

Risk Factors of Cervical Cancer Among Women of Reproductive Age at Undata General Hospital Province Central Sulawesi

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Article Information

Submitted: 07 November 2025

Accepted: 11 November 2025

Publish: 20 November 2025

Keyword: Risk; Cervical Cancer; Women of Reproductive Age (WRA);

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Year: 2025

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Abstract

Introduction: Based on medical record data from Undata Regional General Hospital (RSUD Undata) Palu, 120 cervical cancer (Ca cervix) cases received examination and medical treatment in 2023. This high number indicates that cervical cancer remains a major public health problem in Central Sulawesi. **Objective:** To analyze the risk factors associated with cervical cancer among women of reproductive age at RSUD Undata, Central Sulawesi Province, in 2024. **Method:** This quantitative study applied a cross-sectional design and was conducted at RSUD Undata Palu. The sample comprised 69 respondents selected through proportionate stratified random sampling. Data were analyzed using univariate (frequency distribution) and multivariate (multiple linear regression) analyses. **Results and Discussion:** The analysis revealed that number of marriages ($p=0.009$), age at first pregnancy ($p=0.035$), number of children ($p=0.000$), smoking history ($p=0.016$), and clinical symptoms ($p=0.018$) significantly influenced cervical cancer risk. Conversely, age ($p=0.727$), body weight ($p=0.850$), ethnicity ($p=0.103$), menarche ($p=0.786$), and occupational history ($p=0.596$) showed no significant association. A greater number of children increased risk due to repeated cervical trauma and hormonal changes during pregnancy that facilitate persistent viral infection. **Conclusion:** The number of children, clinical symptoms, marital frequency, and smoking history had dominant effects on cervical cancer risk, while age and body weight had no direct influence. The regression model explained 43% of the variation in cervical cancer risk.

Introduction

Cervical cancer remains a major global reproductive health problem and continues to be one of the leading causes of morbidity and mortality among women. It is characterized by the uncontrolled growth of abnormal cells in the cervical epithelium, most commonly arising from squamous cells (about 90% of cases), while approximately 10% originate from glandular cells of the endocervix. The precancerous stage may persist for five to ten years before progressing into an invasive form (Digambiro, 2024). Although cervical cancer predominantly affects women aged 40–50 years, recent data show an alarming rise among younger women aged 25–30 years, indicating a shift in epidemiological patterns that warrants serious attention.

Globally, cervical cancer ranks as the fourth most common cancer among women. According to the World Health Organization (2024), an estimated 660,000 new cases and 350,000 deaths were recorded in 2022, with the highest incidence reported in Southeast Asia and Sub-Saharan Africa. This trend reflects that cervical cancer is not merely an individual medical condition but also a pressing public health issue. The disease is largely preventable through early detection programs such as Papanicolaou (Pap) smear testing and Human Papillomavirus (HPV) vaccination.

At the national level, the situation in Indonesia reflects similar concerns. The Global Cancer Observatory (GLOBOCAN, 2022) reported 36,964 new cervical cancer cases and 21,376 deaths, accounting for 11.6% of all cancer-related deaths among women. Cervical cancer ranks as the third most common malignancy in Indonesian women after breast and colorectal cancers. Additionally, approximately 66,271 women were recorded as five-year survivors, representing 15.4% of total female cancer cases. These figures highlight the high disease burden, medical costs, and potential long-term complications that significantly impact women's health and quality of life.

At the regional level, the situation in Central Sulawesi Province also demonstrates a fluctuating trend. Data from the Provincial Health Office (2024) showed 22 cases in 2021, declining to 6 in 2022, and no confirmed cases in 2023. However, visual inspection with acetic acid (IVA) screening detected 46 positive precancerous lesions. In 2024, the number of confirmed cervical cancer cases increased to 21, alongside 46 IVA-positive cases referred for further management. In Palu City, 4 confirmed cases were reported in 2023 and 7 in 2024, with 36 IVA-positive findings (Palu City Health Office, 2024). Moreover, medical record data from Undata Regional General Hospital (RSUD Undata) reported 120 cervical cancer patients who underwent treatment during 2023, reflecting the disease's substantial burden in the province (RSUD Undata Medical Records, 2023).

Early detection serves as a key strategy in cervical cancer prevention. The Pap smear test remains the most widely used and effective cytological screening method due to its high sensitivity and specificity in identifying premalignant lesions such as ASC-US (Atypical Squamous Cells of Undetermined Significance) and LSIL (Low-grade Squamous Intraepithelial Lesion). Fatma et al. (2024) found that, among 1,000 women screened using Pap smears, 71.5% had normal results, while others showed various abnormalities such as cervicitis, vaginitis, and HSIL, emphasizing the importance of widespread screening coverage.

Women of reproductive age (15–49 years) are particularly vulnerable due to heightened hormonal and sexual activity, as well as social and economic barriers affecting access to health services. Tamrakar et al. (2021) reported that vaginal infections and epithelial cell abnormalities were most prevalent among women aged 31–40 years. Additional risk factors include HPV infection, early sexual debut, multiparity, smoking

habits, prolonged use of hormonal contraceptives, and a history of sexually transmitted infections (Venkatesh & Gopalan, 2020).

Despite the proven benefits of Pap smear screening, its implementation faces several challenges, including cultural barriers, economic limitations, and low public awareness. However, educational and counseling interventions have demonstrated a significant positive impact. Fatma et al. (2024) reported that after receiving health education, all participants expressed willingness to undergo Pap smear testing, indicating the effectiveness of awareness-based interventions in promoting preventive behavior.

Given the complex interplay of risk factors and the persistent high incidence of cervical cancer in Central Sulawesi, comprehensive research is required to identify and analyze the determinants of cervical cancer among women of reproductive age. Findings from this study are expected to provide scientific evidence for the formulation of more adaptive, preventive, and community-based health policies aimed at strengthening early detection and reducing the burden of cervical cancer in Indonesia.

Method

This study was an observational research employing a cross-sectional design, aiming to analyze the risk factors associated with cervical cancer among women of reproductive age at Undata Regional General Hospital (RSUD Undata), Central Sulawesi Province. Data collection was carried out from January to December 2024. The study population consisted of all women of reproductive age who underwent Pap smear examinations at RSUD Undata during the study period, with a total of 132 individuals recorded. From this population, a sample of 69 respondents was selected based on predefined inclusion and exclusion criteria. The sampling technique used was non-probability sampling with a purposive sampling approach, in which participants were deliberately chosen according to specific characteristics relevant to the study objectives.

The study utilized secondary data obtained from Case Form Records (CFRs) of patients who underwent Pap smear examinations at RSUD Undata within the designated period. The collected data included demographic information (age, ethnicity, and occupation), reproductive health characteristics (age at menarche, maternal age at first pregnancy, parity, and number of marriages), and health-related factors (body weight, smoking history, and clinical symptoms).

Data analysis was performed using multiple linear regression to determine the relationship between independent variables namely age, body weight, ethnicity, occupation, age at menarche, maternal age at first pregnancy, parity, number of marriages, smoking history, and clinical symptoms and the dependent variable, which was the risk of developing cervical cancer. The coefficient of determination (R^2) was used to assess the extent to which the independent variables could explain variations in the dependent variable (Sugiyono, 2017). Furthermore, an F-test (simultaneous test) was conducted to examine whether all independent variables collectively had a significant effect on cervical cancer risk, while a t-test (partial test) was used to determine the influence of each independent variable individually.

Result and Discussion

1. Result

The characteristics of respondents in this study include age group, body weight classification, ethnicity, and marital history. These variables provide a general overview of the demographic and biological profiles that may influence the risk of cervical cancer among women of reproductive age. Understanding these characteristics is crucial, as age, nutritional status, ethnic background, and marital history are significant determinants that can affect exposure to Human Papilloma Virus (HPV) infection and the progression of cervical cancer:

Table 1		
Distribution of Respondents by Characteristics		
Characteristics	f	%
Age Group		
20–29 years	9	13.0
30–34 years	16	21.2
35–39 years	11	16.2
40–49 years	33	38.4
Total	69	100
Body Weight Classification		
45–59 kg	32	46.4
60–69 kg	37	53.6
Total	69	100
Ethnicity		
Kaili	34	49.3
Bugis	13	18.8
Javan	10	14.5
Bali	3	4.3
Balantak	1	1.4
Mori	2	2.9
Pamona	4	5.8
Buol	2	2.9
Total	69	100
Number of Marriages		
First marriage	46	66.7
Second marriage	23	33.3
Total	69	100

Source: Secondary Data, 2024

The respondents' characteristics include age group, body weight, ethnicity, and marital history, which together illustrate the demographic and biological factors influencing cervical cancer risk among women of reproductive age. Understanding these characteristics is essential since age, nutritional status, and marital history are determinants of HPV exposure and cervical cancer development.

Based on the results, most respondents were aged 40–49 years (38.4%), representing the premenopausal stage when hormonal changes and reduced epithelial regeneration increase susceptibility to cervical cancer. The 30–39 age group (37.4%) comprised women in their active reproductive years, while younger respondents aged 20–29 years (13%) had relatively lower risk but still required preventive education. This

finding aligns with WHO (2020) and CDC (2020), which note higher cervical cancer incidence among women over 35 due to prolonged HPV infection.

In terms of body weight, over half of the respondents (53.6%) weighed 60–69 kg, while 46.4% were 45–59 kg. This pattern indicates that many respondents were overweight, a condition linked to hormonal imbalance particularly elevated estrogen which may increase the likelihood of cervical neoplasia (WHO, 2000; Kemenkes RI, 2019). Maintaining an ideal nutritional status is therefore crucial for cervical cancer prevention.

Regarding ethnicity, the majority were Kaili (49.3%), followed by Bugis (18.8%) and Javanese (14.5%). The dominance of the Kaili ethnic group reflects the local population of Central Sulawesi, where cultural practices and health behaviors can influence participation in cervical cancer screening programs such as IVA or Pap smear.

For marital history, two-thirds (66.7%) were in their first marriage, while one-third (33.3%) had remarried. Multiple marriages may increase HPV exposure due to a higher chance of having multiple sexual partners a key behavioral risk factor in cervical cancer pathogenesis (Park, 2018; Becker, 1998).

Multivariat Analysis

A multiple linear regression analysis was conducted to identify the risk factors influencing the incidence of cervical cancer among women of reproductive age at Undata Regional General Hospital, Palu. The independent variables included age, body weight, ethnicity, occupation, age at menarche, age at first pregnancy, number of children (parity), smoking history, number of marriages, and clinical symptoms, while the dependent variable was the Pap Smear result:

Coefficient of Determination (R^2 Test)

The analysis revealed a correlation coefficient (R) of 0.655, indicating a moderately strong relationship between the independent variables and cervical cancer incidence. The R^2 value of 0.429 suggests that 42.9% of the variation in cervical cancer occurrence can be explained by the model, while the remaining 57.1% is influenced by other factors not included in this study such as genetic predisposition, sexually transmitted infections, or immune status. The Adjusted $R^2 = 0.330$ further indicates that approximately one-third of the variance in cervical cancer risk can be meaningfully explained by the ten variables included in the model.

Table 2
Correlation Coefficient (R) Test

Model	R	R Square	Adjusted R Square
1	0.655a	0.429	0.330

Source: Primary Data, 2025

Simultaneous Test (F-Test)

The F value = 4.351 with a significance level of 0.000 (< 0.05) indicates that the regression model is statistically significant as a whole. This means that the combination of all independent variables collectively affects the Pap Smear results. Therefore, the model is considered appropriate to explain the variation in cervical cancer incidence. These findings highlight that cervical cancer risk is not determined by a single factor but rather by an interaction of biological, behavioral, and reproductive variables.

Table 3
Simultaneous Test (F-Test)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	15.704	10	1.570	4.351	0.000
Residual	20.934	58	0.361		
Total	36.638	68			

Source: Primary Data, 2025

Partial Test (t-Test)

Partial test results show that number of marriages ($p = 0.009$), age at first pregnancy ($p = 0.035$), number of children ($p = 0.000$), smoking history ($p = 0.016$), and clinical symptoms ($p = 0.018$) have a significant effect on cervical cancer incidence. Meanwhile, variables such as age, body weight, ethnicity, menarche age, and occupation show no significant effect.

Among all predictors, the number of children emerged as the most dominant factor, followed by number of marriages and clinical symptoms. A higher number of childbirths and multiple marital histories increase cervical trauma and exposure to human papillomavirus (HPV), which elevates the risk of developing cervical cancer. Moreover, smoking history contributes to the disease due to carcinogenic substances in tobacco that accelerate abnormal cervical cell changes.

Overall, this regression model effectively explains a significant relationship between reproductive, behavioral, and clinical factors with cervical cancer incidence among women of reproductive age. These findings emphasize the importance of health education, smoking cessation, and routine early detection programs for high-risk groups, particularly in the Central Sulawesi region.

Table 4
Partial Test (t-Test)

Variable	B	Std. Error	t	Sig.
Age	0.004	0.010	0.351	0.727
Body Weight	0.006	0.030	0.189	0.850
Ethnicity	-0.074	0.045	-1.655	0.103
Number of Marriages	0.500	0.185	2.706	0.009
Menarche Age	-0.034	0.125	-0.273	0.786
Age at First Pregnancy	0.134	0.062	2.162	0.035
Number of Children	0.325	0.088	3.710	0.000
Smoking History	0.360	0.225	1.598	0.016
Occupation	0.091	0.171	0.534	0.596
Clinical Symptoms	1.035	0.425	2.436	0.018

Source: Primary Data, 2025

2. Discussion

The Effect of Age on Cervical Cancer Risk

The analysis showed that age did not significantly influence cervical cancer incidence at RSUD Undata ($p = 0.727 > 0.05$). Although the positive coefficient ($B = 0.004$) suggests a slight tendency for risk to increase with age, it was not statistically significant. Rapar et al. (2021) noted that age is a predisposing factor, with risk typically increasing in women over 35 due to accumulated HPV infections. However, the dominance of productive-age respondents (20–40 years) in this study may have masked significant differences. According to the American Cancer Society (2020), the carcinogenesis process of cervical cancer takes many years after initial HPV infection, making age more of a cumulative indicator rather than a direct cause. This aligns with

Wulandari et al. (2020) and Lestari et al. (2020), who both found that age itself is less influential than the duration of exposure to HPV and sexual or reproductive behaviors that heighten infection risk.

The Effect of Body Weight on Cervical Cancer Risk

Body weight was not found to significantly affect cervical cancer risk ($p = 0.850$). Although the coefficient ($B = 0.006$) indicates a weak positive association, it lacks statistical relevance. Rapar et al. (2021) explained that body weight alone does not directly cause cervical cancer, but obesity may increase risk through hormonal mechanisms involving elevated estrogen levels that promote abnormal cell proliferation. Similarly, Yuliani et al. (2019) highlighted that obesity is associated with several cancers, yet its link to cervical cancer is relatively indirect compared to behavioral factors such as HPV infection or parity.

The Effect of Ethnicity on Cervical Cancer Risk

Ethnicity showed no significant association with cervical cancer incidence ($p = 0.103$). This implies that ethnic background does not act as a determinant of cervical cancer risk in this population. Rapar et al. (2021) suggested that cultural norms may influence reproductive behavior such as early marriage or hygiene practices but ethnicity itself is not a biological risk factor. Bray et al. (2021) further asserted that interregional variations in cervical cancer prevalence are mainly due to differences in access to screening and health education rather than genetic or ethnic differences.

The Effect of Number of Marriages on Cervical Cancer Risk

The number of marriages significantly affected cervical cancer risk ($p = 0.009$, $B = 0.500$). Each additional marriage increases exposure to different sexual partners, thereby heightening the risk of HPV transmission. This is consistent with Rapar et al. (2021) and the World Health Organization (WHO, 2023), which identified multiple sexual partnerships as a major risk factor for HPV infection especially types 16 and 18 responsible for over 70% of global cervical cancer cases. The American Cancer Society (2022) also emphasized that inconsistent condom use and lack of screening contribute to persistent HPV infections. Supporting studies by Suba et al. (2020), Handayani et al. (2020), Muliawati and Rahayu (2021), and Sari et al. (2019) all reported that women with multiple marriages are two to four times more likely to develop cervical cancer, linking social and educational factors to early or repeated marriages and, consequently, prolonged HPV exposure.

The Effect of Age at First Pregnancy on Cervical Cancer Risk

Age at first pregnancy significantly influenced cervical cancer risk ($p = 0.035$, $B = 0.134$). Women who became pregnant at a younger age faced greater risk. Rapar et al. (2021) explained that the cervix in young women is physiologically immature, making it more susceptible to HPV infection. Castellsagué et al. (2019) and Kumar et al. (2020) further noted that hormonal surges during early pregnancy facilitate HPV replication and cellular transformation. Studies by Castellsagué & Muñoz (2020), Sari et al. (2020), Rakhmawati & Putri (2021), and Herlina et al. (2022) consistently demonstrated that women who experience first pregnancy before 20 years of age are two to three times more likely to develop cervical cancer due to prolonged hormonal exposure and cervical trauma during early reproductive maturity.

The Effect of Number of Children on Cervical Cancer Risk

The number of children (parity) showed a strong and significant association with cervical cancer risk ($p = 0.000$, $B = 0.325$). High parity (≥ 3 children) increases risk through repeated cervical trauma during childbirth and persistent hormonal changes. Rapar et al. (2021) and WHO (2020) stated that women with three or more births are up to three times more likely to develop cervical cancer. Mandal et al. (2018) explained that hormonal and immune alterations after multiple pregnancies may hinder HPV clearance. Consistent results were also reported by Sutanto & Nugraheni (2022), Puspitasari et al. (2019) and Wijayanti & Sari (2020), all emphasizing that frequent cervical trauma and prolonged HPV exposure from multiple deliveries contribute significantly to carcinogenesis.

The Effect of Smoking History on Cervical Cancer Risk

Smoking history significantly influenced cervical cancer risk ($p = 0.016$, $B = 0.360$). Women who smoke or are exposed to secondhand smoke are more likely to develop cervical cancer. According to Rapar et al. (2021), carcinogenic substances such as nicotine and benzopyrene accumulate in cervical mucus and damage epithelial DNA. Castle and Giuliano (2019) and IARC (2020) confirmed that tobacco toxins promote oxidative stress and suppress immune function, doubling the risk of high-grade cervical lesions. This finding is consistent with Castellsagué & Muñoz (2020), Simanjorang et al. (2020), Rahman et al. (2022), and Zhao et al. (2022), all of whom demonstrated that both active and passive smoking significantly increase cervical cancer risk through immunosuppression and chronic epithelial damage.

The Effect of Occupational History on Cervical Cancer Risk

Occupational history showed no significant influence on cervical cancer risk ($p = 0.596$). Rapar et al. (2021) argued that occupation may only have indirect effects through stress, environmental exposure, or healthcare access. Sari et al. (2018) added that socioeconomic status and education level related to occupation may influence awareness of cervical cancer screening rather than directly affecting disease risk.

The Effect of Age at Menarche on Cervical Cancer Risk

Age at menarche did not significantly correlate with cervical cancer risk ($p = 0.786$). While early menarche may increase estrogen exposure, Rapar et al. (2021) noted that its influence is weaker compared to breast or endometrial cancers. Yuliani et al. (2019) similarly concluded that HPV infection and sexual behavior are far more relevant factors in cervical carcinogenesis.

The Effect of Clinical Symptoms on Cervical Cancer Risk

Clinical symptoms were significantly associated with cervical cancer ($p = 0.018$, $B = 1.035$). Women reporting symptoms such as postcoital bleeding, malodorous discharge, or pelvic pain were more likely to have positive Pap Smear results. Rapar et al. (2021) and WHO (2020) described these symptoms as markers of advanced epithelial pathology. From a pathophysiological perspective, Berek (2020) explained that neoplastic invasion causes chronic inflammation and vascular changes, producing abnormal bleeding and discharge. Supporting studies by Setiawan & Handayani (2022), Wahyuni & Lestari (2020), Nurhayati et al. (2021), and Yuliani & Sari (2022) all affirmed that early

recognition of reproductive symptoms plays a critical role in early diagnosis and timely intervention, particularly in low-resource settings where screening services are limited.

Conclusion

This study concludes that several factors significantly influence the risk of cervical cancer among women of reproductive age at Undata Regional Hospital, Central Sulawesi. The key determinants include the number of marriages, age at first pregnancy, number of children, smoking history, and clinical symptoms. Among these, the number of children was the most dominant factor, as repeated cervical trauma and hormonal changes during multiple pregnancies may promote persistent HPV infection. Smoking history also contributed significantly, where exposure to carcinogenic substances in cervical mucus can damage epithelial cell DNA. Furthermore, clinical symptoms such as abnormal vaginal discharge, postcoital bleeding, and pelvic pain were strongly associated with cervical cancer incidence, serving as early indicators of pathological changes in cervical tissue.

In contrast, variables such as age, body weight, ethnicity, age at menarche, and occupational history showed no significant relationship, suggesting an indirect influence through behavioral and socioeconomic pathways. The regression model explained 43% of the variation in cervical cancer risk, indicating that other unmeasured factors may also play a role. Overall, this study highlights that parity, clinical symptoms, marital history, and smoking behavior are dominant predictors of cervical cancer, emphasizing the need for early detection, education, and preventive interventions at the community and primary healthcare levels.

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