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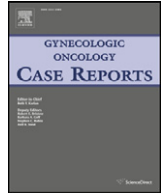
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Survey Article

Almost half of women with endometrial cancer or hyperplasia do not know that obesity affects their cancer risk



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1. Introduction

An estimated 52,630 cases of endometrial cancer were diagnosed in 2014 (Siegel et al., 2014), and up to 40% of these are attributable to obesity (Polednak, 2008). Women of low socioeconomic status and minority race, especially Hispanic and African-American women, are disproportionately obese and at increased risk (Ogden et al., 2010). Most cases of endometrial cancer, particularly type 1, estrogen-dependent cancers, will be curable with surgery with or without adjuvant therapy (Sorosky, 2012). The leading cause of death after treatment for endometrial cancer is cardiovascular disease (Ward et al., 2012) and the link between obesity and death from cardiovascular disease is well established (Malnick and Knobler, 2006). Obesity is also linked to increased risk of postmenopausal breast cancer and infertility (Malnick and Knobler, 2006). While over 90% of the general public is aware of the impact of obesity on cardiovascular disease (Lake S. Perry and Associates, 2003), studies show that as few as 18–42% of women are aware of the association between endometrial cancer and obesity (Cardozo et al., 2012a,b; Soliman et al., 2008). These studies evaluated populations that largely consisted of White and African-American, college-educated women. Additionally, no study has

specifically evaluated knowledge in women who had been diagnosed with endometrial hyperplasia or cancer.

The purpose of this study was to evaluate knowledge of obesity's health risks in a population of underserved, predominantly Hispanic women. We sought to determine baseline health literacy with regard to obesity's cardiovascular and reproductive health risks, and to compare knowledge between women with endometrial hyperplasia and cancer versus unaffected controls.

2. Methods

2.1. Subjects

A survey study was offered to women presenting to general gynecology, infertility, and gynecologic oncology clinics from October 2012 to June 2013 at Olive View-UCLA Medical Center, a Los Angeles County public hospital. Institutional Review Board (IRB) approval was obtained with waiver of written informed consent. All patients either had no health insurance, or were in a state or federal insurance program. Women were able to participate if they were English or Spanish speaking, age ≥ 18 , and not pregnant.

2.2. Survey design

Our survey included questions to assess the following about participants:

1. Perception of their weight,
2. Recollections about discussion of weight with health care providers,
3. Knowledge of obesity's negative health impacts.

Questions were developed from previously published and validated questionnaires, including the Harvard Forums on Health Survey, and the Center for Disease Control and Prevention Behavioral Risk Factor Surveillance System (Lake S. Perry and Associates, 2003; Behavioral Risk Factor Surveillance System, 2011). The survey was available in both Spanish and English and was self-administered with a trained bilingual scribe available when needed.

Supplemental data to the survey were collected from the corresponding medical records. This included height and weight as measured at the clinic visit, medical diagnoses, and review of pathology reports. All

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diagnoses of hyperplasia or cancer were confirmed after review at an intradepartmental conference per department protocol.

2.3. Survey distribution

A study team member was present to distribute the survey. A standardized, IRB approved script was employed when offering women participation. The voluntary nature of the survey was emphasized and patients were verbally consented to participate. After completion of the questionnaire, all women were given a handout on healthy food choices “10 tips to a healthy plate” (United States Department of Agriculture, 2011).

2.4. Statistics

For the data analysis, subjects were separated into two groups: women with a current diagnosis or history of endometrial hyperplasia or cancer (the EH/EC group) and women with no history of endometrial hyperplasia or cancer (the control group). Categorical variables were compared between the EH/EC and control groups with chi-squared tests where $n > 5$ and Fisher's exact tests where $n \leq 5$. T-tests were used to compare continuous variables between EH/EC and control groups.

Patients' responses to knowledge questions about the association between obesity and endometrial or breast cancer, heart disease, hypertension, and infertility were answered on a four-point scale and categorized as correct and incorrect for analysis. Similar to the methods in Soliman et al. (2008), responses of “increase a lot” and “increase a little” were considered correct and “does not affect” and “don't know” were considered incorrect. Questions regarding self-recognition and recollection of physician discussion of overweight status were evaluated among patients who were overweight or obese, defined as BMI (body mass index) $> 24.9 \text{ kg/m}^2$ calculated using the measured values found in the medical chart. Responses were assessed for the entire study population and compared between EH/EC and control groups using chi-square and Fisher exact tests where appropriate.

Logistic regression was employed to explore predictors of patient knowledge about the impact of obesity on cardiovascular health, reproductive health, and endometrial cancer risk. Each of these three knowledge categories is a separate binary outcome variable. Knowledge of endometrial cancer risk is defined as described above. Knowledge of reproductive health impact was defined as a correct response to all three of the knowledge questions about endometrial cancer, infertility, and breast cancer. Knowledge of cardiovascular health risk was defined as a correct response to the both knowledge questions about hypertension and heart disease. The following were used as predictor variables in univariate models: EH/EC group, age, BMI > 24.9 , less than high school education, income $< \$12,000/\text{year}$, reports having primary care doctor/clinic, diagnosis of diabetes, hypertension, high cholesterol, infertility, heart disease, and affirmative responses to the questions “has a doctor ever told you that losing weight would improve your health?” and “has a doctor ever told you that you are overweight or obese?”. Variables that were significant at the $p < 0.10$ level in univariate analysis were considered as potential covariates in multivariate models. Final multivariate models were fit through stepwise selection. P-values < 0.05 were considered significant. SAS software (SAS Institute Inc., Cary, NC, USA, v9.3) was used for analysis.

3. Results

3.1. Demographics

Of all patients approached during the clinics where survey participation was offered, 163 out of 272 women completed the survey (60%). Detailed demographic information can be found in Table 1. The mean age was 46.5 years, 66.9% were Hispanic, 71.9% had a high school

education or less, and over half reported a household income less than \$12,000/year. Mean BMI was 31.4 ± 7.8 and 78.5% of the subjects were overweight or obese.

Forty-three women (26%) had a diagnosis of endometrial cancer or hyperplasia and were designated the EH/EC group. One-hundred twenty women (74%) did not have either diagnosis and were included in the control group. The EH/EC group was significantly older (mean age 50.9 vs. 44.9 years; $p < 0.01$), had a higher BMI (34.8 vs. 30.1 kg/m^2 ; $p < 0.01$), lower parity (1.6 vs. 2.4; $p = .03$), and more frequently had diabetes (32.6% vs. 11.7%; $p < 0.01$) and hypertension (44.2% vs. 24.7%; $p = 0.01$). There were no differences in level of education, overall racial make-up, or income between the two groups.

3.2. Knowledge about health outcomes

The percentage of women in each group who correctly identified obesity's effect on cardiovascular and reproductive health outcomes is shown in Fig. 1.

3.2.1. Cardiovascular disease

Overall, 109 women (67%) correctly identified the association between obesity and heart disease and hypertension. There was no difference in knowledge between the EH/EC group and control group (76.7% vs 63.3%, $p = 0.31$ for hypertension; 83.7% vs. 60.8%: $p = 0.05$ for heart disease).

3.2.2. Reproductive health and endometrial cancer risk

Significantly fewer women were aware of the association between obesity and reproductive health issues vs cardiovascular health risks ($p < 0.001$). Overall, 61 (37.4%) women correctly identified obesity as a risk factor for endometrial cancer, 56 (34.4%) for breast cancer, and 57 (35.0%) for infertility. When analyzed separately, the EH/EC group demonstrated significantly superior knowledge in all reproductive domains with 53.5%, 48.8%, and 51.2% of the EH/EC group recognizing obesity as a risk factor for endometrial cancer, breast cancer, and infertility respectively, vs. 31.7%, 29.2% and 29.2% of the control group ($p < 0.05$).

3.3. Self and physician identification of overweight status

Results for questions regarding self and physician identification of overweight status are shown in Table 2. Overall, 128 women (78.5%) were overweight or obese, and 107 (83.6%) correctly reported themselves as overweight or obese. Seventy-five percent responded affirmatively to the question “has a doctor ever told you that losing weight would improve your health?” and 55.5% responded affirmatively to the question “has a doctor ever told you that you are overweight or obese?” These results were not significantly different between the EH/EC and control groups.

3.4. Predictors of knowledge

Data regarding factors associated with knowledge of obesity's impact on endometrial cancer risk, reproductive health, and cardiovascular health is presented in Table 3.

Univariate analysis for both knowledge of obesity's impact on endometrial cancer risk and reproductive health yielded the same 3 significant predictors: having a diagnosis of EH/EC, responding “yes” to the question “has your doctor ever told you that you are overweight or obese?”, and responding “yes” to the question “has your doctor ever told you that losing weight would improve your health?”. Stepwise multivariate analysis for identified two remaining significant predictors: a personal diagnosis of EH/EC ($p < 0.01$) and having been told by a physician of their overweight/obese diagnosis ($p = 0.01$ EC risk knowledge, $p = 0.04$ reproductive health knowledge). Being Hispanic

Table 1

Characteristics of the survey participants (N = 163).

EH/EC group: group with endometrial cancer or hyperplasia diagnosis

BMI: body mass index

†Chi-square compares the ≤8th grade education and >8th grade education groups.

	Total N = 163		Control group N = 120		EH/EC group N = 43		p-Value
Age in years mean (SD)	46.5	(10.8)	44.9	(10.4)	50.9	(10.9)	<.01
BMI in kg/m ² mean (SD)	31.4	(7.9)	30.11	(6.5)	34.8	(10.1)	<.01
Parity mean (SD)	2.2	(1.9)	2.4	(1.9)	1.6	(1.8)	0.03
Race N (%)							
Non-Hispanic White	28	(17.2)	17	(14.1)	11	(25.6)	0.11
Hispanic	109	(66.9)	86	(71.7)	23	(53.5)	
AA	10	(6.1)	7	(5.8)	3	(7.0)	
Asian	8	(4.9)	4	(3.3)	4	(9.3)	
Native American	1	(0.6)	1	(0.8)	0	(0)	
No answer	7	(4.3)	5	(4.2)	2	(4.6)	
Annual income N (%)							
<\$12,000/year	83	(55.3)	59	(53.2)	24	(61.5)	0.22
\$12,000 to <\$20,000/year	40	(24.5)	28	(23.3)	12	(27.9)	
\$20,000/year to <\$35,000/year	15	(9.2)	12	(10.0)	3	(7.0)	
\$35,000/year to <\$50,000	11	(6.8)	11	(9.2)	0	(0)	
\$50,000 or more	1	(0.6)	1	(0.8)	0	(0)	
Language N (%)							
English	64	(39.3)	42	(35.0)	22	(51.2)	0.06
Spanish	99	(60.7)	78	(65.0)	21	(48.8)	
Education level N (%)							
≤8th grade education	55	(34.4)	41	(35.0)	14	(32.6)	0.76 †
>8th grade education	105	(65.6)	76	(65.0)	29	(67.4)	
– High school or equivalent	60	(36.8)	43	(35.8)	17	(39.5)	
– Vocational program	14	(8.6)	11	(9.2)	3	(7.0)	
– College	26	(15.9)	18	(15.0)	8	(18.9)	
– Graduate school	5	(3.1)	4	(3.3)	1	(2.3)	
– No response	3	(1.8)	3	(2.5)	0	(0)	
Medical conditions N (%)							
Diabetes	28	(17.2)	14	(11.7)	14	(32.6)	<0.01
Heart disease	7	(4.3)	2	(1.7)	5	(11.6)	0.01
Hypertension	48	(29.5)	29	(24.2)	19	(44.2)	0.01
Hypertension	15	(9.2)	10	(8.3)	5	(11.6)	0.52
Infertility	28	(17.2)	17	(14.2)	11	(25.6)	0.09
High cholesterol							
Reports primary care clinic or doctor	66	(45.2)	52	(48.2)	14	(36.8)	0.23

or Spanish speaking was not a significant predictor of EC or reproductive health knowledge.

On multivariate analysis of predictors of cardiovascular health knowledge, one significant positive predictor were identified: reporting having a primary care provider (p < 0.01, respectively). Spanish as primary language was noted to be a negative predictor of cardiovascular knowledge.

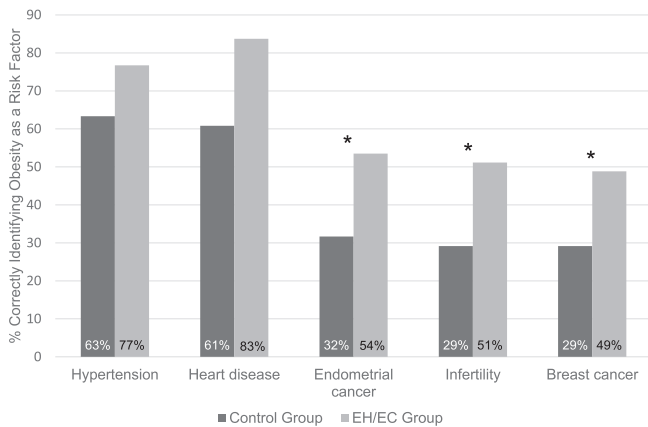


Fig. 1. Percentage of women correctly identifying obesity as a risk factor for cardiovascular and reproductive health outcomes among the control group and the EH/EC Group. The EH/EC group had significantly better knowledge of obesity’s negative effects on endometrial cancer, infertility, and breast cancer compared to controls. * = p < 0.05; EH = endometrial hyperplasia; EC = endometrial cancer.

4. Discussion

Several prior studies have shown poor lay public knowledge of the association between obesity and endometrial cancer risk. Soliman and colleagues (Soliman et al., 2008) surveyed mostly college-educated White or African American women, and 42% recognized the impact of obesity on endometrial cancer risk. Cardozo et al. demonstrated that 21% of a predominantly Caucasian, college-educated cohort seeking fertility treatment (Cardozo et al., 2012a), and 18% of an urban, college-educated, predominantly African-American cohort (Cardozo et al., 2012b) were aware of this association. Similar to these studies, 37% of our total cohort were aware that obesity was a risk factor for endometrial cancer.

A prior national poll found that 94% of Americans recognize obesity as a risk factor for hypertension, and 95% for heart disease (Lake S. Perry and Associates, 2003). In our largely Hispanic, low-income cohort, only 67% of the surveyed patients knew that excess weight increases the risk of hypertension and heart disease, and only about one third were aware of obesity’s association with poor reproductive health outcomes. This inferior awareness may reflect disparities in socioeconomic status and access to healthcare and education. Interestingly, being Spanish speaking was a negative predictor of cardiovascular health knowledge, but did not affect reproductive health knowledge. This may reflect the fact that this cohort of patients has access to specialty gynecologic care, but less than 50% reported having a primary care provider.

To our knowledge, ours is the first study to specifically evaluate differences in knowledge between women with and without a diagnosis of EH/EC. We demonstrate that while there was no difference between the groups in their knowledge regarding the cardiovascular impacts of

Table 2

Questions regarding self-recognition and recollection of physician discussion of overweight status in the 128 overweight/obese subjects.

	Total N = 128		Control group N = 92		EH/EC group N = 35		p-Value
	N	(%)	N	(%)	N	(%)	
Has a doctor ever told you that you are overweight or obese? Answer: yes	71	(55.5)	49	(53.9)	22	(59.5)	0.56
Has a doctor ever told you that losing weight would improve your health? Answer: yes	96	(75)	70	(76.9)	26	(70.3)	0.43
Do you consider yourself overweight? Answer: yes	107	(83.6)	75	(82.4)	32	(86.5)	0.57

Table 3

Predictors of knowledge of the impact of obesity on endometrial cancer, reproductive health, and cardiovascular health risk.

Endometrial cancer knowledge predictors	Univariate		Multivariate	
	OR (95% CI)	p-Value	OR (95% CI)	p-Value
EH/EC group	4.37 (2.08–9.19)	<0.01	4.50 (2.09–9.71)	<0.01
MD told overweight/obese diagnosis	2.50 (1.25–5.0)	0.01	2.61 (1.24–5.47)	0.01
Reports having primary care doctor/clinic	1.83 (0.88–3.82)	0.11	–	–
Hispanic	0.69 (0.33–1.27)	0.26	–	–
Spanish-speaking	0.53 (0.27–1.06)	0.07	–	–
BMI > 24.9	1.53 (0.64–3.67)	0.34	–	–
MD advised to lose weight	2.26 (1.05–4.89)	0.04	–	–
Income < \$12,000/year	1.34 (0.65–2.76)	0.42	–	–
Less than high school education	0.82 (0.4–1.69)	0.18	–	–
Age	1.00 (0.96–1.03)	0.75	–	–
Diabetes	1.90 (0.80–4.51)	0.15	–	–
Hypertension	1.81 (0.85–3.84)	0.12	–	–
Heart disease	1.16 (0.20–6.54)	0.87	–	–
Infertility	3.26 (0.70–15.16)	0.13	–	–
High cholesterol	1.41 (0.64–3.11)	0.39	–	–
Reproductive health knowledge predictors	Univariate		Multivariate	
	OR (95% CI)	p-Value	OR (95% CI)	p-Value
EH/EC group	3.90 (1.61–9.43)	<0.01	4.83 (1.86–12.51)	<0.01
MD told overweight/obese diagnosis	2.85 (1.15–7.04)	0.02	2.80 (1.03–7.56)	0.04
Hispanic	0.70 (0.29–1.69)	0.43	–	–
Spanish-speaking	0.66 (0.28–1.54)	0.33	–	–
Reports having primary care doctor/clinic	2.27 (0.88–5.88)	0.09	–	–
BMI > 24.9	1.52 (0.49–4.76)	0.47	–	–
MD advised to lose weight	3.21 (1.04–9.91)	0.04	–	–
Income < \$12,000/year	0.96 (0.39–2.39)	0.94	–	–
Less than high school education	0.8 (0.32–2.02)	0.64	–	–
Age	1.01 (0.98–1.06)	0.48	–	–
Diabetes	0.87 (0.37–2.03)	0.75	–	–
Hypertension	1.21 (0.59–2.48)	0.61	–	–
Heart disease	1.04 (0.20–5.33)	0.96	–	–
Infertility	6.68 (0.79–56.85)	0.08	–	–
High cholesterol	0.91 (0.43–1.92)	0.8	–	–
Cardiovascular health knowledge predictors	Univariate		Multivariate	
	OR (95% CI)	p-Value	OR (95% CI)	p-Value
EH/EC group	2.55 (1.18–5.52)	0.02	–	–
MD told overweight/obese diagnosis	1.39 (0.74–2.61)	0.3	–	–
Hispanic	0.37 (0.18–0.74)	<0.01	–	–
Spanish-speaking	0.35 (0.18–0.70)	<0.01	0.37 (0.17–0.78)	<0.01
Reports having primary care doctor/clinic	2.80 (1.41–5.55)	<0.01	2.74 (1.35–5.57)	<0.01
BMI > 24.9	1.10 (0.51–2.34)	0.81	–	–
MD advised to lose weight	1.12 (0.58–2.14)	0.74	–	–
Income < \$12,000/year	0.93 (0.48–1.78)	0.82	–	–
Less than high school education	0.43 (0.2–0.91)	0.03	–	–
Age	1.01 (0.98–1.04)	0.55	–	–
Diabetes	1.01 (0.43–2.41)	0.98	–	–
Hypertension	1.43 (0.67–3.07)	0.35	–	–
Heart disease	0.62 (0.12–3.18)	0.57	–	–
Infertility	3.98 (0.47–33.87)	0.21	–	–
High cholesterol	0.99 (0.46–2.13)	0.98	–	–

'MD told overweight/obese diagnosis' = responding "yes" to the question "has your doctor ever told you that you are overweight or obese?"

'MD advised to lose weight' = responding "yes" to the question "has your doctor ever told you that losing weight would improve your health?"

MD: medical doctor; BMI: body mass index; EH: endometrial hyperplasia; EC: endometrial cancer

"–" indicates that the variable was not included in the multivariate regression model.

obesity, women with a diagnosis of EH/EC had superior knowledge regarding the association between obesity and endometrial cancer, breast cancer, and infertility compared with controls. This may be due to focused discussion of obesity's negative reproductive health impacts at the time of endometrial hyperplasia or cancer diagnosis. However, it is important to note that while the EH/EC patients' knowledge was better than that of controls, nearly half of the affected women were not aware of obesity's role in their disease.

Another unique aspect of our study is the identification of predictors of knowledge. While BMI > 24.9 was not a predictor of knowledge of any of obesity's negative health effects, a diagnosis of EH/EC was a significant predictor of awareness of obesity's impact on endometrial cancer risk, reproductive health, and cardiovascular health. Additionally, for reproductive health and endometrial cancer risk, having been told by a doctor the diagnosis of overweight or obese was a significant predictor of knowledge. These results support physicians openly discussing weight status and the risks of obesity with overweight and obese patients.

Our study is limited by its small sample size and recall bias. Additionally, results may not be generalizable, since we specifically focused on a largely Hispanic, socioeconomically disadvantaged patient population, and patients were seen in a variety of resident-run specialty clinics where counseling may have been different depending on the provider and on the patients' diagnoses. There were also baseline demographic differences between the EH/EC and control groups. While these differences are expected as they reflect risk factors for endometrial cancer (age, BMI, diabetes, hypertension, and low parity), it is possible that they impact patient knowledge about obesity.

We advocate for increasing patient education from women's health care providers about the risks of obesity. This is especially important in women diagnosed with endometrial hyperplasia or cancer because, for many patients, a major risk factor that led to their hyperplasia or cancer (obesity) also puts them at increased risk for death from cardiovascular disease (Ward et al., 2012). Further research should evaluate if educational interventions can increase knowledge, impact behavior, and improve outcomes in endometrial cancer survivors. An important first step is for women's health care providers to make a commitment to inform patients about their weight status and educate them on

obesity as a major modifiable risk factor for this potentially preventable cancer. The Society of Gynecologic Oncology (SGO) has created the "Obesity Toolkit" to aid in such a conversation, available at www.sgo.org/obesity/ (Society of gynecologic oncology, 2014).

Conflict of interest statement

All authors confirm that they have no conflict of interest to disclose.

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