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Tubal Sterilization and Cervical Cancer Underscreening in the United States

Hunter K. Holt, MD¹, Gladys Martinez, PhD², Maria F. Reyes, MD³, Mona Saraiya, MD⁴, Jin Qin, ScD⁴, George F. Sawaya, MD⁵

¹Department of Family and Community Medicine, University of Illinois at Chicago, Chicago, Illinois, USA

²Reproductive Statistics Branch, National Center for Health Statistics, Division of Vital Statistics, Centers for Disease Control and Prevention, Hyattsville, Maryland, USA

³Department of Obstetrics, Gynecology and Reproductive Sciences, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA

⁴Epidemiology and Applied Research Branch, Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

⁵Department of Obstetrics, Gynecology and Reproductive Sciences, Center for Healthcare Value, University of California San Francisco, San Francisco, California, USA

Abstract

Background: Tubal sterilization is more commonly utilized by racial/ethnic minority groups and has been implicated in underscreening for cervical cancer. The objective is to determine if prior tubal sterilization is a risk factor for cervical cancer underscreening.

Methods: National Survey of Family Growth dataset from 2015 to 2019 used for analysis; data were weighted to represent the 72 million women in the U.S. population aged 22–49. Chi-square tests, Fisher exact tests, and logistic regression were used for analysis. The primary predictor variable was tubal sterilization which was categorized into no previous sterilization, sterilization completed <5 years ago, and sterilization completed ≥ 5 years ago. The outcome variable was underscreened versus not underscreened. Other predictor variables included age, household income as a percent of federal poverty level, previous live birth, primary care provider, and insurance status.

Address correspondence to: *Hunter K. Holt, MD, Department of Family and Community Medicine, University of Illinois at Chicago, Chicago, IL 60607, USA, hholt2@uic.edu.*

Authors' Contributions

Our team of authors all meet the outlined International Committee for Medical Journal Editors criteria for authorship. Specific contributions are as follows: H.K.H.: Concept, formal analysis, writing—original draft, writing—review and editing, project administration, and supervision. G.M.: Concept, formal analysis, resources, data curation, investigation, methodology, writing—review and editing. M.F.R.: Concept, formal analysis, writing—original draft, writing—review and editing. M.S.: Formal analysis, writing—review and editing. J.Q.: Formal analysis, writing—review and editing. G.F.S.: Concept, formal analysis, writing—original draft, writing—review and editing, project administration, and supervision.

Author Disclosure Statement

No competing financial interests exist.

Results: Prevalence of tubal sterilization completed 5 or more years ago was 12.5% and varied by most measured characteristics in univariate analyses. Approximately 8% of women were underscreened for cervical cancer. In multivariable analyses, women with a tubal sterilization 5 or more years ago had 2.64 times the odds (95% confidence interval = 1.75–4.00) of being underscreened for cervical cancer compared with women who did not have a tubal sterilization.

Conclusions: Approximately 4.3 million women ages 22–49 in the United States are potentially underscreened for cervical cancer and women with previous tubal ligation 5 years ago are more likely to be underscreened. These results may inform the need for culturally sensitive public health messages informing people who have had these procedures about the need for continued screening.

Keywords

cervical cancer underscreening; tubal sterilization; National Survey of Family Growth

Introduction

IN THE UNITED STATES, cervical cancer incidence and mortality rates are higher in women who identify as Black and/or Hispanic^{1–3} and in people who have not been adequately screened.⁴ Currently, family planning clinics and Title X-funded health centers not only support the delivery of contraception but are also critical in providing preventive care such as cervical cancer screening for their patients.^{5,6} Because of their critical role in providing preventive care for many people, it has been hypothesized that women who have undergone tubal sterilization may be at risk of underscreening as they will not be attending these clinics.⁴

Tubal sterilization is the most common form of contraception in the United States.⁷ Black and Hispanic women are more likely to rely on tubal sterilization than White women for their contraception choice (23% and 19% compared to 18% of those currently using contraception).⁷ In addition, women with low-income are more likely to use tubal sterilization than women with higher incomes.⁸ Previous studies have not isolated tubal ligation as a specific risk factor for increased incidence of cervical cancer,⁹ but others have found that women diagnosed with cervical cancer had higher odds of previous tubal sterilization and decreased screening uptake^{4,10,11} No previous studies have performed an in-depth evaluation of tubal sterilization and race, ethnicity, and nativity on cervical cancer screening adherence in the United States. The objectives of this study were to estimate the prevalence of cervical cancer underscreening in the United States by race and ethnicity and to determine if prior tubal sterilization is a risk factor for underscreening.

Methods

The National Survey of Family Growth is a publicly available, deidentified dataset that has been reviewed and approved for release by the Disclosure Review Board (DRB), and does not constitute human subjects research, thus Ethics Review Board (ERB) review was not required. The data used were collected in 2015–2019 and the NSFG questionnaires used to collect the data were reviewed and approved by the ERB of the National Center for Health Statistics.

The National Survey of Family Growth (NSFG) dataset was used because it contains information about tubal sterilization and cervical cancer screening and is designed to produce national level data.¹² The NSFG is a multistage, probability-based, nationally representative sample of men and women aged 15–49 years in the U.S. household population. This study used data collected from women in 2015–2019, the most recent years available for analysis; data were weighted to represent the 72.2 million women in the U.S. population at the midpoint of 2015–2019. The NSFG female response rate in this survey period was 62.4%. Women aged 22–49 years were included in the analysis sample as cervical cancer screening is not recommended to start until age 21¹³; women who had a hysterectomy ($n = 540$) were excluded as the U.S. Preventive Services Task Force (USPSTF) recommends against screening average-risk women who have undergone a hysterectomy with removal of the cervix.¹³ In addition, women with missing information on screening ($n = 7$) were also excluded. The final analytical population included 8,748 women.

Based on recommendations by the USPSTF during the study years,¹³ women were defined as being underscreened if they never had a Pap test or did not have a Pap test in the prior 5 years. Tubal sterilization was defined as having had a tubal ligation, tubal removal, or permanent tubal obstruction. To account for screening that likely would have occurred at a preoperative visit, the timing of tubal sterilization was turned into a categorical variable: no previous sterilization, sterilizations completed <5 years ago, and sterilizations completed 5 or more years ago. Race and ethnicity were self-reported by survey participants and utilized in our analysis due to the known cervical cancer incidence and mortality disparities in Black and Hispanic women^{1–3} and these groups' preference for tubal sterilization.⁷ In addition, due to increased preference among foreign-born Hispanic women for tubal sterilization^{14,15} and evidence of previous cervical cancer underscreening¹⁶ a variable was constructed to determine whether Hispanic respondents, the largest immigrant population in the United States,¹⁷ were U.S.-born or foreign-born.

Chi-square tests, Fisher exact tests, and multivariable logistic regression were used for analysis using SAS survey procedures (version 9.4; SAS Institute). The outcome variable was underscreened versus not underscreened. Other predictor variables (including age, household income as a percent of federal poverty level, parity, regular care provider, and insurance status [yes/no]) were chosen *a priori* because they could plausibly affect both cervical cancer screening and having a tubal sterilization (Table 1). This study followed the Strengthening the Reporting of Observational Studies in Epidemiology Reporting Guideline.

Results

Of the included 8,748 women, the prevalence of tubal sterilization was 15.8% (with 4.7% less than 5 years ago and 11.1% greater than or equal to 5 years ago) (Table 1). Prevalence of sterilization 5 years ranged from 7.2% in non-Hispanic (NH) Asian women to 19% in foreign-born Hispanic women. Black and U.S.-born Hispanic both had higher rates of sterilization 5 years ago than NH White women (14.8%, 12.9%, and 11.3%, respectively). In addition, women with incomes <150% of the federal poverty limit had a higher rate of sterilization 5 years ago compared to women with incomes 300% of the federal poverty

line (18.2% vs. 7.4%). Finally, of women who had at least 1 live birth, 18.3% had a previous tubal sterilization 5 years ago.

Approximately 8% of women aged 22–49 were underscreened for cervical cancer, representing 4.3 million U.S. women. The prevalence of under screening varied by recency of sterilization, with 9.4% of women with previous tubal sterilization 5 years ago, 0.6% of women with tubal sterilization <5 years ago, and 8.0% in women without history of tubal sterilization. When evaluating by race and ethnicity, NH Black women had the lowest underscreening prevalence of 3.3%, while NH Asian women had the highest underscreening prevalence of 14.7%. In addition, U.S.-Born Hispanic women had higher underscreening rates compared to NH White women, while foreign-born Hispanic women had lower underscreening rates (10.1%, 8.0%, and 6.8%, respectively).

In bivariate analysis, women with tubal sterilization 5 years ago was not associated with cervical cancer under screening but women with tubal sterilization <5 years ago was significantly associated with cervical cancer screening (odds ratio = 0.07; 95% confidence interval [CI] = 0.02–0.21). In multivariable analyses, women with a tubal sterilization 5 or more years ago had 2.64 times the odds (95% CI = 1.75–4.00) of being underscreened for cervical cancer compared with women who did not have a tubal sterilization. Other independent variables investigated for underscreening were race and ethnicity other than NH Black, younger and older age (compared with ages 30–39), having a lower household income, being nulliparous, being uninsured, and not having a regular care provider.

Discussion

The results of this cross-sectional study utilizing the NSFG suggest that ~4.3 million women ages 22–49 in the United States are potentially underscreened for cervical cancer, and they are more likely to have had a prior tubal ligation. Our study has confirmed findings in other national surveys that NH Black women are more likely to report screening in the previous 5 years. Asian women are least likely to report screening and Hispanic women have high rates of under-screening.^{18,19} Our study provides further context as we also found differences by nativity status with foreign-born Hispanic women less likely to be underscreened compared to both NH White and U.S.-born Hispanic women.¹⁹ These data also support previous data analyzed from the National Health Interview Survey, which found that both recently immigrated and long-term immigrant Hispanic women were more likely to have been screened for cervical cancer in the past 3 years compared to NH White women.¹⁶ Further studies exploring the health services utilization among U.S.-born and foreign-born Hispanic women are necessary to identify if utilization is changing.

Our study also found an association with underscreening and low income and insurance status, which has been seen in previous studies.^{20,21} Women with incomes <150% of the poverty limit had increased odds of cervical cancer underscreening, this may be due to the perceived financial barriers to cervical cancer screening and the associated costs.²² In addition, uninsured status was associated with cervical cancer underscreening, which could also be in line with high perceived costs of screening and low awareness of free screening programs such as the National Breast and Cervical Cancer Early Detection Program.^{22,23} It

is critical that insurance benefits be expanded to low-income women and awareness is made regarding the availability of free screening programs for uninsured women.

Finally, our study found that women who had tubal sterilization >5 years ago had higher odds of underscreening, a finding consistent with previous studies that investigated women with cervical cancer.^{4,10,11} Our study expands on that study by investigating a nationally representative cohort of women and found that over 648,000 women in the United States have had a tubal ligation >5 years ago and are underscreened for cervical cancer. This could be due to women believing that because they are now sterilized, they no longer need to present to the doctor for reproductive and preventive health care.⁴ Further studies are needed to investigate the implication of tubal sterilization on subsequent health care utilization in reproductive age women.

Our study has several limitations. First, this survey can be affected by selection bias, though the administration of the survey attempts to counter this issue.¹² Next, this survey did not differentiate between human papillomavirus (HPV) testing and Pap testing which may underestimate screening rates, though a vast majority of providers in the United States utilize cytology with or without HPV testing.²⁴ Also, in women who only receive a cytology test, it is recommended that they be screened with cytology alone every 3 years, given our definition of underscreening it is also possible that we may be overestimating screening rates as well.¹³ Next, the NSFG survey utilizes self-reported screening history, which can have a low specificity for cervical cancer screening, especially in different racial and ethnic groups and may be susceptible to recall bias.^{25,26} In addition, our study lacked the sample size necessary to conduct interaction analysis between race, ethnicity, and nativity with tubal sterilization and cervical cancer underscreening.

Our study potentially reinforces race as a biological construct when, in fact, it is a social construct.^{27–29} We acknowledge that race, ethnicity, and nativity are poor proxies for the lived experience, shared culture, and structural racism that groups with shared ancestry have experienced with regard to their reproductive health care.^{30,31} Nonetheless, we explored race and ethnicity because of notable disparities in cervical cancer incidence and mortality and high utilization of tubal sterilization in the United States. The differences we noted by race, ethnicity, and nativity may be due to the shared social environments and structural racism these women face which may have played a role in both their preferences for tubal sterilization and utilization of cervical cancer screening services.^{27,32}

Our study also has notable strengths, including having a relatively large sample size with variables that allowed for an in-depth evaluation of race, ethnicity, and nativity. Because of its design, the NSFG also has a unique strength that allows for extrapolation of results to the entire U.S. population with estimated numbers of underscreened persons.

In conclusion, a significant portion of the U.S. population has had a previous tubal sterilization and has higher odds of underscreening for cervical cancer. These results may inform the need for culturally sensitive public health messages informing people who have had previous tubal sterilizations procedures about the need for continued screening and other

preventive services. Such messages may serve to narrow observed disparities in cervical cancer incidence and mortality.

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Table 1. TUBAL STERILIZATION AND CERVICAL CANCER UNDERSCREENING IN THE UNITED STATES, NATIONAL SURVEY OF FAMILY GROWTH 2015–2019

Characteristic	Survey sample		Tubal sterilization		Cervical cancer underscreening			Adjusted ^b odds ratios (95% CI) for cervical cancer underscreened
	N (%)	Percent, 5 years ago	Percent, <5 years ago	Percent, 5 years ago	Percent ^c	Population estimate (thousands) ^a	Unadjusted odds ratios (95% CI) for cervical cancer underscreened	
Total	8,748	4.7	11.1	7.8	4,318			
Tubal sterilization								
No	7,365 (84.2)	NA	NA	8.0	3,656	Reference	Reference	
Yes, <5 years ago	411 (4.7)	100	NA	0.6	14	0.07 (0.02–0.21)	0.13 (0.04–0.42)	
Yes, 5 years ago	972 (11.1)	NA	100	9.4	648	1.19 (0.86–1.65)	2.64 (1.75–4.00)	
Age, years								
30–39	3,412 (39.0)	6.4	11.7	4.2	854	Reference	Reference	
22–29	2,983 (34.1)	3.2	0.6	13.6	2,378	3.62 (2.76–4.74)	2.14 (1.62–2.82)	
40–49	2,353 (26.9)	3.0	25.5	6.3	1,087	1.54 (1.15–2.05)	1.72 (1.23–2.41)	
Race and ethnicity								
Non-Hispanic Black	1,841 (21.0)	4.3	14.8	3.3	241	Reference	Reference	
Non-Hispanic White	3,988 (45.6)	4.0	11.3	8.0	2,489	2.55 (1.77–3.66)	3.38 (2.28–5.03)	
U.S.-born Hispanic	1,151 (13.2)	5.5	12.9	10.1	586	3.32 (2.24–4.91)	3.49 (2.21–5.50)	
Foreign-born Hispanic	942 (10.8)	6.0	19.0	6.8	355	2.13 (1.45–3.13)	1.85 (1.13–3.05)	
Non-Hispanic Asian	375 (4.3)	2.2	7.2	14.7	411	5.07 (2.86–8.99)	7.52 (4.24–13.33)	
None of the above	451 (5.1)	4.2	13.1	8.6	236	2.78 (1.48–5.21)	3.54 (1.86–6.73)	
Household income ^d								
High	3,041 (34.8)	2.2	7.4	4.4	1,004	Reference	Reference	
Moderate	2,344 (26.8)	5.8	13.5	10.1	1,450	2.41 (1.74–3.32)	2.75 (1.94–3.89)	
Low	3,363 (38.4)	5.7	18.2	10.3	1,864	2.46 (1.81–3.36)	2.91 (2.07–4.09)	
Parity								
1 Live birth	5,853 (66.9)	6.2	18.3	4.3	1,566	Reference	Reference	
Nulliparous	2,895 (33.1)	0.5	0.8	15.1	2,753	3.99 (3.13–5.09)	4.66 (3.58–6.07)	
Has a regular care provider								
Yes	7,540 (86.2)	4.4	12.7	6.2	2,938	Reference	Reference	
No	1,205 (13.8)	3.7	11.2	18.1	1,362	3.36 (2.54–4.45)	2.13 (1.58–2.87)	

Characteristic	Survey sample		Tubal sterilization		Cervical cancer underscreening			Adjusted ^b odds ratios (95% CI) for cervical cancer underscreened
	N (%)		Percent, <5 years ago	Percent, 5 years ago	Percent ^c	Population estimate (thousands)	Unadjusted odds ratios (95% CI) for cervical cancer underscreened	
Insurance status								
Insured ^e	7,511 (85.9)	4.2	11.8	6.2	2,996	Reference	Reference	
Uninsured ^f	1,237 (14.1)	5.0	17.7	18.5	1,322	3.40 (2.63–4.40)	2.86 (2.08–3.94)	

^aNever had a Pap test or did not have a Pap test in the prior 5 years.

^bAdjusted for all other variables in the table.

^cIn univariate analyses, percentages varied by all characteristics ($p < 0.05$).

^dAs percent of federal poverty limit: low (<150%), moderate (150%–299%), and high (>300%).

^ePrivate, Medicaid, Children’s Health Insurance Program, Medicare, or military insurance.

^fIndian Health Service or single service plans.

CI, confidence interval; NA, not applicable.