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East/South East Asian Ethnicity and Moderate-to-Severe Endometriosis

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Title: East/South East Asian Ethnicity and Moderate-to-Severe Endometriosis

Running Title: Ethnicity and Severe Endometriosis

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Précis:

In our tertiary referral center, East and South East Asian women were more likely than Caucasians to have moderate-to-severe endometriosis.

Word count: 2903

ABSTRACT

Study Objective: To investigate ethnic differences for moderate-to-severe endometriosis

Design: Analysis of a prospective registry, December 2013 – December 2016

(ClinicalTrials.gov # NCT02911090). Inclusion Criteria: Women presenting to tertiary

referral center for pelvic pain and/or endometriosis. Exclusion criteria: Age greater than 50, menopausal, or mixed ethnicity. Logistic regression analysis was used to obtain adjusted odds ratios (aOR) and 95% confidence intervals (CI) adjusting for potential confounders (e.g., age, infertility, body-mass-index (BMI), previous hormonal use and previous surgery for endometriosis). (Canadian Task Force Classification II-2).

Setting: Tertiary referral center

Patient(s): A total of 1594 women with pelvic pain and/or endometriosis.

Intervention: None

Main outcome measure: Moderate-to-severe endometriosis.

Main Results: On logistic regression, adjusting for potential confounders, East/South East Asians were 8.3 times more likely than Caucasians to have a previous diagnosis of Stage III/IV endometriosis prior to referral (aOR 8.33, 95% CI 3.74–18.57); 2.7 times more likely to have a palpable nodule (aOR 2.66, 95% CI 1.57–4.52); 4.1 times more likely to have an endometrioma on ultrasound (aOR 4.10, 95% CI 2.68–6.26); and 10.9 times more likely to have Stage III/IV endometriosis at the time of surgery at our center (aOR 10.87, 95% CI 4.34–27.21).

Conclusion: Moderate-to-severe endometriosis was more common in women with East or South East Asian ethnicity in our tertiary referral center. This could be explained by East/South East Asians with minimal-mild disease being less likely to seek care, or genetic/environmental differences that increase the risk of more severe disease amongst East/South East Asians.

[ClinicalTrials.gov # NCT02911090, Endometriosis Pelvic Pain Interdisciplinary Cohort

Data Registry, <https://clinicaltrials.gov/ct2/show/NCT02911090>, September 22, 2016 – data prior to this date were incorporated into registry with institutional research ethics board approval from the University of British Columbia]

Key words: ethnicity, endometriosis, stage, severity

INTRODUCTION

The Revised American Fertility Society (rAFS) classification of endometriosis (Stage I/II vs. Stage III/IV) reflects the amount, depth and location of endometriosis and adhesive disease present at the time of surgery (1), with consideration of the three anatomic subtypes of endometriosis: superficial peritoneal endometriosis (SUP), endometrioma (OMA), and deep infiltrating endometriosis (DIE) (2).

In previous studies, several factors have been found to be possibly associated with DIE and OMA (and by extension, Stage III-IV disease): older age, infertility/nulliparity, lower body mass index (BMI), urban (versus rural) populations, previous usage of hormonal medications, previous surgery for endometriosis, more severe pain symptoms, and diet and other lifestyle factors (2-10). In addition, recent studies have investigated endometriosis as an inheritable complex genetic trait (11-14), with genetic associations that may be stronger for more advanced stages of disease.

To our knowledge, there have not been studies that assessed ethnic differences in severity of endometriosis (e.g. Stage or anatomic subtypes). Historically it was believed

that endometriosis was a disease confined almost exclusively to Caucasian women (15). More recent population studies have had conflicting results for racial and ethnic differences in the prevalence of the disease (7, 16, 17).

Our objective was to investigate the distribution of moderate-to-severe endometriosis across different ethnic racial groups presenting with pelvic pain and/or infertility. Based on our clinical experience, we hypothesized that East and South East Asian women in this population are more likely to have moderate-to-severe endometriosis (Stage III/IV) and/or the DIE/OMA phenotypes compared to Caucasians and other ethnic groups.

MATERIALS AND METHODS

Setting and Sample

This study involved an analysis of data from the prospective Endometriosis Pelvic Pain Interdisciplinary Cohort (EPPIC) Data Registry (Clinicaltrials.gov # NCT02911090, <https://clinicaltrials.gov/ct2/show/NCT02911090>, September 22, 2016), which is based at a tertiary referral center for endometriosis and pelvic pain in British Columbia, Canada.

EPPIC includes demographic information, clinical history, patient reported outcomes, physical exam data, objective surgical findings and surgical pathology data captured by the Research Electronic Data Capture (REDCap) Database. Usage of this database for data management and subsequent prospective outcomes has been previously reported in the literature (18, 19). All women in the EPPIC cohort consented to participate in the

registry and data from December 2013 onwards were incorporated into the registry with institutional research ethics approval from BC Women's Hospital and Health Center and the University of British Columbia Research Ethics Board (H16-00264).

Inclusion criteria were participants in the EPPIC data registry who were seen by one of the center's gynecologists for a new or re-referral between December 1st, 2013 and December 31st, 2016 and consented to be included in the data registry. Women eligible for the registry were new or re-referrals with pelvic pain and/or endometriosis. Excluded from analysis were duplicate data entries, women who did not complete a physical exam or ethnicity questionnaires, women who withdrew from the data registry prior to the date of data extraction, women who were menopausal and/or over 50 years of age, and those of self-reported mixed ethnicity (Figure 1).

Prior to attending an assessment with a gynecologist, women were asked to self-identify their ethnicity according to the categories in Table 1. In the questionnaire, participants could choose a single ethnicity or multiple ethnicities, and women who chose multiple ethnicities were excluded from the analysis.

Other information collected in the EPPIC registry have been described in detail) (18, 19). Endometriosis data were obtained from surgical reports and/or referral letters based on surgery prior to referral to our center, findings on physical exam and point-of-care ultrasound at our center, and surgery performed at our center. Pain symptoms were measured on a numeric rating scale of 0 – 10 across different categories;

dysmenorrhea, deep dyspareunia, dyschezia and chronic pelvic pain (20). Quality of life assessment was evaluated with the Endometriosis Health Profile (EHP-30) (scale 0-100) (21), and psychological questionnaires included the Patient Health Questionnaire (PHQ-9) (scale 0-27) (22), the Generalized Anxiety Disorder scale (GAD-7) (scale 0-21) (23), and the Pain Catastrophizing Scale (PCS) (scale 0-52) (24). In each of these scales a higher score equates to worse quality-of-life or more severe psychological symptoms. Sociodemographic and lifestyle variables of interest included self-reported age, infertility, and current or ever used hormonal therapy. Rural versus urban residence was defined by the Canadian Postal Code forward sortation area (FSA) system which specifies rural from urban areas in Canada (25).

Data analysis

The primary outcome was severity of endometriosis, and was phenotyped as follows:

- a) Moderate-to-severe endometriosis before referral to the center: Stage III/IV (vs. Stage I/II) endometriosis at previous surgery, with the denominator being all women who had surgery for endometriosis prior to referral and surgical reports with staging
- b) Palpable nodule on physical exam at our center: Palpable nodule (present/absent) of the pouch of Douglas or uterosacral ligaments on initial assessment, with the denominator being all women who had a pelvic examination at our center
- c) Ovarian endometrioma on point-of-care ultrasound at our center, performed by gynecologists trained in advanced gynecologic ultrasound: Endometrioma of either ovary (present/absent), with the denominator being all women who had an endovaginal ultrasound examination at our center

d) Moderate-to-severe endometriosis at surgery at our center: Stage III/IV (vs. Stage I/II) endometriosis at surgery, with the denominator being all women who subsequently underwent surgery at our center and were found to have histologically confirmed endometriosis.

The main explanatory variable of interest was ethnicity. As demonstrated in Figure 2 and the results from the chi-square post hoc tests in Table 3, East and South East Asians had a higher incidence of Stage III/IV endometriosis on surgery prior to referral to the center, compared to Caucasians, South Asians, and other ethnicities. Therefore, for subsequent analyses, ethnicity was classified into three groups: Caucasian, East/South East Asian, and Other.

Ethnicity (classified into the three groups) was then examined with respect to each of the endometriosis phenotypes using Chi-square test. Other variables from EPPIC were then compared between the ethnic groups to identify any potential confounders, using Chi-square or ANOVA/Kruskal-Wallis test.

Logistic regression analyses were then carried out to assess the association between each endometriosis phenotype and ethnicity, while controlling for potential confounders (e.g. age, BMI, history of infertility, previous surgery for endometriosis and use of hormonal therapy (2, 5). For each endometriosis phenotype, ethnicity was entered as a categorical variable (three groups) into the logistic regression model, and each potential confounding variable was also entered simultaneously into the model. Adjusted odds

ratios (ORs) were then calculated between ethnicity and the endometriosis outcomes, adjusting for the potential confounders.

Statistical significance was set at $p < 0.05$. Missing data were excluded. The summary statistics for all continuous variables are described using means and standard deviations, whereas categorical variables are described using frequencies and percentages. All data was analysed with the SPSS software V22.0 (IBM Corporation, Armonk, NY).

Corollary analysis

We also compared the ethnic distribution at our center to the ethnic distribution amongst females in British Columbia as reported in the 2016 Canadian census (Supplementary Table 1).

Interim analysis

In 2015, we had conducted an interim analysis of patients recruited from December 2013 to April 2015. At that time, there were 264 patients with surgical staging from previous surgery: 189 Caucasians, 37 East/South East Asians, and 38 of other ethnicities. The prevalence of Stage III/IV disease was 43.9% (83/189) amongst Caucasians, 89.2% (33/37) amongst East/South Asians, and 65.8% (25/38) amongst other ethnicities (Chi-square, $p < 0.001$). Although the results were already significant at that time, indicating adequate power, we continued recruitment to December 2016 in order to further

increase sample size. The cases in the interim sample were included in the final sample, to produce the total dataset from December 2013 to December 2016. Based on the data at the time of the interim analysis, our final sample size of 72 East/South East Asians with previous surgical staging and 531 Caucasians/Other ethnicities with previous surgical staging (see Supplementary Table 2), with $\alpha = 0.05$, provides power = 100%.

RESULTS

Descriptive statistics

There were 1594 women who met the study criteria (Figure 1). Ethnic distribution of women included is as follows: 76.2% (n=1214) of women were Caucasian, 9.1% (n=145) East or South East Asian, 7.5% (n=119) were South Asian, and 7.3% (n=116) were of other ethnicities (Table 2). The number of women with each of the endometriosis phenotypes/outcomes is listed in Table 2. Additional demographic factors are presented in Table 2.

Staging of endometriosis from previous surgical reports prior to referral was available in 603 patients. Of these 603 patients, 49.6% (n=299) of women had Stage I-II, versus 50.4% (n=304) had Stage III/IV (Table 2). Subdividing by ethnicity, we observed that East/South East Asians had a higher frequency of Stage III/IV endometriosis, compared to Caucasians, South Asians, and other ethnicities (Figure 2 and Table 3). Therefore,

for subsequent analyses, ethnic groups were divided into three groups: Caucasian, East/South East Asian, and Other.

During the initial appointment at the center, 1311 patients had a pelvic examination, of which 10.6% (n=139) had a palpable nodule on physical exam. A palpable nodule was present in 25.4% (n=30) of East/South-East Asian women, versus 8.5% (n=85) of Caucasians and 12.4% (n=24) of other ethnicities ($p<.001$) (Supplementary Table 2). During the initial appointment at the center, 1559 patients had an endovaginal ultrasound performed, of which 13.5% (n=210) were diagnosed with an endometrioma. An endometrioma was found in 38.7% (n=55) of East/South East Asian women, versus 9.6% (n=114) of Caucasians and 18.1% (n=41) of other ethnicities ($p<.001$) (Supplementary Table 2).

Of women seen at the center, 375 women (23.9%) subsequently underwent surgery at our center within the study time period and also had histologically confirmed endometriosis (Table 2 and Supplementary Table 2). Of these, 82.9% (n=40) of East/South East Asian women had Stage III-IV endometriosis, compared to 24.8% (n=71) of Caucasians and 54.2% (n=26) of other ethnicities ($p<.001$) (Supplementary Table 2).

Clinical characteristics

In Supplementary Table 3, clinical characteristics are compared between the ethnicities. Interestingly, East/South East Asian women reported less pain and better quality-of-life. In terms of potential confounding, of particular interest were age, history of infertility, body mass index (BMI), current or previous use of hormonal treatment, previous surgery for endometriosis, and geographical location, as these have been identified in previous studies as risk factors for deep infiltrating endometriosis (2, 5). East/South-East Asians were on average older, with lower BMI, more likely to have infertility, less likely to ever have used hormonal therapy, and less likely to have had previous surgery for endometriosis (Supplementary Table 3). For geographical location, only one East/South East Asian patient lived in a rural location, and thus rural/urban comparisons were not possible (Supplementary Table 3).

Multivariable analysis(26, 27)

Logistic regression analyses for each of the endometriosis phenotypes and ethnicity was performed, controlling for potential confounders mentioned above (Table 4). East/South-East Asians were 8.3 times more likely than Caucasians to have a previously documented history of Stage III/IV endometriosis before referral to the center (adjusted odds ratio [aOR] 8.33, 95% CI 3.74 – 18.57, $p < .001$). They were also 2.7 times more likely to have a palpable nodule at physical exam (aOR 2.66, 95% CI 1.57-4.52, $p < .001$), and 4.1 times more likely to have an endometrioma on ultrasound (aOR 4.10, 95% CI 2.68-6.26, $p < .001$). Furthermore, East/South East Asians were 10.9 times more likely to have Stage III/IV endometriosis at the time of surgery by gynecologists at our center (aOR 10.87, 95% CI 4.34-27.21, $p < .001$).

Corollary analysis

Ascertainment or referral patterns may influence our results; for example, East/South East Asians with Stage I/II endometriosis may be less symptomatic and thus less likely to be referred. Therefore, ethnic distribution at our center was compared to the ethnic distribution amongst females in British Columbia (2016 Canadian census). Caucasian women were over-represented in our center (76.2% in our sample vs. 45.6% in British Columbia [BC]), while all other ethnicities were under-represented in our center vs BC: East/South East Asians (9.1% vs. 32.4%), South Asians (7.5% vs. 12.8%), and other ethnicities (5.1% vs. 9.1%). East/South East Asians were 3.5-fold less frequent in our center, while South Asians and other ethnicities were 2-fold less frequent in our center (see Supplementary Table 1).

DISCUSSION

In a prospective registry at a tertiary referral center for endometriosis and pelvic pain, we observed significantly increased rates of moderate-to-severe endometriosis (rAFS stages III-IV) in women of East and South East Asian ethnicity. The incidence of endometrioma on ultrasound was also higher in the East/South East Asian group compared to Caucasian and other ethnicities, as was the incidence of palpable nodule in our study sample. These associations with East/South-East Asian ethnicity were independent of potential confounders including age, BMI, infertility, previous surgery for endometriosis, and use of hormonal medications.

One explanation for these observations may be that women of East/South East Asian descent may be at increased risk of more severe, advanced stages of endometriosis. However there are alternative explanations as well. For example, East/South East Asians with minimal-mild endometriosis could be less symptomatic and thus not referred to our center. Indeed, we found that East/South East Asian women (as well as other minorities) reported less pain compared to Caucasians, and were also less frequent at our center compared to the province of British Columbia as a whole (28). In addition, if there is a delay in East/South East women with endometriosis seeking care, which would be supported by our observation of older age in this ethnic group, then the endometriosis lesions could progress over time leading to more severe disease. It is also possible that a combination of these factors may lead to the observation of more frequent moderate-to-severe endometriosis in East/South East women in our tertiary center.

Strengths of the study include large sample size ($n = 1594$) from a registry of prospectively consented women in British Columbia, Canada, a province known for its ethnic diversity that allows studies of ethnicity-related outcomes. In particular, we compared East/South East Asian women to not only Caucasians, but other minorities including South Asians, to determine that the findings were specific to East/South East Asians. Other strengths include confirmation of retrospective data (previous surgical staging) with prospective data (physical exam, ultrasound, and subsequent surgical staging).

One limitation is that the study setting was at a tertiary referral center. Thus, the findings may not be generalizable to endometriosis patients seen in the community setting or in the general population. That being said, a tertiary referral center is where the clinical and surgical expertise resides in order to diagnose and excise advanced stage endometriosis. In future work, community or other clinical settings (e.g. infertility clinics) could be included in our registry to determine whether similar ethnic differences are observed in these other samples of women with endometriosis.

Previous studies have shown that infertile women are more likely to have advanced stage endometriosis, as pelvic anatomy becomes distorted and pelvic adhesions and tubal occlusion may impair oocyte transfer from ovary to the Fallopian tube (29, 30). Older age may also be associated with DIE (3, 31). In our study, we also observed infertility and older age to be associated with more severe endometriosis. Moreover, in the FEELING case-control study of patients from China, Russia and France, factors associated with DIE and OMA were previous use of hormonal treatments for endometriosis, previous surgery for endometriosis and living in an urban area (2). In our sample, where we included ethnicity as an independent variable, ever use of hormonal therapy and previous surgery for endometriosis were non-significant in most of the regression models (Table 4). We were unable to add geographical location into the regression models, as only one East/South East Asian lived in a rural location (Supplementary Table 3).

Interestingly, although a higher proportion of East/South East Asians in our study had moderate to severe endometriosis, overall they had less pain and better quality of life compared to Caucasian and other ethnicity counterparts. This finding was also demonstrated in the FEELING study (2), where investigators found profound differences in the rate of dysmenorrhea severely impacting quality of life between the French (82%) and the Chinese (44%). There have been studies showing that environmental factors, lifestyle and culture may influence the rate at which pain is reported, healthcare seeking behaviours across cultures, and the way in which pain is conceptualized and expressed (2).

If the association between East/South East Asian ethnicity and more severe endometriosis is verified in other studies, ethnic background could be considered a risk factor in the pre-operative prediction of moderate-to-severe endometriosis. We observed that East/South East Asians in our study sample were up to 11-times more likely to have moderate to severe endometriosis at the time of our surgery, controlling for age, BMI, infertility, previous surgery for endometriosis and ever usage of hormonal medications. This association may be explained by genetic or environmental factors. Genome wide association studies (GWAS) have identified 12 single nucleotide polymorphisms at 10 separate loci that were more strongly associated with Stage III/IV endometriosis than Stage I/II (12), and it is plausible that these genetic loci vary between ethnicities (14). Environmental factors that may differ between ethnicities include diet, employment, or other psychosocial or life history variables (2). However, other population studies are needed first to verify the findings observed in our tertiary referral center.

CONCLUSION:

We observed higher rates of moderate-to-severe (Stages III-IV) endometriosis in women of East/South East Asian ethnicity in our tertiary referral center. Additional studies are needed to replicate this finding. Our study raises the possibility that endometriosis severity and/or symptomatology may vary by ethnic background.

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Ethnicity Identified	Example of countries or geographic areas included*
Caucasian	Non-Indigenous North American and/or European Roots
East Asian	China, Japan, Korea, Taiwan, Mongolia
South East Asian	Vietnam, Laos, Cambodia, Thailand, Malaysia, Indonesia, Singapore, Burma, Philippines
South Asian	Pakistan, India, Nepal, Sri Lanka, Bangladesh
Middle Eastern/North African	Egypt, Iran, Iraq, Lebanon, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen
First Nations	
Other	African, other

Table 1: Ethnicity categories and examples of countries or geographic areas that may be included within each category.

*Not a complete or exhaustive list

Variables	%	SD / IQR	n
<u>Demographic characteristics</u>			
Age in years (mean)	34.9	7.7	(1594)
Body Mass Index (BMI) (mean)	25.3	5.9	(1567)
Household Income			
< \$20 000	13.4	-	(212)
\$20 000 - \$99 999	60.3		(962)
\$ 100 000 or more	26.1		(416)
Education			
High school or Less	15.3	-	(244)
Some college / College	62.7		(999)
Post-Graduate Degree	17.7		(282)
Other	4.1		(65)
Currently Working	72.6	-	(1150)
Infertility			
Yes	29.5	-	(469)
Never tried	42.0	-	(669)
No	28.5		(454)
Hormonal therapy			
Current use	29.0	-	(463)
Ever use	73.0		(1163)
Location			
Rural	6.3		(97)
Urban	93.7		(1443)
Previous surgery for endometriosis	39.1	-	(624)

<u>Ethnicity</u>			
Caucasian	76.2	-	(1214)
East Asian	5.4	-	(86)
South East Asian	3.7	-	(59)
South Asian	7.5	-	(119)
Hispanic	2.5	-	(40)
Afro-Caribbean	0.4	-	(6)
Middle Eastern/North African	2.1	-	(34)
First Nations	1.3	-	(21)
Other (eg. African, Fijian, etc)	0.9	-	(15)
<u>Pelvic Pain Symptoms</u> (scale 0-10)			
Dysmenorrhea (median)	7	5	(1389)
Deep Dyspareunia (median)	7	4	(1514)
Dyschezia (median)	4	6	(1594)
Chronic Pelvic Pain (median)	7	4	(1594)
<u>Quality of Life Measures</u>			
Endometriosis Health Profile (EHP-30) (mean; scale 0-100)	49.6	24.1	(1572)
Patient Health Questionnaire (PHQ-9) (mean; scale 0-27)	8.8	6.6	(1570)
			(24)
Generalized Anxiety Disorder scale (GAD-7) (mean; scale 0-21)	6.5	5.7	(1569)
Pain Catastrophizing Scale (PCS) (mean; scale 0-52)	19.6	13.6	(1569)

<u>Endometriosis</u>			
Endometriosis (pre-referral surgery) Stage I/II	49.6		(299)
Endometriosis (pre-referral surgery) Stage III/IV	50.4	-	(304)
Palpable nodule on exam	10.6	-	(139)
Endometrioma on ultrasound	13.5	-	(210)
Endometriosis Stage I/II (at current surgery, histology confirmed)	65.1	-	(244)
Endometriosis Stage III/IV (at current surgery, histology confirmed)	34.9	-	(131)

Table 2: Descriptive statistics (n=1594) of women with chronic pelvic pain/endometriosis treated at tertiary care centre

Groups	Chi-squared (degrees of freedom)	P-value
Caucasian vs. East Asian	27.076 (1)	<.001*
Caucasian vs. South East Asian	31.751 (1)	<.001*
Caucasian vs. South Asian	5.932 (1)	.015
Caucasian vs. Other	5.478 (1)	.019
East Asians vs South East Asians	.445 (1)	.505
East Asians vs South Asians	6.718 (1)	.010
East Asians vs Other	6.094 (1)	.014
South East Asians vs. South Asians	9.665 (1)	.002*
South East Asians vs. Other	8.956 (1)	.003*
South Asians vs. Other	.004 (1)	.950

Table 3: Ethnicity and previous stage of endometriosis (mutual comparisons). Statistical comparisons between ethnic groups for previous stage of endometriosis from surgical staging prior to referral to our center (Stage I/II vs. Stage III/IV), as illustrated in Figure 1. Comparisons are corrected for multiple comparisons (*statistical significance $p < 0.005$, due to Bonferroni correction)

Endometriosis outcome	Stage III/IV, pre-referral surgery (n = 592)			Presence of Palpable Nodule on Physical Exam (n = 1283)			Presence of Endometrioma on Ultrasound (n = 1521)			Stage III/IV, current surgery and histology confirmed (n = 368)		
	aOR	95% CI	p value	aOR	95% CI	p value	aOR	95% CI	p value	aOR	95% CI	p value
Ethnicity ¹												
East/South East Asian	8.33	3.74 – 18.57	<.001*	2.66	1.57 – 4.52	<.001*	4.10	2.68 – 6.26	<.001*	10.87	4.34 – 27.21	<.001*
Other	2.00	1.18 – 3.39	.010*	1.59	.96 – 2.64	.071	2.00	1.32 – 3.12	.001*	4.46	2.19 – 9.08	<.001*
Age (years, continuous variable)	1.07	1.04 – 1.11	<.001*	1.04	1.13 – 1.07	.005*	1.03	1.01 – 1.06	.016*	1.11	1.06 – 1.16	<.001*
BMI (continuous variable)	.99	.96 – 1.03	.669	.92	.88 – .96	<.001*	1.00	.97 – 1.03	.914	.99	.94 – 1.03	.577
Ever used hormonal therapy	.51	.30 – .84	.009*	1.59	1.02 – 2.48	.042	.92	.65 – 1.30	.636	.59	.32 – 1.10	.095
Infertility ²												
Yes	2.03	1.26 – 3.31	.004*	1.82	1.11 – 2.97	.017*	2.52	1.64 – 3.89	<.001*	2.57	1.27 – 5.17	.008*
Never tried	1.77	1.06 – 2.94	.028*	1.17	.69 – 2.00	.559	1.80	1.13 – 2.80	.013*	2.60	1.22 – 5.17	.013*

		2.96			1			7		5.53		
Previous surgery for endometriosis	-	-	-	.97	.66	.892	.53	.37	<.001*	.79	.46 – 1.36	.397
Household Income ³												
\$20 000 - \$99 999	1.66	.81 – 3.38	.165	1.23	.61	.562	1.52	.85	.161	.90	.37 – 2.20	.821
\$100 000 or more	1.52	.70 – 3.29	.289	1.36	.64	.430	1.21	.63	.565	.36	.13 – 1.03	.056
Education ⁴												
Some college	1.28	.71 – 2.30	.413	.73	.40	.306	1.62	.91	.102	1.68	.71 – 3.97	.234
Post-graduate degree	2.44	1.21 – 4.95	.013*	.98	.50	.948	1.66	.87	.128	1.89	.70 – 5.12	.210
Other	2.93	1.04 – 8.23	.042*	.90	.30	.850	1.49	.58	.403	5.36	1.15 – 25.01	.033*
Currently Working	1.42	.91 – 2.21	.125	1.96	1.19	.008*	1.84	1.22	.003*	1.02	.54 – 1.92	.962

¹Caucasian is the reference category.

²No infertility is the reference category.

³<\$20 000 is the reference category.

⁴High school or less is the reference category.

* statistically significant p<0.05

aOR denotes adjusted odds ratio, CI denotes confidence interval, BMI(kg/m²) denotes body mass index

Table 4 Logistic Regression Results. Adjusted odds ratios for the endometriosis outcomes.

Figure legends:

Figure 1: N/A

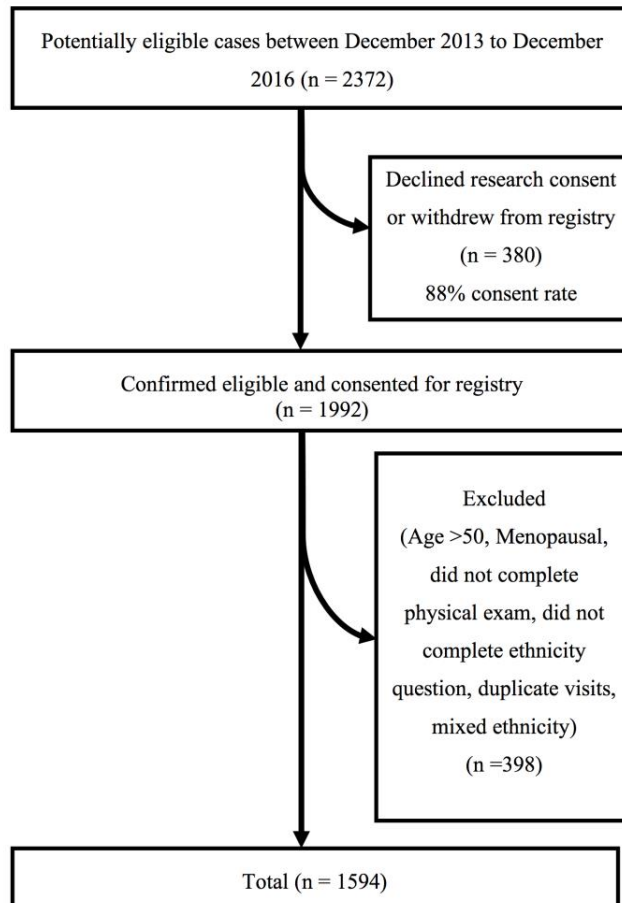
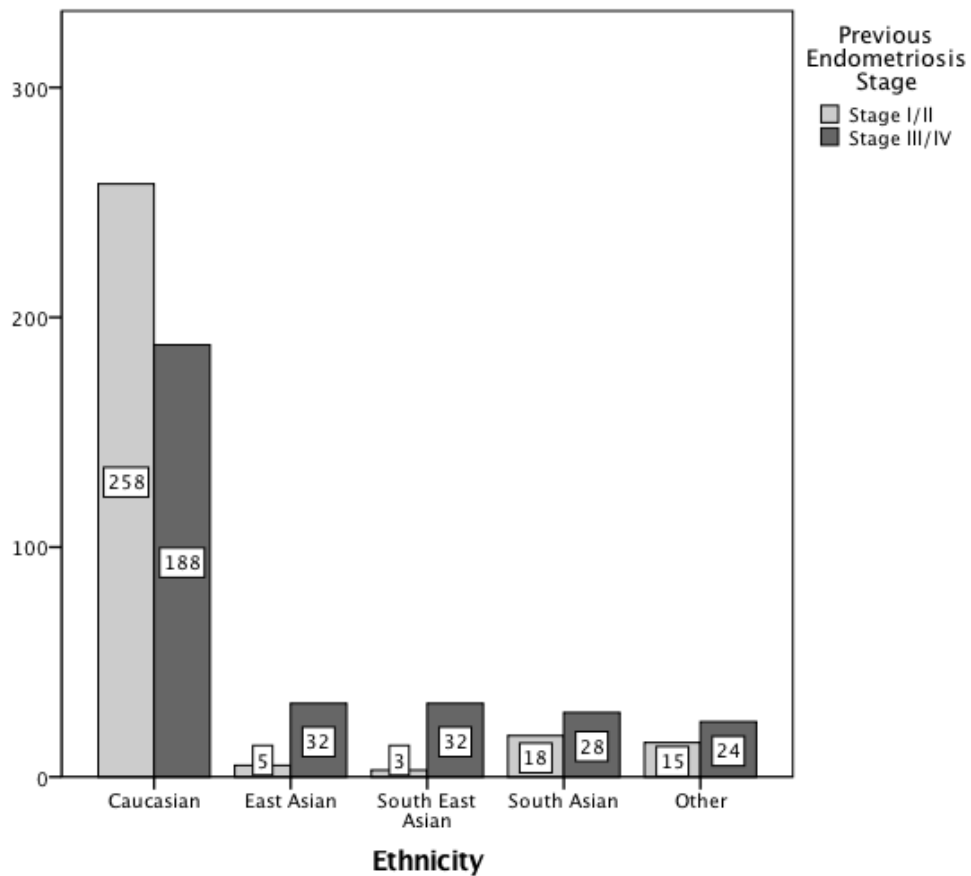


Figure 1: Inclusion/Exclusion criteria flowchart

Figure 2: Stage of endometriosis prior to referral to BC Women's Pelvic Pain and Endometriosis tertiary referral centre (n=603).



ACCEPTED