Racial Disparities in Sterilization Procedure Performed at Time of Cesarean Section

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Abstract

Objectives While bilateral tubal ligation has historically been performed for sterilization at cesarean delivery (CD), recent data supports the use and safety of opportunistic bilateral salpingectomy during CD to decrease lifetime ovarian cancer risk. Prior studies have described racial disparities in sterilization rates, but there is a paucity of data regarding racial disparities in type of sterilization procedure. Our objective was to determine differences in sterilization procedure type performed at CD by race (Black vs. non-Black) to evaluate for equity in bilateral salpingectomy utilization.

Study Design We performed a retrospective cohort study of patients included in the American College of Surgeons National Surgical Quality Improvement Program database who underwent sterilization at time of CD from January 2019, to December 2020, identified using Current Procedural Terminology codes. Patients without documented race were excluded. Multivariable logistic regression was used to determine odds of undergoing bilateral salpingectomy compared with bilateral tubal ligation by race while controlling for confounders.

Results Of 28,147 patients who underwent CD, 3,087 underwent concurrent sterilization procedure, and 2,161 met inclusion criteria (Black: $n = 279$; non-Black: $n = 1{,}882$). Black patients were significantly more likely to have hypertension (10.8% vs. 5.3%, $p < 0.01$), bleeding disorders (3.9% vs. 1.3%, $p < 0.01$), preoperative anemia (hemoglobin < 11 g/dL; 36.9% vs. 21.3%, $p < 0.01$), and be of American Society of Anesthesiologist class 3 or higher (29.4% vs. 22.5%, $p = 0.01$) than non-Black patients. After adjusting for differences, Black patients were almost 50% less likely than non-Black patients to undergo bilateral salpingectomy compared with bilateral tubal ligation for sterilization at CD (adjusted odds ratio = 0.52, 95% confidence interval: 0.36–0.75).

Conclusion Despite evidence that bilateral salpingectomy decreases ovarian cancer risk and is safe at CD, there is a racial disparity in bilateral salpingectomy utilization. While the cause of this disparity is unclear, further research is warranted to determine root causes and equitable solutions.

Keywords
- equity
- opportunistic salpingectomy
- racial disparities
- sterilization
- tubal ligation

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Key Points

- Opportunistic salpingectomy is recommended for primary prevention of ovarian cancer in patients undergoing pelvic surgery who have completed childbearing.
- Black patients were almost 50% less likely to undergo bilateral salpingectomy compared with bilateral tubal ligation than non-Black patients even after controlling for possible confounders.
- Further research is needed to determine root cause of the racial disparity in bilateral salpingectomy utilization rate.

Bilateral tubal ligation is a commonly used method of permanent sterilization in the United States and worldwide.[1,2] Since the first tubal ligation procedure was described by Samuel Smith Lungren in 1880, sterilization has become the most frequently used form of contraception.[1,2] In the postpartum period (i.e., the first 6 weeks following childbirth), the most common sterilization procedures performed are either tubal ligations, via Pomeroy or Parkland method, or salpingectomy.[1,2]

Prior to the last two decades, there was little evidence to guide the selection of salpingectomy versus bilateral tubal ligation. The surgical risks of salpingectomy and tubal ligation have been found to be similar when performed in the postpartum period.[3–6] However, in recent years, an increasing body of evidence has identified the fallopian tube as the origin of serous tubal intraepithelial carcinomas, a precursor for high grade serous ovarian carcinoma.[3] Further research has demonstrated that bilateral salpingectomy is associated with a reduced risk of ovarian cancer.[3,7] In 2013, the Society of Gynecological Oncologists published recommendations for opportunistic salpingectomy—or the removal of the fallopian tubes for primary prevention of ovarian cancer in a woman who has completed childbearing and already undergoing pelvic surgery for a benign indication—based on these findings.[3,8]

While the practice of opportunistic salpingectomy at time of cesarean delivery has increased since the publication of these guidelines, racial disparities in this practice have not been studied.[9] The history of sterilization in the United States is fraught with racial and socioeconomic disparities, rooted in the eugenics movement of coerced sterilization in the early 20th century.[10,11] More recent research shows a persistent racial difference in rates of sterilization, with Black patients twice as likely to undergo sterilization than White patients regardless of age, income, education level, or insurance status.[11]

Given the known benefits of salpingectomy as compared with tubal ligation, identifying existing racial disparities in the use of opportunistic salpingectomy may have significant implications for ovarian cancer prevention and is crucial to ensure equitable care across racial groups. Considering the well-researched, persistent racial disparities in reproductive health, we hypothesized that there would be a difference in the rate of salpingectomy and tubal ligation procedures performed at the time of cesarean delivery between Black and non-Black patients.

Materials and Methods

This was a retrospective cohort study of patients who underwent a bilateral salpingectomy or bilateral tubal ligation at the time of cesarean section between January 2019 and December 2020 using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database. The ACS-NSQIP database is a national, validated, prospective, quality improvement database that is comprised of clinical and surgical outcomes data at over 750 participating hospitals. Participating sites include a variety of hospitals that have chosen to participate in the program, from community-based hospitals to large metropolitan academic centers. Data including preoperative patient comorbidities, intraoperative variables, and 30-day postoperative outcomes, is collected directly from patient medical charts by trained surgical clinical reviewers at each participating site. The database uses Current Procedural Terminology (CPT) codes to identify procedures. In addition to the "principal operative procedure," data are also collected on "other procedures," which are defined as procedures performed at the same time as the principal procedure by the same primary surgical team.[12] Although ACS-NSQIP first started collecting surgical data in 2004, cesarean section was only recently included among the surgical procedures captured by the database starting in 2019. This study was deemed exempt from approval by the University of Pennsylvania Institutional Review Board, as it involved deidentified patient data.

Patients were identified by CPT codes for cesarean section (59510, 59514, 59515, 59618, 59620, and 59622) in addition to CPT code for either bilateral tubal ligation (58600 and 58611) or bilateral salpingectomy (58700). The primary exposure was patient self-identified race; therefore, patients with unknown race were excluded. Patient groups were identified as Black and non-Black (including White, Asian, American Indian or Alaskan Native, Native Hawaiian, or Pacific Islander) given the small proportion of patients identifying as other races and the historically known disparities of sterilization in Black patients.[10,11] The primary outcome was odds of undergoing a bilateral salpingectomy versus a bilateral tubal ligation when performed for sterilization at the time of cesarean delivery.

Preoperative patient demographics and medical comorbidities data including age, body mass index (BMI), smoking status, American Society of Anesthesiology (ASA) class, hypertension, diabetes, bleeding disorders, and preoperative anemia were collected. Perioperative characteristics regarding preoperative blood transfusion and emergent procedure status were also collected. Bivariate analyses were performed using the Wilcoxon rank sum, chi-squared, and Fisher's exact tests as appropriate. Demographic and clinical characteristics associated with both exposure (race) and outcome (mode of sterilization) on bivariate analyses

Table 1 Patient characteristics

Characteristics	Non-Black ($n = 1,882$)	Black ($n = 279$)	p-Value
Age	33 (29–36)	32 (28–36)	0.17
Obesity (BMI $\geq$ 30 kg.m^2)	1,393 (76.5)	216 (80.3)	0.17
Diabetes	196 (10.4)	24 (8.6)	0.35
Smoking	302 (16.1)	34 (12.2)	0.10
Hypertension	100 (5.3)	30 (10.8)	< 0.01
Bleeding disorder	25 (1.3)	11 (3.9)	< 0.01
ASA class $\geq$ 3	423 (22.5)	82 (29.4)	0.01
Anemia (Hgb < 11)	400 (21.3)	103 (36.9)	< 0.01
Preoperative blood transfusion	4 (0.2)	0 (0.0)	0.44
Emergency case	192 (10.2)	33 (11.8)	0.41

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; Hgb, hemoglobin.
Note: Data shown as *n* (%) for categorical variables and as median (interquartile range [IQR]) for age.

($p < 0.20$) were considered as possible confounders. Multivariable regression analysis with stepwise elimination was performed to assess odds of bilateral salpingectomy versus bilateral tubal ligation at the time of cesarean section between Black and non-Black patients while controlling for possible confounders. All covariates with a p-value of < 0.10 were retained in the final model. Thus, hypertension, bleeding disorders, and obesity were retained as covariates in the final model. Statistical analysis was performed using STATA (v.17.0; StataCorp, College State, TX).

Results

Of the 28,147 patients who underwent a cesarean section during the study period, 3,087 (11.0%) underwent a concurrent sterilization procedure. After excluding patients with unknown race, the study groups consisted of 279 (12.9%) Black patients and 1,882 (87.1%) non-Black patients. Demographic information and comparisons between Black and non-Black patients are described in ►Table 1. Black patients were more likely to have hypertension, preoperative anemia, an ASA class $\geq$ 3, and bleeding disorders and less likely to smoke than non-Black patients.

Among our study cohort, 482 (22.3%) patients underwent bilateral salpingectomy at time of cesarean while 1,679 (77.7%) patients underwent concurrent bilateral tubal ligation. When comparing rate of sterilization procedure type among racial groups, Black patients were less likely to undergo bilateral salpingectomy compared with non-Black patients (13.6 vs. 23.6%, $p < 0.01$; ►Table 2). Even when adjusting for hypertension, bleeding disorders, and BMI $\geq$ 30, Black patients remained nearly 50% less likely to undergo a bilateral salpingectomy compared with a bilateral tubal ligation for sterilization (adjusted odds ratio [aOR] = 0.52, 95% confidence interval [CI]: 0.36–0.75).

Discussion

Racial disparities in sterilization have been well documented given the history of coercive sterilization in the United States and continue to exist almost half a century after government regulations to end forced sterilization.[10,11,13] More specifically, previous research has shown that Black persons are significantly more likely to undergo sterilization than White persons, regardless of age, parity, insurance status, education level, and poverty status.[11] While these studies have consistently revealed racial differences in sterilization rates, there is a paucity of data on racial disparities in salpingectomy versus tubal ligation for sterilization following recommendations for opportunistic salpingectomy by national gynecologic societies. This study shows that racial disparity in opportunistic salpingectomy at the time of cesarean section exists, with Black patients being nearly 50% less likely to undergo salpingectomy than non-Black patients, even when accounting for preoperative confounders.

Racial disparities in the use of opportunity salpingectomy may have significant consequences for disparities in ovarian cancer risk between racial groups. In 2022, it is estimated that there will be 19,880 new cases and 12,810 deaths caused by ovarian cancer in the United States.[14] Based on these statistics, ovarian cancer remains the fifth leading cause of cancer-related death in females despite being less common

Table 2 Sterilization procedure performed at time of cesarean delivery by race

Procedure	Non-Black	Black	OR (95% CI)	aOR (95 CI%)
Bilateral tubal ligation	1,438 (76.4)	241 (86.4)	Ref.	Ref.
Bilateral salpingectomy	444 (23.6)	38 (13.6)	0.51 (0.36–0.73)	0.52 (0.36–0.75)

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; Ref., reference.

than all other gynecological cancers.[14] One hypothesis for this high mortality rate is the lack of reliable screening and the overall late stage of disease on diagnosis.[3,7] Overall survival rates from ovarian cancer have marginally increased over the last decade; however, epidemiologic studies have shown that Black patients continue to have a significantly lower overall survival rate when compared with White patients.[15,16]

While there remains no ovarian cancer screening tool to improve early diagnosis, salpingectomy has been found to decrease the lifetime risk of ovarian cancer.[3,7] There is no data on the number of salpingectomies procedures needed to prevent a single case of ovarian cancer. Nevertheless, a large national cohort study in Sweden found a 35 and 28% reduction in ovarian cancer risk in patients who had bilateral salpingectomies and tubal occlusion procedures when compared with unexposed patients, respectively.[7]

The results of this study identify a racial disparity in rate of salpingectomy for sterilization at the time of cesarean delivery despite evidence that salpingectomy decreases lifetime risk of ovarian cancer and is safe to perform at time of delivery. It is imperative to develop strategies to address this disparity in opportunistic salpingectomy, as its persistence may further widen existing racial disparities in ovarian cancer outcomes.

A strength of this study is the use of a validated, national database that includes procedures from over 750 hospitals, which reduces regional or institution bias in sterilization procedures performed. The use of a clinical database rather than an insurance-claims database allows for studying clinical factors, such as self-reported race as well as factors that may confound type of sterilization procedure performed. However, this database study is not without limitations. As race was our primary exposure, patients who did not report a self-identified race were excluded from data analysis. Depending on the true demographic makeup of this cohort, excluding this group has the potential to bias our study in either direction.[17] This study was also limited by the lack of racial diversity within our study cohort, as fewer than 11% of patients identified as a race aside from White or Black. While this study focused specifically on the profound inequities around sterilization for patients of Black race, similar disparities may exist within other patients of color, which should be further explored. This study is also limited by its retrospective study design; there are possible additional confounders to sterilization type, including number of prior cesarean deliveries, intraoperative adhesive disease burden, indication for cesarean delivery, and other potential confounders that could not be assessed using the ASC-NSQIP database. In addition, the ACS-NSQIP database is not stratified by hospital site and therefore analysis cannot be performed to determine whether institutional-level and regional factors contribute to the disparity observed in this study. Finally, the time frame was confined to the 2-year period between 2019 and 2020 in which surgical data on cesarean sections was included within the ACS-NSQIP database. This period is less than a decade since recommendations for opportunistic salpingectomy were published by the Society of Gynecologic Oncologist (2013) and American College of Obstetricians and Gynecologists (2015, reaffirmed in 2020). As such, it is unclear whether published guidance has had an impact on the practice of opportunistic salpingectomy, which was found to be low in both cohorts. Future research should seek to improve on these limitations. For example, an analysis should be repeated in the future to include a larger patient population and to assess for trends in opportunistic salpingectomy among multiple racial groups across a longer study period. To address the potential institutional or regional bias that could contribute to the observed disparity, future studies could also analyze hospital sites stratified as "low-salpingectomy-performing" or "high-salpingectomy-performing" hospitals and whether these disparities persist despite controlling for institutional-level factors.

The etiology of the racial disparity found in this study is unclear but is likely multifactorial and should be further examined in future studies. Prior studies examining causes of disparity in sterilization rates have identified several potential etiologies including physician, patient, and systemic factors. Contributing factors likely include systemic racism and implicit bias among physicians. One study used physician surveys to analyze which patient characteristics contributed to their willingness to perform a sterilization procedure.[18] The study found that physicians were significantly more likely to perform a sterilization procedure if a patient was older, postpartum and parous, Black, married, with a low income, and higher education level.[18] While this survey dates back to the 1980s, a more recent study of health care providers showed that providers were significantly more likely to recommend long-acting reversible contraception to Black patients than they were to White patients, highlighting a bias that providers have regarding a woman's reproductive right.[19]

Further research is needed to both determine the root cause of the racial disparities as well as equitable solutions. For example, future research should examine the content of preoperative counseling for patients undergoing sterilization at time of cesarean delivery. Namely, studies should seek to identify if a disparity exists in preoperative counseling on the benefits of opportunistic salpingectomy. Future studies may also examine both patients' knowledge on benefits of salpingectomy versus tubal ligation as well as their personal beliefs to examine personal values as they impact sterilization mode decisions. Building on these findings, future research should assess whether specific interventions decrease these racial disparities. One potential intervention is the use of standardized patient-centered shared-decision making tools such as decision aids regarding salpingectomy for patients desiring permanent sterilization that are introduced early in patients' prenatal care.[20]

Conclusion

In conclusion, this retrospective cohort study showed a significant racial disparity in sterilization procedure

performed at the time of cesarean delivery. While the cause of this disparity is unclear, further research is indicated to determine the root cause so that equitable solutions can be implemented.

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Conflict of Interest
None declared.

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