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Exploring the impact of income and race on survival for women with advanced ovarian cancer undergoing primary debulking surgery at a high-volume center☆

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HIGHLIGHTS

- Racial disparities in OS in treatment of advanced OC were not observed at this HVC.
- SES disparities in PDS/OS in treatment of advanced OC were not observed at this HVC.
- Greater efforts are needed to centralize care/increase diversity for OC pts at HVCs.

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ABSTRACT

Objective. To evaluate patients with advanced ovarian cancer (OC) undergoing primary debulking surgery (PDS) at a high-volume center (HVC), to determine whether socio-demographic disparities in PDS outcome and overall survival (OS) were present.

Methods. All patients with stages IIIB-IV high-grade OC undergoing PDS at our institution from 1/2001–12/2013 were identified. Patients self-identified race/ethnicity as non-Hispanic White (NHW), non-Hispanic Black (NHB), Asian (A), or Hispanic (H). Income level for the entire cohort was estimated using the census-reported income level for each patient's zip code as a proxy for SES. Main outcome measures were PDS outcome and median OS. Cox proportional hazards model was used to examine differences in OS by racial/ethnic and income category, controlling for selected clinical factors.

Results. 963 patients were identified for analysis: 855 NHW; 43 A, 34H, 28 NHB, and 3 unknown. PDS outcome was not significantly different among NHB and H as compared to NHW. Compared to NHW, Asians were more likely to have >1 cm residual (AOR 2.32, 95%CI 1.1–4.9, $p = 0.03$). Median income for the entire cohort was $85,814 (range $10,926–$231,667). After adjusting for significant prognostic factors, there were no significant differences in PDS outcome between income groups ($p = 0.7281$). Median OS was 55.1mos (95%CI 51.8–58.5) with no significant differences in OS between the income ($p = 0.628$) or racial/ethnic ($p = 0.615$) groups.

Conclusion. Statistically significant socio-demographic disparities in PDS and survival outcomes were not observed among women with advanced OC treated at this HVC. Increased efforts are needed to centralize care to and increase the diversity of pts treated at HVCs.

1. Introduction

Ovarian cancer is a complex heterogenous disease affecting a diverse group of women. Each year in the United States over 22,000 women are diagnosed with ovarian cancer [1]. Most of these patients present at advanced stages and eventually succumb to their disease [2]. Appropriate management requires combined surgical and systemic medical

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treatment, ideally provided by a skilled team of clinicians specializing in gynecologic oncology. National and international studies have demonstrated that clinicians who treat a high volume (≥20 cases per year) of ovarian cancer patients provide superior healthcare quality and survival outcomes [3–8]. This is likely due to their increased experience and adherence to national guidelines [9,10].

There are very clear disparities in the distribution of and access to high-volume providers and higher-volume or specialized hospitals. Some researchers suggest that 65–80% of centers handle <10 cases of advanced ovarian cancer per year [5,11]. Patients treated in low-volume centers are more likely to be of lower socioeconomic status (SES), to belong to racial/ethnic minority groups, and to have Medicare or Medicaid insurance; and they are more likely to present with Stage IV disease [5,12]. In fact, SES has been identified as the most consistent predictor of where a patient receives her care [13]. Population-based studies report that women with lower household incomes are less likely to be treated at a high-volume center (HVC), and are less likely to receive guideline-adherent care. Thus, these patients are also less likely to receive optimal surgical management, and they have lower rates of overall survival (OS) [14–16].

It has been hypothesized that equitable access to HVCs and high-volume providers would mitigate socioeconomic and racial/ethnic disparities in outcome for women with ovarian cancer [17,18]. In the past decade there have been numerous studies demonstrating the value of high-volume cancer care, not just in ovarian cancer, but also in other diseases that require a complex treatment strategy such as lung, pancreatic, and colorectal cancers [19–22]. The objective of this study was to evaluate patients with advanced ovarian cancer who underwent primary debulking surgery (PDS) at an HVC, to determine whether socioeconomic and racial/ethnic disparities persist in surgical outcome and survival.

2. Methods

2.1. Study population

This is a retrospective single-institution study of a cohort of patients with International Federation of Gynecology and Obstetrics (FIGO) stages IIIB-to-IV epithelial ovarian, fallopian tube, or peritoneal cancer. Patients were identified using an institutional surgical database. The study population consisted of women ≥18 years of age, diagnosed with primary invasive advanced-stage epithelial ovarian cancer, who underwent PDS from January 1, 2001 to December 31, 2013. After obtaining IRB exemption, we collected the demographic, clinical, pathologic, and outcome data for all women in the study cohort. Patients who received neoadjuvant chemotherapy were excluded. Patients were also excluded if they had non-epithelial or borderline tumors, or non-ovarian pathology.

2.2. Data analysis

Data on patient demographics, tumor characteristics, operative findings, outcomes of PDS, progression-free survival (PFS), and OS were collected. Patients self-identified as Non-Hispanic White (NHW), Non-Hispanic Black (NHB), Asian (A), or Hispanic (H). Patients were excluded from the racial portion of the analysis if their race/ethnicity was not documented anywhere in the medical record. The median household income was determined by using the census-reported income level of each patient's zip code. The median household income per zip code was based on the 2010–2014 American Community Survey (ACS) 5-year estimates, and was used as a proxy for SES [23]. Patients were categorized by census-based income categories, which we refer to as SES groups. The median household incomes were as follows: Group 1, <$50,000; Group 2, $50–99,999; Group 3, $100–149,999; and Group 4, ≥$150,000. The main outcome measures were PDS outcome (optimal versus sub-optimal) and median OS. PDS outcome was determined by the amount of residual disease, as recorded on the operative report. Optimal outcome was defined as residual disease ≤1 cm. Suboptimal outcome was defined as residual disease >1 cm. OS was defined as time elapsed (in months) from the date of PDS to the date of last follow-up, or death. Follow-up data were collected until August 2016. The Cox proportional hazards model was used to examine differences in OS by income category, when controlling for selected clinical factors. The Kaplan-Meier method was used to generate survival curves [24].

3. Results

3.1. Patient and surgery characteristics

Nine hundred and sixty patients meeting the inclusion criteria for the racial portion of the analysis were identified. Nine hundred and sixty-three patients met the inclusion criteria for the income based portion of the analysis. 855 (89%) identified as non-Hispanic White women; 43 (4%) as Asian (A); 34 (4%) as Hispanic (H), and 28 (3%) as non-Hispanic Black (NHB). The 3 patients that had an unknown race were excluded from the racial analysis cohort. The median age at time of diagnosis was 62 years (range 19–95) for both cohorts. Asian women were significantly younger than other racial/ethnic groups with a median age of 53 ($p < 0.0001$). Twelve percent had a known BRCA 1/2 mutation. Eighty-nine percent had high-grade serous histologies. The majority had carcinomatosis (81%) and/or bulky upper abdominal disease (60%) at the time of PDS. There were statistically significant differences between the racial groups in BRCA status, BMI, and income. These are detailed in Table 1. There were statistically significant differences between the income groups in ASA level and race/ethnicity, detailed in Table 2.

3.2. Examining race

At time of PDS, 82% of patients in the cohort were left with 1 cm or less residual disease, resulting in an optimal debulking outcome. After controlling for age, BMI, income, BRCA status, ASA status, tumor grade, presence of carcinomatosis and upper abdominal disease, PDS outcome was not significantly different among NHB and H as compared to NHW. As compared to NHW, Asians were more likely to have >1 cm residual (adjusted OR 2.32, 95%CI 1.1–4.9, $p = 0.03$). Median OS was 55.1 mos (95%CI: 51.8–58.5) for this cohort. On both univariate and multivariate analysis, there was no significant difference in OS between racial or ethnic groups (adjusted $p = 0.615$), detailed in Table 3. See Fig. 1 for a Kaplan–Meier OS plot.

3.3. Examining income

The median income for the entire cohort was $85,814 (range $10,926–$231,667). Fig. 2 shows the frequency distribution of median household incomes based on the patients' zip codes. Patient distribution across income groups was not symmetrical; a majority was categorized as Group 2, ($50,000–$99,999), and few patients were from zip codes in the lowest (Group 1) or highest (Group 4) income groups. There were 129 patients (13.4%) from zip codes with median income in Group 1, 496 (51.1%) in Group 2, 283 (29.4%) in Group 3, and 55 (5.7%) in Group 4. There was no significant difference in age, stage, grade, or tumor burden between income groups. The data was also analyzed using median income quartiles, which demonstrated no difference.

The median OS for this cohort was also 55.1 months (95% CI, 51.8–58.5). On univariate analysis, there was no significant difference in OS with respect to SES group. After controlling for age, race, BMI, BRCA status, ASA status, tumor grade, presence of carcinomatosis or upper abdominal disease, and PDS outcome, there was no significant difference in OS between the four income groups (adjusted $p = 0.603$) (detailed in Table 3). A Kaplan-Meier OS plot is shown in Fig. 3.