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ORIGINAL RESEARCH

Contextual Factors, Health History, and Daily Living Activities for Ovarian Cancer Risks: A Case-Control Study in Indonesia

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Abstract

Background: Women are encouraged to aware for risk factors that may aid in the early detection of ovarian cancer before symptoms and sign appear. However, limited studies evaluated the broad aspects of the risk factors for ovarian cancer, particularly in Indonesia. For a more thorough analysis of ovarian cancer risk factors, more variables and a research approach that can make it easier to uncover risk factors of ovarian cancer are necessary. Detecting factors associated with ovarian cancer could serve as the foundation for developing an early warning model.
Purpose: The aim of this study was to analyze contextual factors, reproductive health history, and Activity Daily Living (ADLs) associated with ovarian cancer risks.
Methods: This retrospective case-control study included 408 women with a 1:1 balanced composition: 204 women diagnosed with ovarian cancer and 204 without. The study was conducted at the Cancer Referral Hospital in West Java Province, Indonesia, from April to November 2020. The instrument was developed based on previous studies and hospital medical/nursing records. The data were analyzed using the Chi-square test and the logistic regression test. The sensitivity and specificity were examined using the Receiver Operating Characteristic (ROC).
Results: The variables significantly associated with an increased risk of developing ovarian cancer were advanced age (≥ 45 years) with an odds ratio (OR) of 19.76, low education (OR: 225.00), obesity (OR: 6.04), prior surgery (OR: 51.06), parity (OR: 110.38), and poor sleep quality (OR: 15.75). These factors were found to have the strongest associations with ovarian cancer development.
Conclusion: The present study has identified risk factors that have a statistically significant association with the occurrence of ovarian cancer. Healthcare practitioners have the potential to employ this information as foundational data for future research in the development of a self-detection tool for assessing the risk of ovarian cancer.

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1. Introduction

Globally, ovarian cancer is the fifth leading cause of morbidity and mortality in women (Arora et al., 2023). In Indonesia, ovarian cancer is the third leading cause of death in women after breast and cervical cancer (Ministry of Health Republic of Indonesia [MOHRI], 2019). It is estimated that, by 2040, the cancer mortality rate will have increased significantly (National Cancer Institute, 2020). Individual women, families, communities, health workers, and the government are all concerned about ovarian cancer's high morbidity and mortality rates. This cancer is known as a silent killer because it does not present a typical symptom (Kemppainen et al., 2019; Mahoney & Pierce, 2022; Mathieu et al., 2018). Most patients present at health services with an advanced stadium, which increases the risk of death (Mathieu et al., 2018; Momenimovahed & Salehiniya, 2019). The annual incidence of ovarian cancer ranges from 9 to 15 per 100.000 women, with an average mortality rate of 5.4 to 11.6 deaths per 100.000 women (Mathieu et al., 2018). Almost 300.000 new cases were reported in 2018, placing Indonesia at number 22 among the top 25 countries with the highest ovarian cancer rates, with an incidence rate of 9.7 (Arora et al., 2023).

A comprehensive approach that includes early self-detection by identifying risk factors, screening in health services, early diagnosis, and treatment programs could help prevent diagnosis delays.

Ovarian cancer is divided into five histological subtypes, each with its own set of risk factors, cell origin, molecular composition, clinical features, and treatment options (Matulonis et al., 2016). Since early detection of ovarian cancer is difficult, one strategy to pursue is prevention by understanding the risk factors (Jauhari et al., 2016). According to research conducted in several countries, hormonal, lifestyle, women in postmenopausal ages were contributed factors to the formation of ovarian cancer (Koskela-Niska et al., 2013; Schüler et al., 2013; Umakanthan et al., 2019). The research in Indonesia found that menarche, parity, contraceptive use, family history, infertility treatment, age, occupation, menopause, body mass index (BMI) are risk factors for ovarian cancer (Agusweni et al., 2020; Arania & Windarti, 2015; Jauhari et al., 2016; Kamajaya et al., 2021; Latief et al., 2023; Wulandari et al., 2019). Unfortunately, these studies only calculate the frequency of occurrence and demographic characteristics without analyzing which factors increase or decrease ovarian cancer risks. In addition, several studies on ovarian cancer risk factors have only been conducted in cross-sectional form (Nababan et al., 2021). Previous research found risk variables that can be divided into three categories: contextual factors, health history, and health behavior. However, more variables and a research methodology that can aid the finding of risk factors that influence ovarian cancer occurrence are required for a more thorough and detailed investigation of ovarian cancer risk factors. This study aimed to investigate the association between contextual factors, reproductive health history, ADLs, and ovarian cancer risks. Identifying risk variables for ovarian cancer can be the foundation for developing an early-warning ovarian cancer model.

2. Methods

2.1 Research design

The quantitative analytic observation with a retrospective case-control study approach was used in this study. This study compares two groups of respondents, that focuses on comparing two groups of women: those with cancer (cases group) and non-cancer (controls group) to look at factors associated with ovarian cancer.

2.2 Setting and samples

The samples were selected using a consecutive sample technique. The unpaired categorical comparative analytic formula was used to calculate the sample size. The case inclusion criteria were patients diagnosed with ovarian cancer, a treatment history, or being hospitalized at a referral hospital in West Java, Indonesia. The population in the control group had to be free of ovarian cancer, and not hospitalized in the cancer ward. Both groups were adult women, and their health data information was captured in the medical record. G-Power analysis was used to calculate the sample determination, with alpha error probability 0.05, effect size 0.3, and power 0.95. The Cohen's rule (1988) and studies by Ribeiro et al. (2010) and Oksuz et al. (2021) were used to calculate the effect size. According to the computation, the minimum sample size for each group was 191, with an additional 5% sample added to prevent respondents from dropping out. As a result, 408 samples were taken from 204 individuals in the case group and 204 participants in the control group. The study was conducted from April to November 2020. The samples' recruitment explained in the Figure 1.

2.3 Measurement and data collection

The dependent variable in this study was the incidence of ovarian cancer. The selection of independent variables was informed by prior research on the examination of risk factors associated with ovarian cancer globally (Huusom et al., 2006; Kemppainen et al., 2019; Matulonis et al., 2016; Momenimovahed & Salehiniya, 2019); these studies contained valid variables. The contextual factors (demographic data, medical and health history, and activity daily living), medical history, and daily activities were investigated as independent variables. The contextual factors were categorized and adjusted with the Indonesian formal category, especially in demographic data: age, education level, occupation, and economic level (MOHRI, 2019; Public Relations West Java Regional Government Agency, 2020; The Central Statistics Bureau of Indonesia, 2020). Variables of medical and health history included menstrual history, marriage status, reproductive health, illness, family health, family planning, and gynecological health (Bell,

2013; Lowdermilk et al., 2013; Matahari et al., 2018; National Population and Family Planning Agency, 2018; Saryono, 2009). Daily activity factors included nutrition status, elimination pattern, sleep patterns, and exercise. Nutritional status factors include BMI, dietary patterns, food portions, amount of drink, caffeine consumption, and smoking (MOHRI, 2018a, 2018c; 2018d). Basic Health Research and the Cohort of the Ministry of Health of the Republic of Indonesia were used to create the questionnaire used in this study (MOHRI, 2018b). The detail of variables described in the results section (Table 1). The instrument's validity was assessed through a two-stage process. Initially, the assessment of content validity was conducted through a comparative analysis of the instrument's contents with prior research. Subsequently, the establishment of construct validity was achieved by consulting with two distinct groups of nursing professionals: basic nursing experts and women's health nurse specialists (Bolarinwa, 2015; Cresswell, 2013).

The administrator at the national referral hospital in West Java provinces collected data from the medical record in the case group, which was subsequently forwarded to the research team. The data for the control group were obtained online by sharing survey formulations on WhatsApp, which were linked to the Google Form from April to November 2020. It took them roughly 15-20 minutes to complete the survey formula. Following the collection of data, the nurse proceeded to undertake the editing phase, wherein the information obtained from the medical records of the hospital was cross-referenced to ensure the accuracy of the data provided by the participants. All members of the study team were taught in the COVID-19 transmission prevention procedure, research objectives, data collection method, how to fill out the survey format through Google Forms, and paying attention to the general health state of participants while collecting data.

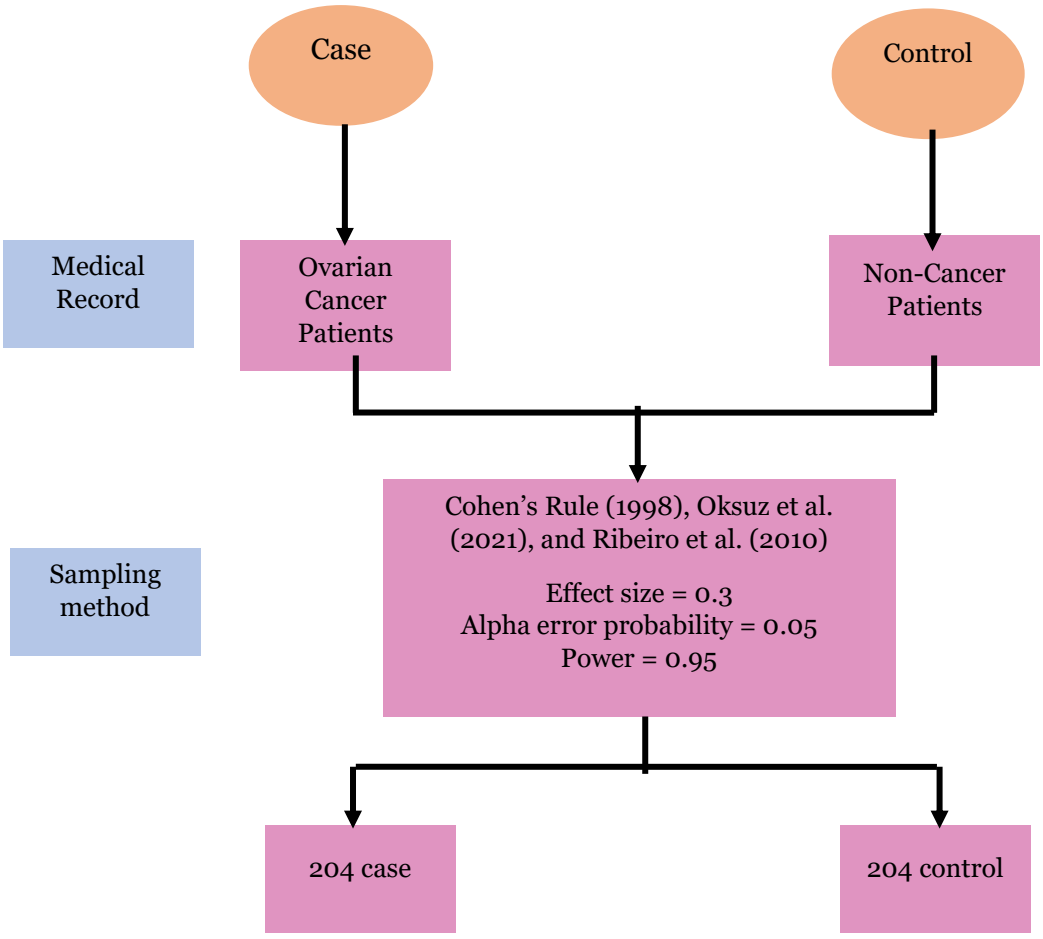

Figure 1. The flowchart of samples' recruitment

2.4 Data analysis

The SPSS version 25 was utilized by the researchers to examine the research data. The information was entered into a spreadsheet and analyzed using the Chi-square test and logistic regression. Chi-square analysis was performed to analyze the link between each variable and the

risk of ovarian cancer, while logistic regression was utilized to determine which variable was the most influential (Umami et al., 2021). In this investigation, the *p*-value for all statistical tests was less than 0.05, with a 95% confidence level for the adjusted odds ratio (AOR). The multivariate logistic regression findings found the estimated coefficient and divided it by the standard error to find the least number, which was then rounded off. The scoring accuracy was validated using ROC, which was utilized to examine sensitivity and specificity (Nahm, 2022).

2.5 Ethical considerations

This study received ethical approval from the Health Research Ethics Committee of Universitas Padjadjaran, Indonesia, number: LB.02.01/X.B.5/180/202. The research ethics principles applied in this study were respect for human dignity, privacy and confidentiality, and justice. In applying these ethic principles, this study had no risk of causing physic or mental harm to the subjects. Respondents might leave the research at any time and with no consequences to their health treatment. The data of the respondents were kept private by the researchers.

3. Results

The results are presented in four parts: first, a table of the relationship between respondent characteristics, medical history, and ADLs on ovarian cancer incidence, and second, the results of logistic regression analysis, the estimated β coefficient, and third, the ROC findings.

3.1 Relationship of respondent characteristics, health history, and ADLs with ovarian cancer

Table 1 shows the findings of risk factors associated with ovarian cancer ($p<0.05$). The risk factors were age >45 years, low level of education, and unemployed. Several additional risk factors related to reproductive history were menarche age (15 years), menstrual cycle (less than or more than the standard time,) dysmenorrhea, marriage age 20 years, number of pregnancies, history of pregnancy problems, breastfeeding history, fertility treatment, non-hormonal contraception and contraception problems. Then, risk factors related to health history included family history of cancer, surgeries, and history of disease complication. Lastly ADLs risk factors were coffee drinking, exercise, food, drinking practices, smoking, sleep, defecation and urination patterns.

Table 1. The association of respondent characteristics, health history, and ADLs with ovarian cancer (n=408)

Variable	Ovarian Cancer (n=204)	Normal (n=204)	*p*-value	Crude OR (95% CI)
	f (%)	f (%)		
Demography				
Age (years)				
>45	103 (50.5)	3 (1.5)	<0.001*	68.33 (21.15 – 220.72)
12-45 (ref)	101 (49.5)	201 (98.5)		
Education				
Junior High School or less	166 (81.4)	7 (3.4)	<0.001*	122.94 (5.49 – 282.55)
Senior High School or more (ref)	38 (18.6)	197 (96.6)		
Occupation				
Jobless	149 (73.0)	97 (47.5)	<0.001*	2.99 (1.98 – 4.52)
Workers (ref)	55 (27.0)	107 (52.5)		
Menstrual History				
Menarche				
≥15 years	58 (28.4)	35 (17.2)	0.007*	1.92 (1.19 – 3.08)
<15 years (ref)	146 (71.6)	169 (82.8)		
Length of Menstruation				
≤14 days	204 (100.0)	204 (100.0)	-	
>14 days (ref)	0 (0.0)	0 (0.0)		
Menstrual Cycle				
<21 days	0 (0.0)	54 (26.5)	<0.001*	167.97 (10.22 – 2726.81)
21-35 days (ref)	204 (100.0)	133 (65.2)		
>35 days	0 (0.0)	17 (8.3)	0.006*	53.61 (3.20 – 899.14)

Table 1. Continued

Variable	Ovarian Cancer (n=204)	Normal (n=204)	*p*-value	Crude OR (95% CI)
	f (%)	f (%)		
Menstrual symptoms				
Yes	53 (26.0)	122 (59.8)	<0.001*	0.24 (0.16 – 0.36)
No (ref)	151 (74.0)	82 (40.2)		
Type of menstrual symptoms				
Dysmenorrhea	52 (98.1)	84 (68.9)	<0.001*	23.52 (3.14 – 176.53)
Others (ref)	1 (1.9)	38 (31.1)		
Marriage History				
Marriage status				
Married	180 (88.2)	128 (62.7)	<0.001*	4.45 (2.67 – 7.43)
Single (ref)	24 (11.8)	76 (37.3)		
Age of Marriage				
<20 years	67 (37.2)	12 (9.4)	<0.001*	5.73 (2.94 – 11.17)
≥20 years (ref)	113 (62.8)	116 (90.6)		
Reproductive Health History				
Pregnant History				
None (ref)	19 (9.3)	88 (43.2)		
Once	41 (20.1)	36 (17.6)	<0.001*	5,28 (2.71 – 10.29)
More than two	144 (70.6)	80 (39.2)	<0.001*	8,34 (4.73 – 14.69)
Pregnancy and Delivery health problems				
Yes	51 (27.6)	33 (28.4)	0.868	0,96 (0.57 – 1,60
No (ref)	134 (72.4)	83 (71.6)		
Type of Pregnancy and Delivery health problems				
Bleeding/PROM/Eclampsia	47 (25.4)	2 (1,7)	<0.001*	14,56 (3.44 – 61.52)
Other problems	5 (2.2)	31 (26.7)	<0.001*	0.08 (0.03 – 0.24)
None/normal (ref)	134 (72.4)	83 (71.6)		
Breastfeeding experience				
Yes	185 (90.7)	103 (50.5)	<0.001*	9,55 (5.53 – 16.49)
No (ref)	19 (9.3)	101 (49.5)		
Infertile History				
Yes	6 (2.9)	12 (5.9)	0,148	0,49 (0.18 – 1.32)
No (ref)	198 (97.1)	192 (94.1)		
Infertile Therapy				
Yes	0 (0.0)	10 (4,9)	0.033*	0.05 (0.003 – 0.78)
No (ref)	204 (100.0)	194 (95.1)		
Illness History				
History of disease complication				
Yes	136 (66.7)	27 (13.2)	<0.001*	13.11 (7.96 – 21.59)
No (ref)	68 (33.3)	177 (86.8)		
Type of health complications				
Surgery	126 (92.6)	7 (25.9)	<0.001*	46.85 (20.83 – 105.41)
Other complications	10 (4.9)	20 (9.8)	0.523	1.30 (0.58 – 2.92)
No complication (ref)	68 (33.3)	177 (86.8)		
Family health history				
Family history with cancer				
Yes	3 (1.5)	18 (8.8)	0.001*	0.15 (0.05 – 0.53)
No (ref)	201 (98.5)	186 (91.2)		
History of Family Planning				
Type of Contraception				
None (ref)	154 (75.5)	128 (62.7)		
Hormonal Contraception	30 (14.7)	32 (15.7)	0.379	0,78 (0.45 – 1.35)
Non-Hormonal Contraception	20 (9.8)	44 (21.6)	0.001*	0,38 (0.21 – 0.68)
Contraception problems				
Yes	36 (72.0)	26 (34.2)	<0.001*	4.95 (2.27 – 10.77)
No (ref)	14 (28.0)	50 (65.8)		

Table 1. Continued

Variable	Ovarian Cancer (n=204)	Normal (n=204)	*p*-value	Crude OR (95% CI)
	f (%)	f (%)		
Type of problems				
Irregular periods	24 (48.0)	13 (17.1)	<0.001*	6.59 (2.69 – 16.19)
Other problems	12 (24.0)	13 (17.1)	0.017*	3.30 (1.23 – 8.81)
None (ref)	14 (28.0)	50 (65.8)		
Gynecological Health History				
History of Gynecological Problems				
Yes	204 (100.0)	20 (9.8)	<0.001*	3681 (221 – 61295)
No (ref)	0 (0.0)	184 (90.2)		
Type of Gynecology problems				
Cancer in reproductive system	204 (100.0)	0 (0.0)	<0.001*	18405 (356 – 950247)
Others (ref)	0 (0.0)	22 (100.0)		
Nutrition status				
BMI				
Overweight/Obese (>25,0)	143 (70.1)	66 (32.4)	<0.001*	4.90 (3.22 – 7.46)
Normal (18,5-25,0) (ref)	61 (29.9)	138 (67.6)		
Dietary pattern				
≤3 times/day	204 (100.0)	199 (97.5)	0.061	11.28 (0,62 – 205.27)
>3 times/day (ref)	0 (0.0)	5 (2.5)		
Food Portion				
≤1 Portion	204 (100.0)	185 (90.7)	0.009*	42.99 (2.58 – 717.14)
>1 Portion (ref)	0 (0.0)	19 (9.3)		
Amount of drink				
<8 glasses	108 (52.9)	124 (60.8)	0.110	0.73 (0.49 – 1.08)
≥8 glasses (ref)	96 (47.1)	80 (39.2)		
Caffein consumption				
Yes	5 (2.5)	88 (43.1)	<0.001*	0.03 (0.01 – 0.08)
No (ref)	199 (97.5)	116 (56.9)		
Smoking				
Yes	1 (0.5)	3 (1.5)	0.623	0.33 (0.03 – 3.20)
No (ref)	203 (99.5)	201 (98.5)		
Elimination pattern				
Defecation pattern				
1-4 times/day	204 (100.0)	179 (87.7)	0.005*	58.10 (3.51 – 961.30)
>4 times/day (ref)	0 (0.0)	25 (12.3)		
Characteristic of feses				
Solid	202 (99.0)	200 (98.1)	0.685	2.02 (0.37 – 11.15)
Liquid/blood (ref)	2 (1.0)	4 (1.9)		
Urination Pattern				
Urinate pattern				
<3 times/day	0 (0.0)	8 (3.9)	0.049*	0.06 (0.003 – 0.99)
≥3 times/day (ref)	204 (100.0)	196 (96.1)		1
Colour				
Clear	200 (98.0)	196 (96.1)	0.241	2.04 (0.61 – 6.89)
Yellow pale (ref)	4 (2.0)	8 (3.9)		
Sleep pattern and Exercise				
Length of take a nap				
≤3 hours	204 (100.0)	204 (100.0)	-	
>3 hours	0 (0.0)	0 (0.0)		
Length of night sleep				
≤7 hours	162 (79.4)	79 (38.7)	<0.001*	6.10 (3.93 – 9.49)
>7 hours (ref)	42 (20.6)	125 (61.3)		
Exercise				
Yes	26 (12.7)	100 (49.0)	<0.001*	0.15 (0.09 – 0.25)
No (ref)	178 (87.3)	104 (51.0)		
Income status				
< country's standard	129 (63.2)	131 (64.2)	0.837	0.96 (0.64 – 1.44)
≥ country's standard (ref)	75 (36.8)	73 (35.8)		

Note. Chi-square test, *Statistically significant (p<0.05)

3.2 Multivariate analysis of the most relating risk factors of ovarian cancer

The logistic regression test was used to perform a multivariate analysis. Table 2 shows the final model, which identifies the factors most associated with ovarian cancer and increasing the risk of ovarian cancer, such as age >45 years, junior high school education or below, the number of pregnancies, history of surgery, overweight/obesity, and ≤ 7 hours of sleep duration. According to the AOR results, education has the highest level of risk, with an AOR of 225 (95% CI: 34.22–1479.52), meaning that a low education (junior high school and below) increases the risk of ovarian cancer by 225 times, followed by the number of pregnancies (AOR: 110.38), history of surgery (OR: 51.06), age> 45 years (AOR: 19.76), duration of sleep ≤7 hours (AOR: 15.75), and overweight/obese (AOR: 6.04). The results also reveal factors associated with lowering cancer risks, such as menstrual complaints, marriage history, family history of cancer, and coffee consumption. A family history of cancer was the factor with the highest risk reduction, with an AOR of 0.01 (95% CI: 0.00–0.21), meaning that a family history of cancer could reduce the risk of ovarian cancer by 99%, followed by a history of marriage, coffee consumption, and menstrual complaints.

Table 2. Results of multivariate analysis (n=408)

Variable	*P*-value	Adjusted OR	95% CI	
			Lower	Upper
Age >45 years	0.010*	19.76	2.03	192.55
Education (Junior High School and less)	<0.001*	225.00	34.22	1,479.52
Menstrual problem Symptoms	0.006*	0.19	0.06	0.63
Marriage History	0.045*	0.02	0.00	0.92
Pregnancy number				
No history		1		
One time	0.022*	110.38	1.98	6,167.87
More than ≥2	0.110	27.29	0.47	1,575.24
History of disease complications				
No history		1		
Surgery	<0.001*	51.06	8.58	304.01
Other complication	0.472	0.49	0.07	3.45
Family history with cancer	0.003*	0.01	0.00	0.21
BMI Overweight/Obese	0.003*	6.04	1.87	19.51
Caffein consumption	<0.001*	0.04	0.01	0.19
Length of night sleep ≤7 Jam	<0.001*	15.75	4.30	57.64

Note. *Logistic regression*
* Statistically significant (p<0.05)

3.3 Results of the Receiver Operating Characteristic (ROC) test

The ROC test was used to verify the scoring accuracy. In Table 3, the area under the ROC curve (AUC) value was 0.988 (95% CI 0.973–0.996), meaning that the risk factor scoring model was very accurate in predicting the incidence of ovarian cancer.

Table 3. Scoring validation using the ROC test (n=408)

Variables	AUC (95%CI)	*p*-value
Scoring Model	0.988 (0.973 – 0.996)	<0.001
Cut-off poin	>23	
Sensitivity	93.1%	
Specificity	97.1%	

Note. *ROC test,* AUC = Area Under the Curve
* Statistically significant (p<0.05)

The ROC analysis revealed that the cutoff score was >23, with a sensitivity of 93.1%, a specificity of 97.1%, and a sensitivity and specificity of >80%, meaning that a cutoff score of >23

had good accuracy in predicting ovarian cancer incidence. If a woman's total score is >23, she has a high risk of ovarian cancer (Figure 2).

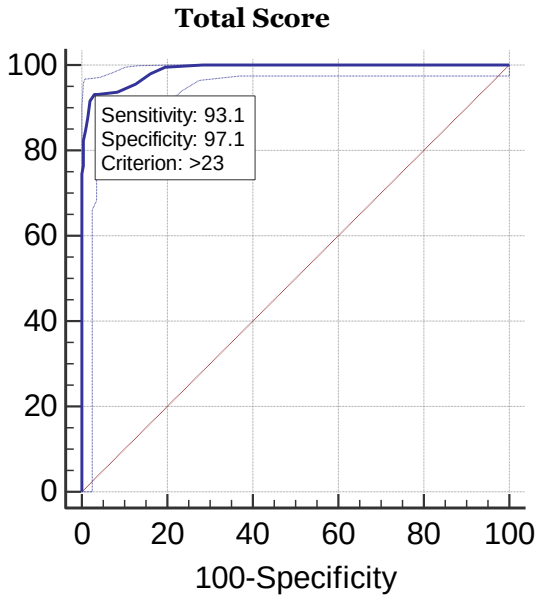

Figure 2. ROC curve predicted score on the incidence of ovarian cancer

4. Discussion

This study analyzed contextual factors, reproductive health history, and ADLs associated with ovarian cancer risks. The results showed that various contextual factors, medical history, and ADLs were significantly associated with the risk of ovarian cancer. These included being over 45, having a low education level, and being unemployed. Other factors were related to menstrual and reproductive history including menarche more than 15 years, menstrual cycles less than 21 days, menstruation problems, marital status, age of marriage, parity, bleeding and other issues during childbirth, breastfeeding, and fertility treatment. Next medical history factors included history of complications of certain diseases, history of surgery, family history of cancer, and history of non-hormonal contraception. Finally ADLs risk factors were eating less than three times, consuming coffee, defecating one to four times a day, urinating less than three times, and sleep duration less than seven hours at night. It can be seen that the risk factor variables in this study are more numerous dan more complex than previous studies. Previous research in Indonesia only analyzed between one and three factor variables; none examined as many as this study that analyzed ten factor variables (Purwoko, 2018; Widodo et al., 2019).

This study also identifies the same associated factors and several different factors from previous study. Previous study has shown that there is a significant relationship between age, occupation (Crane et al., 2014; Dixon-Suen et al., 2019), number of pregnancies, oral contraceptives, menarche, obesity, nutritional patterns, exercise, smoking, family history, surgical history, and ovarian cancer (Aarestrup et al., 2019; Bhatti et al., 2013; Bodelon et al., 2013; Jiang et al., 2014; La Vecchia, 2017; Tworoger & Huang, 2016). There is no significant relationship between alcohol consumption and the incidence of ovarian cancer (La Vecchia, 2017). Obesity is associated with ovarian cancer, but not the specific types of food consumed (Crane et al., 2014). In line with previous studies, this study's results and the factors that were found to be significant give new insight into studies that examine a more diverse range of factors associated with ovarian cancer especially from Indonesian participant's culture, such as less alcohol consumption in Indonesian women (13.2%) (Our World in Data, 2016), adolescent's marriage before 15 years old (0.5%) (UNICEF, 2018), and high rate in smoking (World Health Organization, 2020). Multi-center research and various cultures needs to be carried out that would describe and identify more specific ovarian cancer risk factors, then the cancer prevention and control program approaches, especially for ovarian cancer, will develop with more specific, effective and efficient.

The multivariate test determined the factors most associated with ovarian cancer, as well as the characteristics of the relationship that increases or reduces the risk of ovarian cancer based on the bivariate analysis. The multivariate test was conducted in two stages of modeling, with the final model revealing that age >45 years, junior high school education and below, number of pregnancies, history of surgery, overweight/obese, and ≤7 hours of sleep duration all increased the risk of ovarian cancer. Meanwhile, menstrual problems, a history of marriage, a family history of cancer, and coffee consumption all reduce the risk of ovarian cancer. The contextual factors that increased risk of ovarian cancer in this study were age and low education. Previous research has found that older age is a risk factor for ovarian cancer in women over the age of 65 (Mohammadian et al., 2017). Moreover, low education can increase risk factor of ovarian cancer (Alberg et al., 2016). Age and education were common risks for various health problems, including ovarian cancer. However, if a screening tool is developed for self-early warning of ovarian cancer, this cancer can be managed appropriately and optimally. This risk factor analysis study can be fundamental data for developing tools for self-early signs of ovarian cancer.

The health history variables identified that obesity and surgery history as factors that increased risk ovarian cancer. Obesity has been found as predominantly impacting the hormonal, inflammatory, and metabolic channels in the context of health history, notably gynecological cancers (Staley et al., 2020). Next, surgery is still the most successful method of treating cancer; nonetheless, roughly one-third of patients will experience a systemic or local recurrence of the disease, surgery treating cancer is a double-edged sword because, as has been well discussed for more than a century, it can sometimes encourage the growth of certain cancers. Based on anticipated population cancer rates, a retrospective cohort analysis of 13,488 women who underwent augmentation mammoplasty and were monitored for 12 years found a 21% increase in total cancer risk. There was a considerable and more than doubled incidence of leukemia, brain cancer, and stomach cancer among implant patients (Goldstein & Mascitelli, 2011). This study focuses on ovarian cancer, which is a different type of cancer from previous studies, however illustrates that the same thing might happen to ovarian cancer.

Daily activity, particularly sleep duration, and its association to cancer risk are still hotly debated topics. Sleep is crucial for both physical and mental health. The findings of Chen et al's study found that neither short nor long sleep duration were significantly associated with cancer risk. Surprisingly, the subgroup analysis revealed that in Asian people, inadequate sleep duration was associated with an increased risk of cancer (Chen et al., 2018). Sleep duration is important for women's health, espesially in Indonesia, women have big roles in taking care of their family, so they are at risk of experiencing sleep deprivation for a long time. More study needed to assess in detail the sleep pattern of Indonesian women.

This study found that family history, menstrual history, and coffee consumption as factor that reduce the risk of ovarian cancer. Previous study found that family history is a significant risk factor for several common diseases, including diabetes, coronary heart disease, stroke, and malignancies of the breast, ovary, and colon (Acheson et al., 2010). The findings of this study differ from Acheson et al.'s study; this could be due to the fact that almost all of the respondents in this study did not have a family history of cancer (c: 98.5%, nc: 91.2%), which could have influenced the results of statistical tests. Unlike consuming tea, which has been proven to significantly prevent women from ovarian cancer (Zhan et al., 2017), there is minimal literature analyzing this risk factor in relation to coffee that reduces the risk of cancer. More research on the effect of coffee consumption on ovarian cancer is needed because drinking coffee habit is currently popular among men and women both developed and developing countries. We performed the ROC test to determine whether the results were genuine or not after identifying the most relevant factors. The AUC value of 0.988 indicates that this result had a good accuracy to predict the risk factor of ovarian cancer (Hajian-Tilaki, 2013). The ROC test enhanced the risk factor associated with ovarian cancer that was noted from the AUC value (95 CI, 0.973-0.996). Although the findings of this study indicate that the risk factors for ovarian cancer are valid, further investigation using a qualitative approach is required to supplement and reinforce the quantitative findings of this study.

5. Implications and limitations

As health service providers, nurses play a role in preventing disease, improving health, and making innovations in health services, including women's health. The results of this study can be

an initial step toward developing an independent early detection instrument for women at high risk of ovarian cancer, which could become an independent early warning system for women, allowing them to take preventive actions as soon as risk factors are found, protecting them from the advanced stages of cancer.

This study was only conducted at a cancer referral hospital in West Java, where particular ethnicities may predominate, it has an impact on the identified risk factors for ovarian cancer. Another limitation is that medical records, which are the main source of data in this study, are still in paper-based form, thus patient data may not be adequately identifiable.

6. Conclusion

The ovarian cancer is influenced by various risk factors, including contextual factors, medical history, and activities of daily living (ADLs). These factors can either reinforce or inhibit the chance of developing ovarian cancer. The findings of this study have contributed to the existing knowledge on the factors associated with ovarian cancer. However, it is evident that further investigation is necessary to conduct a more comprehensive analysis of the data and gather additional qualitative information. This can be achieved by employing alternative research methodologies or by including a larger and more diverse sample of participants. In addition, healthcare practitioners have the potential to employ this information as foundational data for future research in the development of a self-detection tool for assessing the risk of ovarian cancer.

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Author contribution

RW: conceptualization (lead), methodology (lead), writing-original draft (lead), data collection (lead) review (lead) and editing (lead); WN: conceptualization (supporting), data collection (lead), data analysis (lead), and writing-developed draft (supporting); KN: review (lead), discussion (equal) and writing-developed draft (supporting); TP: review (equal), discussion (equal) and writing-developed draft (supporting) editing (lead)

Conflict of interest

There were no conflicts of interest in this publication.

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