the >35 age group, the risk increases due to the possibility of long-term persistent infection, as well as changes in local and systemic immunity that decline with age. It is this persistence of HPV infection that is the main factor in the development of cervical intraepithelial neoplasia (CIN) and progression to precancerous lesions.

The risk of cervical cancer doubles between the ages of 35 and 60. The increased risk of cancer in older age is a combination of increased and prolonged exposure to carcinogens and a weakened immune system (Fitrisia et al., 2020).

These findings align with previous research showing an increase in the incidence of precancerous cervical lesions in extreme age groups, particularly those under 25 and over 35 years of age. For example, a cohort study by the World Health Organisation (WHO, 2020) states that individuals under 20 years of age and over 35 years of age are high-risk groups recommended to undergo regular cervical screening, either through the IVA test or the HPV DNA test. Several recent studies also support these findings. A study by the World Health Organisation (shows that the prevalence of precancerous lesions increases sharply in women aged 35–44 years due to persistent HPV infection, while in women under 20 years of age, it increases due to high early HPV transmission and incomplete cervical maturation. (Ministry of Health of the Republic of Indonesia, 2024) also recommends earlier screening for high-risk groups to detect precancerous lesions before they develop into invasive cancer.

Relationship between Age at First Marriage and IVA Test Results

Bivariate analysis using the Chi-square test showed no significant relationship between a woman's age at first marriage and IVA test results, as evidenced by a *p-value* of 0.687 (p > 0.05). This indicates that age at first marriage is not a significant determinant of precancerous lesions in the respondents in this study population. Theoretically, age at first marriage is often associated with age at first sexual intercourse. Several studies have shown that sexual intercourse at a young age can increase the risk of Human papillomavirus infection (HPV) because the cervical epithelium in young women is still maturing, making it more susceptible to viral invasion. Persistent HPV infection is known as the primary cause of pre-cancerous lesions and cervical cancer; however, this association was not found in this study.

These findings align with the results of a study by the (Bowden et al., 2023) , which reported that although early age of sexual debut is a risk factor, its influence may be insignificant if the population is relatively homogeneous in terms of age of sexual debut or if other risk factors are stronger. Another study by (Plisko et al., 2024) shows that factors such as high-risk HPV infection status (HR-HPV), multipartner sexual behaviour, and immunocompetence status have a greater influence on the incidence of precancerous lesions than age at marriage.

Previous studies have not been consistent with the results of this study, which indicate a significant association between age at first marriage and cervical pre-cancerous lesions, particularly in populations with very young marriage ages (<18 years). The results of the study (Fogleman & Leaman, 2019) found that women who married at ≤17 years of age had a higher risk of developing cervical intraepithelial neoplasia (CIN) compared to those who married at ≥21 years of age. This difference indicates that the population context and age distribution at marriage greatly influence the significance of this relationship. 's findings mention that there is a relationship between precancerous lesions and the mother's age at marriage ($\rho<0.05$). Transmission of the HPV virus, which causes cervical cancer, is highly dependent on sexual intercourse. This increases in women who have sexual intercourse at an early age. Early marriage is a reproductive health problem; the younger the age at marriage, the longer the time to reproduce.

This study shows that cervical cell changes with positive VAI results are more commonly found in women who married for the first time at an age younger than 20 years (10.3%). The younger a woman is when she becomes sexually active, the greater her risk of developing cervical cancer. Women who begin sexual intercourse before the age of 20 are at greater risk because during young adulthood, the process of squamous cell metaplasia increases significantly, leading to an increased risk of atypical squamous transformation, which can then develop into cervical intraepithelial neoplasia (CIN) (Indonesian Ministry of Health, 2019).
Based on the above explanation, although the age at first marriage theoretically has a correlation with the risk of pre-cancerous cervical lesions, the non-significant findings in this study indicate that this factor is not the primary determinant in the study population.

Association Between Number of Parities and VAI Test Results

Bivariate analysis using the Chi-square test showed no significant association between the number of parities and IVA test results, as evidenced by a *p-value* of 0.215 ($p > 0.05$). The results of this study are relevant to the results of a study conducted by (Bowden et al., 2023) , which states that although high parity has long been identified as a risk factor for cervical cancer, the relationship is often insignificant when controlled for HPV factors and sexual behaviour variables. This aligns with the findings of a study by , which states that parity is not a meaningful independent factor in the development of pre-cancerous lesions after considering high-risk HPV infection and cervical screening history.

Biologically, the number of parities is often associated with an increased risk of precancerous cervical lesions. Some theories suggest that repeated childbirth can cause trauma to the cervical epithelium, which then facilitates the entry of Human papillomavirus infection (HPV) into the cervical epithelial cells. Additionally, in women with high parity, long-term hormonal changes and shifts in the cervical transformation zone to more exposed areas often occur, making them more susceptible to persistent HPV infection and progression to pre-cancerous lesions or cervical cancer.

The results of this study are not in line with those of Fitrisia et al. (2020) , which showed a significant relationship between parity and the incidence of cervical precancerous lesions, p value=0.039 ($p<0.05$). Women with high parity experience cervical columnar epithelial eversion during pregnancy, leading to new dynamics in immature metaplastic epithelium that increase the risk of cellular transformation, particularly in the cervix, resulting in persistent HPV infection. Supporting previous studies, the results of a study by (Fogleman & Leaman, 2019) found that women with parity ≥3 have a higher risk of cervical intraepithelial neoplasia (CIN) compared to those with lower parity.

Relationship Between History of Hormonal Contraceptive Use and VAI Test Results

Bivariate analysis using the Chi-square test showed no significant association between contraceptive use history and IVA test results, as evidenced by a p-value of 0.325 ($p > 0.05$). Consistent with these findings, (Anastasiou et al., 2022) reported no association between hormonal contraceptive use and the occurrence of precancerous lesions. Control of HPV infection status often reduces or eliminates the association that was initially seen between hormonal contraception and cervical lesions. HPV is the main intermediary/triggering factor in the pathogenesis of cervical precancerous lesions. The results of a study by (Yang et al., 2022)

concluded that the effect of contraception on the risk of cervical cancer mainly occurs with long-term use and is often mediated by HPV infection status, rather than contraception itself as an independent factor.

Theoretically, long-term use of hormonal contraceptives, particularly oral and injectable contraceptives, has long been suspected to be associated with an increased risk of precancerous lesions and cervical cancer. The biological mechanisms involve hormonal changes that affect the cervical transformation zone, increased epithelial susceptibility to Human papillomavirus infection (HPV), and modification of the local immune response, leading to more persistent HPV infection. The study "2023)) confirms a significant association between the use of oral and injectable contraceptives and IVA test results at the Meninting Community Health Centre, as evidenced by a p-value <0.05. The results of this study indicate that a history of hormonal contraceptive use is not a major risk factor in this population.

Relationship between Duration of Hormonal Contraceptive Use and IVA Test Results

Bivariate analysis using the Chi-square test showed a significant relationship between the duration of hormonal contraceptive use and IVA test results, as evidenced by a *p-value* of 0.034 (p > 0.05). This finding indicates that the duration of contraceptive use may be one of the factors contributing to changes in cervical epithelial cells that lead to precancerous lesions. This finding is consistent with various previous studies, meta-analyses reporting that long-term oral contraceptive use (>5 years) is associated with an increased risk of precancerous cervical lesions and cervical cancer. Supporting the study's findings, a systematic review by (Anastasiou et al., 2022) also showed a correlation between hormonal contraceptive use and the occurrence of cervical dysplasia, although this effect may diminish after controlling for HPV status. Supporting the study results, the findings of also state that long-term use of hormonal contraceptives can disrupt the balance of oestrogen hormones in the body, causing normal cells to become abnormal.

Hormonal contraception may act as an accelerant for the growth of neoplasms. The effect of hormonal contraception on the occurrence of cervical neoplasia can cause hypersecretion of the endocervical glands and proliferation of the endocervical glands. In addition, progesterone also causes metaplasia and dysplasia of the epithelium of the portio and mucous membrane of the endocervix. Hormonal contraception increases the risk of cervical cancer in women with HPV, and progesterone also triggers the carcinogenic effects of HPV. Furthermore, excess progesterone can also cause cervicitis or cervical infection (Cahyani et al., 2023).

The use of hormonal contraceptives with a composition of oestrogen and progestin that act through their receptors in target cells can increase the incidence of cervical ectropion and other potential carcinogens. Oestrogen and progestin can also directly affect cervical cells, promoting the integration of HPV DNA into the host genome, stimulating HPV DNA transcription and increasing cell proliferation. Sex steroid hormones can increase the expression of HPV-16 E6 and E7 genes through the inactivation and/or degradation of p53 and Rb proteins, which then causes the failure of the apoptosis mechanism and increased carcinogenesis in cervical cells. Moreover, cervical tissue is one of the preferred targets of female steroid hormones (Fitrisia et al., 2020) .

The Relationship Between Spouse/Family Smoking and VAI Test Results

The results of this study indicate that there is no significant relationship between exposure to cigarette smoke from husbands or family members and IVA test results, as evidenced by a *p-value* of 0.325 (p>0.05), indicating that the proportion of precancerous lesions in women exposed to passive cigarette smoke is not significantly different from those who are not exposed. Biologically, active smoking has been proven to be a cofactor in the process of cervical carcinogenesis because the carcinogenic substances contained in cigarette smoke can reduce local immunity in the cervix and increase the risk of persistent Human Papillomavirus (HPV) infection, which is the main aetiological factor of precancerous lesions and cervical cancer. However, the effects of passive cigarette smoke exposure on the development of cervical precancerous lesions still show varying research results. Some studies report a correlation, while others show insignificant or weak results. The National Cancer Institute (2024) states that the effect of smoking on cervical cancer is stronger in active smokers than in passive smokers.

Research by (Jiang, Ma, Zhang, Jiang, & Yan, 2023) indicates that exposure to secondhand smoke can affect HPV persistence, but the effect is not as significant as direct exposure. Meanwhile, research by (Kim et al., 2021) found no significant association between passive cigarette smoke exposure and the occurrence of precancerous cervical lesions, consistent with the results of this study. This may be due to varying intensities and durations of exposure.

Association Between Family History of Cancer and IVA Test Results

The results of this study indicate that a family history of cancer has no significant relationship with IVA test results, as evidenced by a *p-value* of 1.000 (p>0.05), showing that the proportion of cervical precancerous lesions in respondents with a family history of cancer is relatively the same as in respondents without such a history. This indicates that family history is not a major risk factor for the occurrence of cervical precancerous lesions in the study population. Biologically, the development of cervical precancerous lesions is more influenced by persistent high-risk Human Papillomavirus (HPV) infection than by genetic factors. HPV infection is the dominant aetiological factor involved in the transformation of cervical cells into precancerous lesions and invasive cancer. Family history may play a role in increasing individual awareness of cancer risk in general, but its contribution to cervical cancer is relatively small and indirect. *The World Health Organisation* (2024) emphasises that HPV infection is the strongest and primary risk factor for cervical cancer.

These findings are also consistent with research conducted by the , which shows that although certain genetic susceptibility factors exist, their effects are relatively small compared to environmental factors and HPV infection. Genomic research indicates that familial predisposition can increase risk, but it is not a dominant factor. A study by (Ramachandran & Dörk, 2021) states that the genetic factors contributing to the pathogen are not yet fully understood and remain largely unknown. Meanwhile, a study by (Sadia, Shahwani, & Mehboob, 2022) reports that family history plays a greater role in raising awareness of the importance of screening than in directly increasing the biological risk of developing precancerous cervical lesions.

The Relationship Between Consumption of Processed Salted Fish and VAI Test Results

Bivariate analysis using the Chi-square test showed no significant relationship between consumption of processed salted fish and IVA test results, as evidenced by a *p-value* of 1.000 (p>0.05). Some types of preserved foods, including salted fish, may contain nitrosamines, compounds formed from the interaction of nitrites/nitrates with secondary amines, which have been linked to carcinogenesis in several organs. However, evidence of a link between salted fish consumption and specific cervical precancerous lesions is still weak and inconsistent (World Cancer Research Fund, 2018) .

The main factor in the development of cervical precancerous lesions is high-risk *Human Papillomavirus* (HPV) infection, while nutritional factors or diet generally only play a supporting role in accelerating or slowing down the carcinogenesis process.

These findings align with research indicating that the impact of processed foods on cervical cancer tends to be insignificant when not accompanied by other primary risk factors (World Cancer Research Fund, 2018) .

Dietary factors can indirectly influence risk by modulating immunity, helping/hindering HPV clearance, but the direct contribution of processed salted fish consumption to the development of precancerous lesions has not been strongly proven (Schrenk et al., 2023) . Several reviews and studies on dietary patterns suggest a link between high-antioxidant diets and reduced HPV persistence, while processed food consumption is generally examined as part of a pro-inflammatory dietary pattern that may increase the risk of persistent infection (Nazari et al., 2023) .

The results of this study indicate a significant relationship between age and duration of contraceptive use for more than two years with IVA test results. This study also found that six respondents had positive IVA test results. The study also found that many respondents experienced vaginal discharge, indicating that genital hygiene plays an important role in maintaining women's reproductive health, including preventing precancerous cervical lesions. Poor personal hygiene can cause increased moisture and changes in pH in the genital area, which in turn triggers the growth of pathogenic microorganisms. This condition can cause chronic inflammation and disturbances in the vaginal microbiota. An imbalance in the normal vaginal flora, such as a decrease in protective *Lactobacillus* bacteria, can increase the risk of sexually transmitted infections, including *Human Papillomavirus* (HPV) infection, which is the main cause of precancerous lesions and cervical cancer. Research from the, et al.,2021)reports that poor genital hygiene practices, such as wearing damp underwear, rarely changing sanitary pads during menstruation, and using unclean water to wash intimate organs, are significantly associated with an increased risk of precancerous cervical lesions. A similar finding was reported by (Lohova, Rezeberga, & Miskova, 2025) , which stated that personal hygiene is an environmental factor that can either strengthen or weaken the risk of persistent HPV infection.

In addition, women's lack of knowledge and awareness about genital hygiene is also an important factor. Improper hygiene practices can accelerate abnormal cervical epithelial changes due to pathogen exposure, thereby increasing the likelihood of precancerous lesions. Therefore, education about proper

personal hygiene is an important preventive strategy in efforts to reduce the incidence of cervical precancerous lesions, especially in the active reproductive age group.

CONCLUSION

The results of the study found that 51.4% were under 20 and over 35 years of age, 55.7% were married under the age of 20, 64.3% were multiparous, 77.1% had used and were currently using hormonal contraceptives, 57.1% had used hormonal contraceptives for more than 2 years, 96.8% did not smoke, 80% of the respondents' husbands or family members smoked, 98.6% had no history of cancer in the family, 98.6% consumed processed salted fish, 100% of the processed salted fish samples did not contain formalin, and 8.6% had precancerous cervical lesions. Variables associated with the occurrence of precancerous cervical lesions were age with a p-value of 0.025 and duration of hormonal contraceptive use with a p-value of 0.034. The associations found between age, hormonal contraceptive use duration, and precancerous cervical lesions highlight the need for targeted screening and prevention strategies to the development of precision medicine, improved screening technologies, and targeted therapeutic options to reduce cervical cancer incidence and mortality

CONFLICT OF INTEREST

There is no conflict of interest in this study

ACKNOWLEDGEMENTS

The researchers would like to thank the Director of the Health Polytechnic of the Ministry of Health Bengkulu, Indonesia for facilitating this study.

REFERENCES

Alvarez Antoine, Borch Kristin Benjaminsen, Rylander Charlotta. 2021. Reproductive Factors, Use of Exogenous Hormones, and Servic Cancer Incidence: The Norwegian Women and Cancer Study. Clinical Epidemiology:13 67–80

Anastasiou, E., McCarthy, K. J., Gollub, E. L., Ralph, L., van de Wijgert, J. H. H. M., & Jones, H. E. (2022). The relationship between hormonal contraception and cervical dysplasia/cancer controlling for human papillomavirus infection: A systematic review. *ScienceDirect*. https://doi.org/10.1016/j.contraception.2021.10.018

Anugerah. 2015. Jangan Remehkan Kesehatan Organ Reproduksi. http://www.hudzaifah.org/PNp hpBB2-printview-t-155-start0.phtml

Atul Budukh , Amita Maheshwari 1, Sonali Bagal , Arpit Singh , Kedar Deodhar 2, N. P. 3, & Vrushali Palyekar 4, Rajesh Dikshit, R. B. (2021). Factors influencing women to participate in cervical cancer screening by providing menstrual pads: A population-based study from rural areas of Maharashtra State, India. *Indian Journal of Cancer*, *55*(1), 382–389. https://doi.org/10.4103/ijc.IJC

Aziz MF, Andrijono, Saifuddin AB. 2010. Buku acuan nasional onkologi & ginekologi. Jakarta: Yayasan Bina Pustaka Sarwono Prawirohardjo; hlm. 112-274

Aziz MF, Cornain S, Wibowo N, Andrijono, Budiningsih S, Nuranna L, et al. 2013. Buku acuan program pencegahan kanker serviks "see and treat". Jakarta: YKI;.hlm. 82-104

Aziyah, Sumarni Sr, Ngadiyono. 2017. Faktor Resiko yang Berhubungan dengan Kejadian Kanker Servik; Studi Kasus di RSUP dr. Kariadi Semarang. J Riset Kesehatan, 6 (1) : 21 - 25

Bowden, S. J., Bodinier, B., Kalliala, I., Zuber, V., Vuckovic, D., Doulgeraki, T., … Kyrgiou, M. (2021). Genetic variation in cervical preinvasive and invasive disease: a genome-wide association study. *The Lancet Oncology*, *22*(4), 548–557. https://doi.org/10.1016/S1470-2045(21)00028-0

Bowden, S. J., Doulgeraki, T., Bouras, E., Markozannes, G., Athanasiou, A., Grout-Smith, H., … Kyrgiou, M. (2023). Risk factors for human papillomavirus infection, cervical intraepithelial neoplasia and cervical cancer: an umbrella review and follow-up Mendelian randomisation studies. *BMC Medicine*, *21*(1), 1–15. https://doi.org/10.1186/s12916-023-02965-w

Cahyani, N. A., Shammakh, A. A., Sabariah, S., & Arjite, P. D. (2023). Hubungan Penggunaan Kontrasepsi

Hormonal dengan Hasil Pemeriksaan Inspeksi Visual Asam Asetat (IVA). *Jurnal Health Sains*, *4*(4), 30–40. https://doi.org/10.46799/jhs.v4i4.876

Densmore Ryan, Hajizadeh Mohammad, Min Hu. 2019. Trends in socio-economic inequalities in bladder cancer incidence in Canada: 1992–2010. Canadian Journal of Public Health (2019) 110:722–731. https://doi.org/10.17269/s41997-019-00227-y

Dewi IGAAN. 2017. Pendekatan faktor-faktor dalam mendeteksi lesi prakanker leher rahim di kota Denpasar. J Infokes Apikes Citra Med Surakarta; 7(2):56–62.

Fitrisia, C. A., Khambri, D., Utama, B. I., & Muhammad, S. (2020). Analisis Faktor-faktor yang Berhubungan dengan Kejadian Lesi Pra Kanker Serviks pada Wanita Pasangan Usia Subur di Wilayah Kerja Puskesmas Muara Bungo 1. *Jurnal Kesehatan Andalas*, *8*(4), 33–43. https://doi.org/10.25077/jka.v8i4.1147

Fogleman, C., & Leaman, L. (2019). Prophylactic vaccination against human papillomavirus to prevent cervical cancer and its precursors. *American Family Physician*, *99*(1), 15–16. https://doi.org/10.17816/kmj13370

Hembing. 2015. Menghindari Kanker dengan Menerapkan Pola Hidup Sehat.http://cybermed.cbn. net.id/cbprtl/cybermed/pd a/detail.aspx?x=Hembing&y =cybermed%7C0%7C0%7C 8%7C78

Ichya'uddin. 2014. Analisis Kadar Formalin dan Uji Organoleptik Ikan Asin di Beberapa Pasar Tradisional di Kabupaten Tuban. Skripsi.

Institue, N. C. (2023). HPV and cancer. *HPV and Cancer*, *9789400754*, 1–198. https://doi.org/10.1007/978-94-007-5437-9

International Agency for Research on Cancer (IARC). Globocan 2018: Incidence, mortality, 5 years-Prevalence and new cases disabilityadjusted life years (DALYs) cancer of the world. IARC Cancer Base (diakses 26 Desember 2018). Tersedia dari: http://globocan.iarc.fr/Default.aspx

Jiang, L., Ma, S., Zhang, G., Jiang, L., & Yan, L. (2023). Analysis of tobacco exposures and high-risk HPV infection in American women: National Health and Nutrition Examination Survey. *Environmental Science and Pollution Research*, *30*(51), 110489–110498. https://doi.org/10.1007/s11356-023-30175-7

Kemenkes RI. (2019). Kanker Serviks. *Angsamerah.Com Klinik Kesehatan Pria Dan Wanita*. Retrieved from http://blog.angsamerah.com/kanker-serviks/

Kementrian Kesehatan RI. (2024). Rencana kanker nasional 2024-2034 Strategi Indonesia dalam Upaya Melawan Kanker. *Kementrian Kesehatan Republik Indonesia*, (September), 93–94.

Kementerian Kesehatan Republik Indonesia (Kemenkes RI). Pusat data & informasi profil kesehatan tahun 2018. Tersedia dari: http://www.depkes.go.id/resources/ download/pusdatin/infodatin/infodatin-kanker.pdf

Kim, J. Y., Lee, D. W., Kim, M. J., Shin, J. E., Shin, Y. J., & Lee, H. N. (2021). Exposição ao fumo passivo, diabetes e alto IMC são fatores de risco para câncer do colo do útero: um estudo transversal da pesquisa nacional de saúde e nutrição da Coreia (2010–2018). *BMC Cancer*, *21*(1), 1–6. Retrieved from https://bmccancer.biomedcentral.com/articles/10.1186/s12885-021-08580-3

Lohova-Matisa, E., Rezeberga, D., & Miskova, A. (2025). Feminine Intimate Hygiene: A Review of Healthy and Unhealthy Habits in Women. *Medicina (Lithuania)*, *61*(7), 1–21. https://doi.org/10.3390/medicina61071302

Makuza JD, Nsanzimana S, Muhimpundu MA, Pace LE, Ntaganira J, Riedel DJ. Prevalence and risk factors for cervical cancer and pre-cancerous lesions in Rwanda. Pan Afr Med J. 2015;22:1–8.

Manuaba, Ida Bagus Gde. 2019. Kapita Selekta Penatalaksanaan Rutin Obstetri Ginekologi dan KB. Jakarta : EGC.

Mubarok, Husnul. 2018. Kanker Serviks. http://cetrione.blogspot.co m/2008/06/kankerserviks.html

Mustikarani, I. K. (2020). Hubungan Lama Penggunaan Alat Kontrasepsi Oral (Pil Kb) Dan Intrauterine Device (Iud) Terhadap Resiko Kanker Serviks Di Puskesmas Ngoresan Surakarta. *Jurnal Keperawatan Malang*, *5*(2), 72–79. https://doi.org/10.36916/jkm.v5i2.113

National Cancer Intitute. (2024). Cervical cancer causes, risk factors, and prevention risk factors. *American Cancer Society*, 2. Retrieved from https://www.cancer.org/cancer/cervical-cancer/causes-risks-prevention.html

Nasir, Rachmad Yuliadi. 2018. Seluk Beluk Kanker Serviks. http://www.halamansatu.n et/index.php?option=com_c ontent&task=view&id=734& Itemid=51

Nazari, E., Hasanzadeh, M., Rezvani, R., Rejali, M., Badpeyma, M., Delaram, Z., … Avan, A. (2023). Association of dietary intake and cervical cancer: a prevention strategy. *Infectious Agents and Cancer*, *18*(1), 1–13. https://doi.org/10.1186/s13027-023-00517-8

Nindrea RD. Prevalensi dan faktor yang mempengaruhi lesi pra kanker serviks pada wanita. J Endur. 2017;2(1):53

Pakpahan, S. (2021). Skrining Lesi Prakanker Leher Rahim Dengan Pemeriksaan IV A. *Jurnal Manajemen Kesehatan Yayasan RS.Dr. Soetomo*, *7*(1), 45. https://doi.org/10.29241/jmk.v7i1.590

Plisko, O., Zodzika, J., Jermakova, I., Pcolkina, K., Prusakevica, A., Liepniece-Karele, I., … Rezeberga, D. (2024). Prediction of high-grade cervical precancerous abnormalities: The role of personal factors, vaginal microflora, sexually transmitted infections, and high-risk human papillomavirus. *PLoS ONE*, *19*(11 November), 1–13. https://doi.org/10.1371/journal.pone.0313004

Ramachandran, D., & Dörk, T. (2021). Genomic risk factors for cervical cancer. *Cancers*, *13*(20). https://doi.org/10.3390/cancers13205137

Sadia, H., Shahwani, I. M., & Mehboob, K. F. (2022). Risk factors of cervical cancer and role of primary healthcare providers regarding PAP smears counseling: Case control study. *PubMed Central*, *38*(4), 998–1003. https://doi.org/10.12669/pjms.38.4.4969

Schrenk, D., Bignami, M., Bodin, L., Chipman, J. K., del Mazo, J., Hogstrand, C., … Grasl-Kraupp, B. (2023). Risk assessment of N-nitrosamines in food. *EFSA Journal*, *21*(3). https://doi.org/10.2903/j.efsa.2023.7884

Smitha Asthana, Vishal Busa, S. L. (2020). Oral contraceptives use and risk of cervical cancer-A systematic review & meta-analysis. *Pubmed*, *Apr:247*, 163–175. https://doi.org/10.1016/j.ejogrb.2020.02.014

Sriyono. 2015 Pengaruh Tingkat Pendidikan Dan Pemahaman Masyarakat Tentang Ikan Berformalin Terhadap Kesehatan Masyarakat. J Faktor Exacta 8(1): 79-91.

Suheimi, Irham. 2016. Divisi Ginekologi Onkologi Departemen Obstetri Dan Ginekologi Rsupncm-Fkui. Jakarta. http://ksuheimi.blogspot.co m/2008/07/kankerserviks.html

WHO. (2020). *Global strategy to accelerate the elimination of cervical cancer as a public health problem: technology landscape*. *World Health Organization*. Retrieved from https://www.who.int/publications/i/item/9789240014107

World Health Organization (WHO).2018. Estimated cervical cancer incidence worldwide in 2018 & human papillovirus and related Cancer in Indonesia. Tersedia dari: http://www.ncc.online.ora/world

World Cancer Research Fund. (2018). Meat, fish and dairy products and the risk of cancer. *World Cancer Research Fund*, 3–79. Retrieved from https://www.wcrf.org/wp-content/uploads/2021/02/Meat-fish-and-dairy-products.pdf

World Health Organization. (2024). Cervical cancer. *Who Int*.

Wulandari. 2018. Kenali Gejala Kanker Serviks. http://cybermed.cbn.net.id /cbprtl/cybermed/detail.as px?x=Health+Woman&y=cy bermed%7C0%7C0%7C14% 7C828

Yang, D., Zhang, J., Cui, X., Ma, J., Wang, C., & Piao, H. (2022). Risk Factors Associated With Human Papillomavirus Infection, Cervical Cancer, and Precancerous Lesions in Large-Scale Population Screening. *Frontiers in Microbiology*, *13*(June), 1–13. https://doi.org/10.3389/fmicb.2022.914516