

Risk Factors of Ovarian Cancer in Eastern Province - Saudi Arabia

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Abstract: The leading cause of death from gynecologic malignancies remains ovarian cancer therefore; preventive strategies are instantly needed to decrease mortality. **Project intended** to determine the risk factors of ovarian cancer among Saudi females, in Eastern Province. **Setting:** was at King Fahd Specialist Hospital in Dammam- Eastern Province. **Design:** was case-control, hospital-based: Cases were counted to 60 ovarian cancer Saudi patients. Controls were counted to 240 Saudi women without ovarian cancer, who attended outpatient clinics of the study hospital, (ratio was1:4). Pre-coded data collection sheet was designed to collect data from cases and controls through interview and from medical records from the first of January, 2016 to the end of December, 2016. Data included the socio- demographic characteristics, reproductive history, and lifestyle attributes of participants. Data was analyzed using SPSS (V.20). Cases & controls were compared for risk factors. **Results** demonstrated that risk factors of ovarian cancer were illiteracy, late menopause, low parity and eating high fat diet. However, history of ovarian cancer in the family and lack of daily physical exercise were surprisingly protective factors. **Recommendation:** Further research to investigate why these possible risk factors raise the likelihood of ovarian cancer is recommended.

Key words: Ovarian cancer- Risk factors- Eastern Province -Saudi Arabia

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I. Introduction

Ovarian Cancer is considered the 8th most common malignancy among ladies worldwide. It has the greatest mortality rate of gynecological malignancies; hence, it has serious effects on the socioeconomic and society^(1,2) The 5-year survival rate ranges from 30% to 45% without significant improvement over the last three decades, even with the new methods have been used in treatment. The American Cancer Society estimated that 22,240 women were going to be diagnosed with ovarian cancer in the US in 2013,⁽³⁾

Women who are older in age “>50” and those with critical family history have a higher risk of developing ovarian cancer; The risk also increases by around threefold when having 1st or 2nd degree relative diagnosed with ovarian malignancy.⁽³⁾ Older age, history of ovarian cancer in the family, infertility medications, hormonal replacement therapy during menopause, and obesity were established to be risk factors related to ovarian cancer.⁽⁴⁻⁵⁾ Women with ovarian cancer are less likely to have reported a tubal ligation, and more possible to account a first-degree relative with breast cancer. In contrast, oral contraceptives use is a protective factor,⁽⁴⁻⁵⁾ specifically this occurs owing to the decreased estrogen levels in ovaries and stoppage of ovulation.⁽⁶⁻⁷⁾

Physical activity is another protective factor for ovarian cancer.⁽⁴⁻⁵⁾ Moorman et al. also stated breast-feeding to be a defensive factor for the existence of ovarian cancer.⁽⁶⁾ Study finds a protective role for some reproductive parameters (parity, twin pregnancy, and oral contraceptive usage) against non-mucinous ovarian cancer, but not mucinous tumors.⁽⁸⁾ Exclusive associations comprise an opposite relation of serious cancer risk to body mass index, however a positive relation of mucinous cancer risk to cigarette smoking, and a weakly positive relation of endometrioid cancer risk to body mass index. Risk of all histologic types was unassociated with age at menopause, history of infertility, non-contraceptive estrogen use, and alcohol consumption.⁽⁹⁾ **The rationale for the current research** is that, once better understanding of the risk factors of ovarian cancer, it is

expected that it becomes possible to introduce procedures that reduce prevalence of the disease by either improving or preventing these risk factors.

Study design was case control. Case: control ratio was 1:4. Cases counted to 60 and controls counted to 240. **Results of the current research** demonstrated that risk factors of ovarian cancer were illiteracy, late menopause, low parity and eating high fat diet. However, family history of ovarian cancer and lack of practicing sports daily were surprisingly protective factors. No obstacles faced research team. **Obstacles** for this study are: the researchers using only living cases to measure the ovarian cancer risk factors, since some risk factors could be identified in severe cases, and using the controls from the hospital (relatively sick) and not from the community (relatively healthy)

II. Literature review:

The fifth most common reason of cancer death in women worldwide is ovarian cancer. Globally, more than 200,000 women are recognized with this disease. According to National Cancer Registry in KSA, ovarian cancer is the seventh most common cancer diagnosed in females representing 3.3% of all female cancer patients diagnosed during 2013. ⁽¹⁰⁾ Detailed descriptive data concerning the clinical course of the disease among Saudi women is largely unknown. ⁽¹¹⁾

In KSA, numerous studies were done on broad analysis of ovarian cancer features, assessment of the disease development, and also the prognostic factors that may influence survival. One research studied integration of Human Papilloma Virus - in Saudi women with ovarian cancer. ⁽¹²⁻¹⁵⁾ As no research studied the association of ovarian cancer with lots of independent variables; socio- demographic, reproductive history, and lifestyle attributes among Saudi women in Eastern Province- KSA, the research intended to determine predictors (risk factors) of ovarian cancer among Saudi patients attending King Fahd Specialist Hospital (KFSH) in Dammam - Eastern Province, KSA for treatment / follow up.

Currently, there is a lack of effective early diagnostic tools for ovarian cancer. Also, there is an apparent major knowledge gap of ovarian cancer and its suggestive symptoms among both public and many health specialists. These factors have significantly contributed to the late stage diagnosis of most ovarian cancer cases (63% are diagnosed at stage III or IV), where the 5-year survival rate is less than 30%. ⁽¹⁾ Thus preventive strategies are urgently required to decrease incidence of ovarian cancer. One of these strategies is determining its risk factors.

III. Material and Methods

Study Setting: King Fahd Specialist Hospital (KFSH) in Dammam - Eastern Province, KSA, is a large specialized hospital for treatment of cancer. It has 640 beds. The hospital has a “**Cancer registry center**” that started registration of cancer cases since 2006. The hospital provides different specialties including medical oncology, surgical oncology, nuclear medicine, radiation oncology, and rehabilitation.

Study Design: Case- control hospital- based study.

Sample Size: Case: Control ratio was 1:4 to increase study power ⁽¹⁶⁾. Cases counted to 60 patients and controls counted to 240 patients. Duration of the study: One year (from the first of Muharam 1437 to the first of Muharam 1438).

Inclusion Criteria:

1. Ovarian cancer diagnosis is confirmed at KFSH.
2. Saudi women.

Exclusion Criteria:

1. Control subjects with bilateral oophorectomy.
2. Patients refuse to participate in this study.

Tool:

A pre-coded data collection sheet was designed ⁽¹²⁻¹⁵⁾ to collect data from cases and controls, which included the following parts:

Part I: Socio-demographic characteristics, which comprised: woman’s age; marital status; educational level; ...etc.

Part II: Reproductive history, which involved: woman’s age at menarche & age at menopause, parity, use oral contraceptive method, tubal ligation, use fertility drugs (e.g. Clomid), infertility, use hormone replacement therapy during menopause, family history of ovarian, breast, or colorectal cancer, individual history of breast

cancer, use of talc powder on genital area, history of multiple births, endometriosis, ovarian cyst, polycystic ovary, use of intrauterine device, and breast feeding.

Part III: Lifestyle attributes e.g. Body Mass Index (BMI), low fat diet, daily eating of fresh fruits and vegetables, smoking, alcohol use, tea consumption, and daily physical exercise.

IV. Methods

For Cases: Saudi patients with ovarian cancer, who fulfilled the inclusion criteria, were interviewed during their treatment/ follow up visits after taking their written consent. Moreover, the reproductive history was obtained from both their paper and electronic health records.

For Controls: Saudi women without ovarian cancer were interviewed while attending the outpatient clinics of the study hospital. Their written consent was taken first. Their medical records/ investigation reports were reviewed to make sure that they have no ovarian cancer diagnosed.

Ethical Consideration: Before conducting the research, formal approval from the institutional review board (IRB) of the study hospital was taken and confidentiality of the data collected was maintained. Informed written consent was taken from participants.

Pilot Study: It was conducted after obtaining the IRB. Fifteen medical records were reviewed to investigate documentation of risk factors. Number of menstrual cycles when Clomid was prescribed was removed due to recall problems.

Data Analysis: SPSS program (version 20) was used for data analysis. Quantitative data were presented as mean & standard deviation and qualitative data were presented as number & percentage. Cases and controls were compared and test of significance at $<0.05\%$ P- Value was used. The measures of risk were calculated by using univariate analysis to study the relation between risk factors and ovarian cancer. Then multivariate logistic regression was used.

V. Results

(**Table 1**) Revealed that most of cases aged 30 and above (81.7%) vs control (70.4%). Cases who were ever married (66.6%) vs controls (71.2%). Percent of cases who completed their secondary school and university education or more was low (55%) in comparison to controls (77.9%), difference was significant ($P < 0.0001$). Cases who had early menarche at or less than 13 years were (65%) vs controls (80.8%), difference was significant ($P 0.008$). Cases with family history of ovarian cancer represented (8.3%) vs controls (2.5 %); difference was significant ($P 0.032$). Majority of cases had high fat diet (66.7%) vs controls (32.9%), difference was significant ($P < 0.0001$). High percent of cases had BMI 30+ (61.7%) vs controls (57.1%), difference was significant ($P < 0.0001$). Cases who did not have daily physical exercise represented (76.7%) in comparison to controls (87.9%), difference was significant ($P 0.026$).

Multivariate regression analysis (**Table 3**) demonstrated that odds of getting ovarian cancer for illiterate were 68.781 times more than the odds for non- exposed to illiteracy (OR: 68.781, 95% CI: 10.141-466.501). Women with late menopause (> 51 years) was getting the risk of ovarian cancer by 2.979 times more than those with menopause (≤ 51) (OR: 2.979, 95% CI: 1.177-6.947). The risk of having ovarian cancer for women with parity ≤ 3 was 3.066 times higher than those having > 3 parity (OR: 3.066, 95% CI: 1.186-7.928). The odds of getting ovarian cancer was 7.536 times higher for women with high fat diet than those who had low fat diet (OR: 7.536, 95% CI: 3.300-17.210). In addition, the risk of having ovarian cancer for women with BMI 18.5-24.9 was 28.758 times more than those non-exposed. In addition, odds of getting ovarian cancer for women with family history of ovarian cancer were 92.7 % times less than those non-exposed (OR: 0.073, 95% CI: 0.017-0.326). Similarly, the odds of getting ovarian cancer for women who did not have daily exercise were 83.6% times less than women who exercised daily (OR: 0.164, 95% CI: 0.061-0.442). Difference was statistically significant for previously mentioned independent variables.

VI. Discussion

The leading cause of death from gynecological malignancies remains ovarian cancer. However, most women present with advanced stage of ovarian cancer due to lack of effective screening approaches. Therefore preventive strategies are urgently needed to reduce mortality. Researchers reported several risk factors for developing ovarian cancer, such as menstrual and reproductive factors, with the exception of parity, remains uncertain.⁽¹⁷⁾

Parity is considered a well-established protective factor for ovarian cancer. There were 6952 incident cases of ovarian cancer reported in a prospective cohort study of middle-aged women in UK, which was done on 1.1 million women. Overall, women with multiparity had a 26% lower risk of ovarian cancer than nulliparous women (OR: 0.74, 95% CI: 0.69–0.79).⁽¹⁸⁾

Between 2006 and 2008, a hospital-based case-control study was undertaken in Guangzhou, Guangdong Province in a sample of 500 ovarian cancer patients and 500 controls (mean age, 59 years). By using unconditional logistic regression models, OR and 95% CI were calculated. High parity was found not associated with ovarian cancer, with an adjusted OR 0.43 (95% CI, 0.30- 0.62) for women who had delivered three or more births compared to women who had delivered no more than one birth.⁽¹⁹⁾ The present findings are parallel to the published research as the risk of having ovarian cancer for women with parity ≤ 3 was 3.066 times higher than those having > 3 parity (Table 3).

Family history of ovarian or breast cancer is remains the most important risk factor for epithelial ovarian cancer.⁽²⁰⁾ On the contrary, the present study showed that odds of getting ovarian cancer for women with family history of ovarian cancer were 92.7 % less than in non-exposed (Table 3). This may be attributed to the fact that researchers collected data from all ovarian cancer patients regardless the histological type of ovarian cancer.

The risk of developing ovarian cancer gets higher with woman's age. Ovarian cancer is rare in women younger than 40. Nearly, half of all ovarian cancers are found in women 63 years of age or older.⁽²¹⁾ Age at menopause was also shown to be positively associated with the risk of ovarian cancer (>52 vs. ≤ 47 years: HR 1.46, 95 % CI 1.06–1.99).⁽²²⁾ This goes parallel to the present findings as the risk of getting ovarian cancer for women with late menopause > 51 years was 2.979 times higher than those with menopause ≤ 51 (Table 3).

The present findings demonstrated that odds of getting ovarian cancer for illiterate were 68.781 times higher than non- exposed to illiteracy (Table 3). Literature reported that socioeconomic characteristics play an important role in survival after ovarian cancer, such as; low level of education; lower income and living without a partner were related to poorer survival after ovarian cancer. Among women with early cancer stage, HR (95% CI) for death was 1.75 (1.20-2.54) in shorter compared to longer educated women.⁽²³⁾

A numerous studies have found a relation between obesity and hormone dependent cancers including, endometrial cancer and postmenopausal breast cancer, but the relation with ovarian cancer is unclear.⁽²⁴⁻²⁵⁾ Researchers in a systematic literature review and meta-analysis, found that 24 of 28 studies reported a positive association between obesity and ovarian cancer, and 10 of this reached statistical significance. The pooled effect estimate for adult obesity was 1.3 (95%CI 1.1 -1.5) with a smaller increased risk for overweight (OR 1.2; 95% CI 1.0 –1.3). The pooled OR was stronger among case–control studies (OR= 1.5) than cohort studies (OR= 1.1).⁽²⁶⁾

In 2001 A systematic review and meta-analysis conducted by Purdie and colleagues, concluded that there was a small-to-moderate positive relation between high BMI and ovarian cancer risk with statistically significant differences.⁽²⁷⁾ Results of the present study revealed that the risk of having ovarian cancer for women with BMI 18.5-24.9 (healthy range) was 28.758 times higher than non-exposed (Table 3). The contradicting findings could be attributed to the fact that BMI in the current study is that measured at time of data collection and not at time of diagnosis as done in the published research.

Dietary factors could explain some of the observed differences in ovarian cancer incidence worldwide. Research revealed that greater consumption of fat may increase risk of ovarian cancer overall.⁽²⁸⁾ In the Women's Health Initiative Dietary Modification randomized controlled trial, a low fat and high fruit, vegetable and grain dietary pattern (vs usual diet) was associated with a reduced risk for ovarian cancer in postmenopausal women after 4–8 years of follow-up (RR= 0.60, 95% CI 0.38–0.96).⁽²⁹⁾ This goes hand in hand with the current findings as the odds of getting ovarian cancer was 7.536 times higher for women with no low fat diet than those who had low fat diet (Table 3).

Between 2006 and 2008, eighty consecutive patients were enrolled in a study in two national referral centers for ovarian cancer in Serbia. Results revealed that patients with ovarian cancer had physical exercise for 6.3 ± 2.1 years and controls for 11.8 ± 9.9 years. Physical exercise was statistically significant protective factor (OR = 0.2, $p = 0.011$ and OR = 0.4, $p = 0.019$ respectively).⁽³⁰⁾ In contrast, present findings revealed that the odds of getting ovarian cancer for women who did not have daily exercise were 83.6% less than women who had daily exercise (Table 3). This may be attributed to lack of data concerning duration of physical exercise.

Conclusions and Recommendations: Risk factors of ovarian cancer were illiteracy, late menopause, low parity and eating high fat diet. This may be due to small sample size of 60 cases evaluated in this study and the short approval time that taken from the institutional review board (IRB) of the study hospital for conducting the research. However, family history of ovarian cancer and lack of daily physical exercise were surprisingly protective factors.

Finally further research to investigate why these risk factors increase the likelihood of developing ovarian cancer is recommended. In addition, researchers recommend that health care providers must formulate different prevention strategies for women attending the outpatient clinics about the risk factors of ovarian cancer.

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Conflicts of Interest:

The authors declare that no financial or personal conflict of interest for this work. However, the limitations of the study that may affect on the study results are: choosing only living cases of ovarian cancer because difficulties of getting all information related to ovarian cancer risk factors from the medical records (as not recorded in the patient medical record). And related to the controls were choosing from the general outpatient clinics of the study hospital not from the community.

Tables:

Table 1: Distribution of Ovarian Cancer Cases Vs Controls attending King Fahd Specialist Hospital in Dammam- Eastern Province - KSA

Independent variables	Cases (n=60)		Controls (n= 240)		Chi-square	P-value
	n	%	n	%		
I. Socio-demographic characteristics						
Age	Mean ± SD 45.3±14.6		Mean ± SD 41.6±15.9		4.182	0.124
<30	11	18.3	71	29.6		
30-	25	41.7	100	41.7		
50+	24	40.0	69	28.7		
Marital status						
Married	29	48.3	142	59.2	3.304	0.347
Single	20	33.3	69	28.8		
Widow	7	11.7	15	6.2		
Divorced	4	6.7	14	5.8		
Education level						
Illiterate	10	16.7	3	1.2	36.102	<0.0001
Completed primary/intermediate school	17	28.3	50	20.8		
Completed secondary school	22	36.7	80	33.3		
Completed university or more	11	18.3	107	44.6		
II. Reproductive history& other health-related data						
Age at menarche	Mean ± SD 12.6±1.7		Mean ± SD 12.7±1.4		6.937	0.008
≤ 13	39	65.0	194	80.8		
> 13	21	35.0	46	19.2		
Age of menopause*	Mean ± SD 43.5± 7.1		Mean ± SD 47± 5.2		0.001	0.980
≤ 51	34	87.2	67	87.0		
>51	5	12.8	10	13.0		

Parity	Mean ± SD		Mean ± SD		0.511	0.475
	3.6± 4.1		2.8± 2.7			
≤ 3	35	58.3	152	63.3		
>3	25	41.7	88	36.7		
History of multiple births						
Yes	3	5.0	23	9.6	1.274	0.259
No	57	95.0	217	90.4		
Use of oral contraceptive pills						
Yes	29	48.3	97	40.4	1.235	0.266
No	31	51.7	143	59.6		
Use of intrauterine device						
Yes	6	10.0	19	7.9	0.273	0.602
No	54	90.0	221	92.1		
History of tubal ligation						
Yes	7	11.7	25	10.4	0.079	0.779
No	53	88.3	215	89.6		
History of infertility						
Yes	3	5.0	3	1.2	3.444	0.063
No	57	95.0	237	98.8		
Use of fertility drugs e.g. clomid						
Yes	7	11.7	11	4.6	4.270	0.039
No	53	88.3	229	95.4		
Hormone replacement therapy after menopause*						
Yes	1	1.7	5	2.1	23.06	<0.0001
No	38	63.3	72	30.0		
Family history of ovarian cancer						
Yes	5	8.3	6	2.5	4.624	0.032
No	55	91.7	234	97.5		
Its relative degree*						
1 st degree	5	8.3	5	2.1	6.045	0.049
2 nd degree	0	0.0	1	0.4		
Family history of breast cancer						
Yes	8	13.3	35	14.6	0.061	0.805
No	52	86.7	205	85.4		
Its relative degree*						
1 st degree	7	11.7	23	9.6	1.448	0.485
2 nd degree	1	1.7	12	5.0		
Family history of colorectal cancer						
Yes	4	6.7	21	8.8	0.273	0.602
No	56	93.3	219	91.2		
Its relative degree*						
1 st degree	2	3.3	20	8.3	5.742	0.057
2 nd degree	2	3.3	1	0.4		
Personal history of other cancer						
Yes	11	18.3	22	9.2	4.120	0.042
No	49	81.7	218	90.8		
Talcum powder on genital area						
Yes	9	15.0	79	32.9	7.433	0.006
No	51	85.0	161	67.1		
History of endometriosis						
Yes	3	5.0	6	2.5	1.031	0.310
No	57	95.0	234	87.5		
History of ovarian cyst						
Yes	3	5.0	11	4.6	0.019	0.891
No	57	95.0	229	95.4		
History of polycystic ovary						
Yes	1	1.7	10	4.2	0.849	0.357
No	59	98.3	230	95.8		
History of diabetes mellitus						
Yes	15	25.0	72	30.0	0.583	0.445
No	45	75.0	168	70.0		
History of ever breast feeding						
Yes	27	45.0	53	22.1	12.89	<0.0001
No	33	55.0	187	77.9		
III. Lifestyle attributes						
Smoking						
Nonsmoker	55	91.7	237	98.8	16.31	<0.0001
Current smoker	1	1.7	3	1.2		
Was smoker then stopped	4	6.7	0.0	0.0		
Alcohol use						

Yes	0	0.0	9	3.8	2.320	0.128
No	60	100.0	231	96.2		
Daily eating fresh fruit & vegetables						
Yes	40	66.7	132	55.0	2.671	0.102
No	20	33.3	108	45.0		
Low fat diet						
Yes	20	33.3	161	67.1	22.84	<0.0001
No	40	66.7	79	32.9		
BMI						
	Mean ± SD		Mean ± SD			
	30.9± 8.1		32.0± 7.3			
< 18.5	7	11.7	2	.8	22.64	<0.0001
18.5-24.9	8	13.3	37	15.4		
25-29.9	8	13.3	64	26.7		
30+	37	61.7	137	57.1		
Daily tea consumption						
Yes	34	56.7	154	64.2	1.154	0.283
No	26	43.3	86	35.8		
Practicing sports daily						
Yes	14	23.3	29	12.1	4.948	0.026
No	46	76.7	211	87.9		

* remaining participants are not applicable P value = ≤ 0.05

Table 2: Univariate Regression Analysis for Risk Factors of Ovarian Cancer of Saudi Patients attending King Fahd Specialist Hospital in Dammam- Eastern Province - KSA

Independent variables	B	P-value	OR	95% CI of OR	
				Lower	Upper
I. Socio-demographic characteristics					
Age		0.281			
<30	Reference				
30-	-2.576	0.113	0.076	0.003	1.842
50+	-1.291	0.294	0.275	0.025	3.070
Marital status					
Ever married	Reference				
Single	-1.198	0.277	0.302	0.035	2.618
Education level					
Illiterate	5.785	0.008	325.263	4.621	22896.678
Completed primary/intermediate school	1.948	0.042	7.016	1.074	45.814
Completed secondary school	2.563	0.004	12.971	2.219	75.822
Completed university or more	Reference				
II. Reproductive history& other health-related data					
Age at menarche					
≤ 13	1.020	0.337	2.772	0.346	22.181
> 13	Reference				
Age of menopause					
≤ 51	Reference				
>51	-2.922	0.034	.054	0.004	0.798
Parity					
≤ 3	2.184	0.030	8.879	1.233	63.959
>3	Reference				
History of multiple births					
Yes	2.511	0.085	12.314	0.704	215.336
No	Reference				
Use of oral contraceptive pills					
Yes	Reference				
No	-1.138	0.250	0.320	0.046	2.228
Use of intrauterine device					
Yes	Reference				
No	-2.083	0.104	0.125	0.010	1.530
History of tubal ligation					
Yes	Reference				
No	-1.942	0.060	0.143	0.019	1.082
History of infertility					
Yes	0.729	0.905	2.072	0.000	330116.907
No	Reference				
Use of fertility drugs e.g. Clomid					
Yes	0.247	0.893	1.280	0.036	45.942
No	Reference				

Hormone replacement therapy after menopause					
Yes	0.685	0.678	1.983	0.079	50.054
No	Reference				
Family history of ovarian cancer					
Yes	-5.569	<0.0001	0.004	0.000	0.067
No	Reference				
Family history of breast cancer					
Yes	- 0.338	0.703	.713	.125	.4.064
No	Reference				
Family history of colorectal cancer					
Yes	- 0.421	0.757	0.656	0.045	9.487
No	Reference				
Personal history of other cancer					
Yes	1.599	0.312	4.950	0.223	109.971
No	Reference				
Talcum powder on genital area					
Yes	0.838	0.303	2.312	0.469	11.395
No	Reference				
History of endometriosis					
Yes	-1.728	0.298	0.178	0.007	4.594
No	Reference				
History of ovarian cyst					
Yes	-3.288	0.036	0.037	0.002	0.804
No	Reference				
History of polycystic ovary					
Yes	5.536	0.029	689.693	1.923	247360.502
No	Reference				
History of diabetes mellitus					
Yes	-2.062	0.025	0.127	0.021	0.774
No	Reference				
History of ever breast feeding					
Yes	Reference				
No	- 0.589	0.555	0.555	0.079	3.924
III. Lifestyle attributes					
Smoking					
Nonsmoker	Reference				
Ever smoker	- 0.851	0.668	0.427	0.009	20.916
Alcohol use					
Yes	22.085	0.998	3902020594	0.000	
No	Reference				
Daily eating of fresh fruit & vegetables					
Yes	Reference				
No	1.414	0.073	4.114	0.879	19.264
Low fat diet					
Yes	Reference				
No	1.265	0.055	3.543	0.973	12.901
BMI					
< 18.5	Reference				
18.5-24.9	5.518	0.000	249.163	11.358	5466.187
25-29.9	- 0.690	0.467	0.501	0.078	3.229
30+	-1.572	0.088	0.208	0.034	1.267
Daily tea consumption					
Yes	1.342	0.099	3.828	0.776	18.891
No	Reference				
Practicing sports daily					
Yes	Reference				
No	-3.854	<0.0001	0.021	0.003	0.143

*P value = ≤ 0.05

Table 3: Multivariate Regression Analysis for Risk Factors of Ovarian Cancer of Saudi Patients attending King Fahd Specialist Hospital in Dammam- Eastern Province - KSA

Independent variables	B	P-value	OR	95% CI of OR	
				Lower	Upper
Education level					
Illiterate	4.231	<0.0001	68.781	10.141	466.501
Completed primary/intermediate school	1.852	0.001	6.372	2.119	19.157
Completed secondary school	1.470	0.004	4.348	1.606	11.776

Completed university or more	Reference				
Age of menopause					
≤ 51	Reference				
>51	1.091	0.012	2.979	1.177	6.947
Parity					
≤ 3	1.120	0.021	3.066	1.186	7.928
>3	Reference				
History of tubal ligation					
Yes	Reference				
No	-1.184	0.060	0.306	0.089	1.050
Family history of ovarian cancer					
Yes	-2.611	0.001	0.073	0.017	0.326
No	Reference				
History of ovarian cyst					
Yes	-1.047	0.239	0.351	0.061	2.008
No	Reference				
History of polycystic ovary					
Yes	1.521	0.274	4.578	0.300	69.912
No	Reference				
History of diabetes mellitus					
Yes	0.488	0.286	1.628	0.665	3.986
No	Reference				
Low fat diet					
Yes	Reference				
No	2.020	<0.0001	7.536	3.300	17.210
BMI					
< 18.5	Reference				
18.5-24.9	3.359	0.001	28.758	3.920	210.973
25-29.9	- 0.284	0.616	0.753	0.248	2.285
30+	-1.095	0.042	0.334	0.116	0.963
Practicing sports daily					
Yes	Reference				
No	-1.807	<0.0001	0.164	0.061	0.442

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