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Gynecologic cancer mortality in Trinidad and Tobago and comparisons of mortality-to-incidence rate ratios across global regions

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Abstract

Purpose—To examine the factors associated with gynecologic cancer mortality risks, to estimate the mortality-to-incidence rate ratios (MIR) in Trinidad and Tobago (TT), and to compare the MIRs to those of select countries.

Methods—Data on 3,915 incident gynecologic cancers reported to the National Cancer Registry of TT from 1 January 1995 to 31 December 2009 were analyzed using proportional hazards models to determine factors associated with mortality. MIRs for cervical, endometrial, and ovarian cancers were calculated using cancer registry data (TT), GLOBOCAN 2012 incidence data, and WHO Mortality Database 2012 data (WHO regions and select countries).

Results—Among the 3,915 incident gynecologic cancers diagnosed in TT during the study period, 1,795 (45.8%) were cervical, 1,259 (32.2%) were endometrial, and 861 (22.0%) were ovarian cancers. Older age, African ancestry, geographic residence, tumor stage, and treatment non-receipt were associated with increased gynecologic cancer mortality in TT. Compared to GLOBOCAN 2012 data, TT MIR estimates for cervical (0.49 vs. 0.53), endometrial (0.61 vs.

Compliance with Ethical Standards

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0.65), and ovarian cancers (0.32 vs. 0.48) were elevated. While the Caribbean region had intermediate gynecologic cancer MIRs, MIRs in TT were among the highest of the countries examined in the Caribbean region.

Conclusions—Given its status as a high-income economy, the relatively high gynecologic cancer MIRs observed in TT are striking. These findings highlight the urgent need for improved cancer surveillance, screening, and treatment for these (and other) cancers in this Caribbean nation.

Keywords

Caribbean; Trinidad and Tobago; Cervical cancer; Ovarian cancer; Endometrial cancer; Mortality; Mortality-to-incidence rate ratio

Introduction

Female gynecologic cancers—namely cancers of the cervix uteri, corpus uteri, and ovary—are leading causes of morbidity and mortality globally. Worldwide, cervical cancer is the 4th most commonly diagnosed cancer among women, with endometrial and ovarian cancer ranking 5th and 7th, respectively [1]. Countries in developing regions and regions with larger populations of African descent (e.g., Africa, Latin America, and the Caribbean) have the highest incidence of cervical cancer, while more developed countries and those with smaller populations of African descent have lower cervical cancer incidence, with age-standardized incidence rates as low as 2 per 100,000 in parts of the Middle East. Unlike cervical cancer, the age-standardized incidence and mortality rates of endometrial and ovarian cancers are highest in more developed countries and lowest in developing countries [1, 2].

A recent study examining the top ten causes of cancer death (5-year cumulative proportions) among women in 21 Caribbean countries, found that cervical (11%), endometrial (6.4%), and ovarian (5.2%) cancers were ranked 2nd, 4th, and 6th, respectively [3]. In terms of cervical cancer mortality, rates were highest in St. Vincent and the Grenadines (15.5 per 100,000), Belize (12.5 per 100,000), and St. Kitts and Nevis (12.3 per 100,000), while Trinidad and Tobago (TT) had the 7th highest rate (10.8 per 100,000). Strikingly, cervical cancer mortality rates in the United States (US), US Virgin Islands, and Puerto Rico, which have well-established cervical cancer screening programs as part of the Center for Disease Control and Prevention's National Breast and Cervical Cancer Early Detection Program, were approximately seven times lower than the rate for TT [3]. Our recent analysis of TT cancer surveillance data (unpublished data) showed that the cervical cancer mortality rate in TT was 9.7 per 100,000. Few studies have examined the risk factors for cervical cancer mortality in Caribbean populations and have suggested that some of the most important risk factors include: older age at diagnosis [4], tumor clinicopathologic features that are indicative of poor prognosis [4], geographical and sociodemographic factors [4, 5], reduced access to effective treatment [3, 6, 7], reduced access to human papillomavirus (HPV) vaccination [3–5, 8], and reduced access to cervical cancer screening and early detection [3–5, 7–9]. In developing countries, as cervical cancer screening rates have increased over the past few decades, cervical cancer incidence rates have significantly declined, but the decline

has been modest throughout the Caribbean. Of note, TT is one of the few countries in the region that has not reported a decline in cervical cancer mortality [10].

Endometrial cancer affects mostly postmenopausal women and has been associated with high body mass index (BMI) and reproductive factors, including nulliparity and early age at first birth. With an endometrial cancer mortality rate of 7.6 per 100,000, TT has the third highest rate in the Caribbean, behind Grenada (9.5 per 100,000) and St. Vincent and the Grenadines (8 per 100,000) [3]. These rates are 2–3 times higher than those in the US, US Virgin Islands, and Puerto Rico [3]. Two recent studies of Caribbean-born women in the US (specifically Jamaican- and Haitian-born women [7]) and women in Puerto Rico [11] showed that endometrial cancer mortality was significantly associated with black race [7, 11] and Puerto Rican ethnicity [11]. Additionally, findings from the Pinheiro et al. study [7] suggested that endometrial cancer mortality was also possibly associated with length of residence in the US and the extent of assimilation into US society and culture. To our knowledge, no other studies have reported on risk factors for endometrial cancer mortality in Caribbean populations.

St. Kitts and Nevis (10.6 per 100,000), TT (7.4 per 100,000), and Antigua and Barbuda (6.5 per 100,000), had the highest ovarian cancer mortality rates [3]. In contrast, the rates in the US, US Virgin Islands, and Puerto Rico were 2–3 times lower than the TT rate. To our knowledge, no studies have examined the risk factors for ovarian cancer mortality in Caribbean populations.

Despite the high rates of gynecologic cancers in TT, the epidemiological landscape of gynecologic cancers has not been fully described. The economy, population demographics, and healthcare system, including an established cancer registry, present a unique opportunity to analyze gynecologic cancer rates in TT, which is classified as a high-income yet developing country with universal access to healthcare [12]. In this study, we describe the factors associated with gynecologic cancer mortality risks in TT and compare mortality-to-incidence rate ratios (MIRs) for gynecologic cancers diagnosed in TT to those across regions and select countries around the world, using the most up-to-date data available from the National Cancer Registry of TT, and data from the GLOBOCAN 2012 Incidence and WHO Mortality Database 2012 data files.

Materials and methods

We obtained TT incidence and mortality data for a 15-year period (1 January 1995–31 December 2009, the time period for which the most complete data were available) from the National Cancer Registry of TT. The cancer registry was established in 1994 by the Trinidad and Tobago Cancer Society, using cancer registry frameworks and policies set by the International Agency for Research on Cancer (IARC) [13, 14]. This population-based cancer registry is the most reliable source of cancer surveillance data currently available for the population of TT. Cancer surveillance records from public and private biomedical institutions are reported to the registry. Public sector reporting biomedical institutions include the following: Port of Spain General Hospital, Caura Hospital, National Radiotherapy Center, Sangre Grande Hospital, Tobago Regional Hospital, Mount Hope

Women's Hospital, Eric Williams Medical Sciences Complex, San Fernando Hospital, and Point Fortin Area Hospital. Private sector reporting biomedical institutions include the following: Augustus Long Hospital, Petrotrin-Santa Flora Medical Centre, Community Hospital of the Seventh-Day Adventists, Brian Lara Treatment Centre, and West-shore Private Hospital.

We restricted our analysis to cancers of the cervix uteri (cervical cancer henceforth), corpus uteri (endometrial cancer henceforth), and ovary (ovarian cancer henceforth) as defined by the following International Classification of Disease for Oncology, Third Edition, 1st revision (ICD-O-3), morphology codes: C53, C54, and C56 [15]. We extracted all 3,974 records of the cancers classified by these ICD-O-3 codes, then removed records of the cases diagnosed among women age <20 years ($n = 16$), records that had "other" listed as the ethnic ancestry, and records that were missing geographic data (Regional Health Authority [RHA]) ($n = 43$), to establish the final analytic sample (Fig. 1).

Statistical analysis

Sociodemographic (age at diagnosis, ethnic ancestry, marital status, and geographic residence) and clinical characteristics (mode of detection, tumor stage, tumor grade, treatment received, and vital status) were described, overall and by gynecologic cancer site, using frequencies and proportions. Previously described imputation methodologies were used to ascribe ethnic ancestry to the gynecologic cancer cases with unreported ancestry [12]. Multi-variable-adjusted logistic regression models (adjusting for age at diagnosis, ethnic ancestry, geographic residence, tumor stage, and receipt of any treatment) were used to estimate mortality risks by gynecologic cancer site. Given that the cancer registry does not collect data on reproductive or other behavioral risk factors, we were unable to account for them in our analysis.

The methods used to calculate the age-standardized incidence and mortality rates, that were included in the calculations of the MIRs, were previously described [12]. Briefly, age-standardized incidence and mortality rates (per 100,000) were standardized to the Segi World Standard 1960 population [16] to allow for comparisons with IARC datasets. The Central Statistical Office of Trinidad and Tobago provided population data from the TT 2000 and 2010 census, stratified by ethnic ancestry and geography. MIRs for all three gynecologic cancers were calculated using the analytic dataset from the National Cancer Registry of TT (1995–2009; described above), while MIRs for all WHO regions and select countries were calculated using incidence data from the GLOBO-CAN 2012 incidence data file and mortality data from the WHO 2012 Mortality Database [17, 18]. The sources and quality of these data have been previously described [1, 19]. MIRs have a maximal value of 1.00, which is an indicator of poor survival. MIRs for each WHO region, the two countries in each region with the minimum and maximum MIR values, and all countries with ethnic/ancestral distributions similar to the TT population, were included in our analyses. This study received approval from the Institutional Review Boards of all participating institutions.

Results

Among the 3,915 incident gynecologic cancers diagnosed in TT between 1 January 1995 and 31 December 2009, 1,795 (45.8%) were cervical, 1,259 (32.2%) were endometrial, and 861 (22.0%) were ovarian cancers. Characteristics of the patient sample, overall and by gynecologic site, are presented in Table 1. Among all gynecologic cancer cases, the average age at diagnosis was 58.5 ± 14.9 years, with more than half of women being diagnosed at 60 years. The average age at diagnosis was slightly younger for cervical cancer cases (54.8 ± 15.3 years) compared to ovarian and endometrial cancer cases (58.3 ± 15.4 and 63.9 ± 12.1 years, respectively). Larger proportions of gynecologic cancer cases were diagnosed among women of African ancestry (53.9%), those who were married or living as married (37.7%), and those who resided in the Southwest RHA catchment area (36.0%). It should be noted that the SWRHA catchment area is the most populous area of TT. In terms of clinical characteristics, less than half of all gynecologic cancer cases was reported as being clinically detected (45.1%), approximately one-third was diagnosed at localized stage (36.4%), and one-fifth was diagnosed at regional stage (20.5%), more than half had unrecorded tumor grade (60.6%), and relatively small proportions of patients received surgical treatment (46.9%), chemotherapy (23.6%), and radiation treatment (30.8%). Approximately half of all gynecologic cancer cases died during the study period (52.3%). Similar sociodemographic characteristics were observed among each of the three site-specific cancers. In terms of clinical characteristics, a larger proportion of endometrial cancers, than cervical and ovarian cancers, was diagnosed at localized stage (48.7 vs. 36.5% and 18.2%, respectively) and as grade I (16.8 vs. 5.2% and 5.0%, respectively). Differences were also observed for cancer treatment received by gynecologic site and a larger proportion of ovarian cancer cases died during the study period compared to cervical and endometrial cancer cases (64.8 vs. 49.9% and 47.3%, respectively).

Mortality risks by gynecologic cancer site, adjusted for sociodemographic characteristics, tumor stage, and cancer treatment receipt (any vs. no treatment) are shown in Table 2. Among cervical cancer cases, risk of death was elevated among women >60 years (HR 1.35, 95% CI 1.14–1.61), women of African ancestry (HR 1.24, 1.06–1.44), and residents of the Southwest RHA catchment area (HR 1.39, 1.16–1.66). There were also increased risk of death associated with regional stage (HR 1.81, 95% CI 1.50–2.19), distant stage (HR 3.05, 95% CI 2.36–3.94), and unknown stage (HR 3.48, 95% CI 2.89–4.19), compared to localized stage. Non-receipt of cancer treatment was associated with threefold mortality risk compared to receipt of any treatment among cervical cancer cases (HR 3.00, 95% CI 2.60–3.48). Similar associations were observed among endometrial and ovarian cancer cases. Mortality risk was elevated among endometrial cancer cases who were diagnosed at >60 years (HR 1.86, 95% CI 1.20–2.91), were of African ancestry (HR 1.33, 95% CI 1.09–1.63), resided in the Southwest RHA catchment area (HR 1.35, 95% CI 1.08–1.68), had later stage or unknown stage at diagnosis (regional, HR 1.67, 95% CI 1.28–2.18; distant, HR 2.78, 95% CI 2.15–3.59; and unknown stage, HR 3.57, 95% CI 2.82–4.52, compared to localized stage), and who did not receive any cancer treatment (HR 4.05, 95% CI 3.32–4.96). Mortality risk among ovarian cancer cases was elevated among women diagnosed at age 45–60 years (HR 1.35, 95% CI 1.04–1.76) and >60 years (HR 1.67, 95% CI 1.30–2.15), and

among women of African ancestry (HR 1.32, 95% CI 1.08–1.61) and mixed ancestry (HR 1.62, 95% CI 1.62, 95% CI 1.21–2.17). Among ovarian cancer cases, compared to residents of the catchment area of the Northwest RHA, those that resided in the Southwest RHA had 35% higher risk of death (HR 1.35, 95% CI 1.08–1.68), while residents of the Tobago RHA had 40% lower risk of death (HR 0.60, 95% CI 0.40–0.91). Ovarian cancers cases diagnosed at later stage or with unknown stage (regional, HR 1.80, 95% CI 1.21–2.66; distant, HR 1.91, 95% CI 1.36–2.68; and unknown, HR 5.25, 95% CI 3.69–7.47, compared to localized stage), as well as those who did not received any cancer treatment, had elevated risk of death (HR 5.09, 95% CI 4.11–6.30).

Figures 2, 3, and 4 show MIRs in WHO regions, select countries, and TT RHAs, highlighting cervical (Fig. 2), endometrial (Fig. 3), and ovarian cancers (Fig. 4). By global region, Africa had the highest cervical cancer MIR (0.62) and Australia and New Zealand had the lowest (0.28) (Fig. 2). The Caribbean region had an intermediate MIR for cervical cancer (0.40), which was only slightly higher than that of North America (0.34). However, the cervical cancer MIR for TT (0.53, as calculated using the analytic dataset of gynecologic cancers described herein) was among the highest by country. The only other Caribbean country with a cervical cancer MIR higher than that of TT was Haiti (0.59). By TT RHA, little geographic variation in the MIRs for cervical cancer was observed (range 0.49–0.57), although it should be noted that the MIR in the Southwest RHA catchment area, the highest cervical cancer MIR in TT (0.57), was similar to the estimate for Haiti.

Figure 3 shows that the global MIRs for endometrial cancer ranged from 0.57 (Europe) to 0.80 (Africa). In terms of country-specific estimates, again TT was among the countries with the highest MIRs (0.65) and represented the highest endometrial cancer MIR among the Caribbean countries examined. Notably, the MIR for this cancer site varied very little by geography in TT (ranging from 0.63 to 0.70), with the Tobago RHA having a relatively high endometrial cancer MIR of 0.70, which was higher than all Caribbean countries.

From Fig. 4, it was clear that the MIRs for ovarian cancer, compared to the MIRs for cervical cancer and endometrial cancer, were substantially lower globally, ranging from 0.12 (North America) to 0.38 (Africa), although for TT it was 0.48. This estimate was similar to the GLOBOCAN estimate for Haiti (0.44), but the MIRs for ovarian cancer in TT and Haiti were substantially higher than many other Caribbean nations (e.g., Bahamas, 0.19; Barbados, 0.17; and Puerto Rico, 0.10). The ovarian cancer MIRs across geographic regions of TT were a bit more variable than the other two cancer sites (ranging from 0.43 to 0.64).

Discussion

Our recent analysis of overall cancer rates and trends in TT (unpublished data) showed that there is a high burden of gynecologic cancers among women in terms of age-standardized incidence and mortality. In TT, between 1995 and 2009, cervical cancer ranked 2nd for both cancer incidence and mortality (average annual age-standardized rates, 17.6 per 100,000 and 9.2 per 100,000, respectively); endometrial cancer ranked 3rd for cancer incidence, and 4th for cancer mortality (average annual age-standardized rates 16.1 per 100,000 and 7.1 per 100,000, respectively), and ovarian cancer ranked 5th for both incidence and mortality

(average annual age-standardized rates 8.5 per 100,000 and 6.1 per 100,000, respectively) (unpublished data). While there was a slight decrease in the cervical cancer incidence rate observed during this period, the cervical cancer mortality rate steadily increased. The incidence and mortality rates of endometrial and ovarian cancers also steadily increased. These findings suggest that improvement in cancer surveillance occurred in more recent years or possibly improvement in the health services capacity (namely cancer diagnosis). Furthermore, upon examination of the clinical characteristics of gynecologic cancers, the observation that approximately one-third of cervical and endometrial cancers (36.4 and 36.5%, respectively) were diagnosed at localized stage, a similar proportion of ovarian cancers were diagnosed at distant stage (36.1%), and approximately 28% of all gynecologic cancers had an unknown stage at diagnosis, there is clearly a need for improvement in early diagnosis, prioritizing prevention and screening, for cervical cancer, especially, given that it is highly preventable through HPV vaccination, earlier detection, and timely treatment of pre-cancerous cervical lesions.

Although cervical cancer screening services are available and provided at no cost to all nationals of TT, the only data currently available have estimated that Papanicolaou (Pap and/or cytological testing) is utilized for cervical cancer screening at substantially low rates (18.4–35.4%) [8, 20, 21], and almost 50% of those sampled reported having never been screened [8]. It is also worth noting that currently in TT, although annual screening is suggested for all sexually active women (no specified age at first screen), there is no specific national cervical cancer screening program in place [20]. Furthermore, HPV testing, which is recommended for cervical cancer screening since it is more effective than Pap testing alone, is not available in the public healthcare system for cervical cancer screening in TT [20]. Nonetheless, data from TT have shown a prevalence of high-risk HPV infection among a sample of sexually active women (ages 18–65 years) to be approximately 35–60% [22, 23], and among cervical cancer specimens the prevalence of HPV 16 and 18 was approximately 84% [24]. As persistent HPV infection is a necessary cause of cervical cancer [25], it is urgent that future cervical cancer screening programs in TT include HPV testing [26]. Additionally, assuring higher screening coverage and subsequent follow-up and treatment for women at increased risk of developing cervical cancer, particularly among women aged 30–49 years, along with assuring high coverage of HPV vaccination for girls aged 9–13 years of age [27] is also essential.

While screening is possible for cervical cancer, access to effective treatment can also serve to improve the cure rates for gynecologic cancers in TT. Our findings indicate the need for patient risk stratification and targeted outreach to identify women at higher risk of developing a gynecologic cancer, as well as screening for cervical cancer specifically. In addition, given that some of these cancers are driven by reproductive factors (for cervical cancer—high parity, increasing number of sexual partners, and for ovarian cancer—nulliparity, early menarche, late menopause, and increasing age), high BMI (for endometrial and ovarian cancer), and a high-fat diet, it is crucial that detailed patient histories are taken, even at routine annual exams to identify those at increased risk. One example is the relationship between family history of endometrial cancer, hereditary non-polyposis colon cancer (HNPCC), and increased risk for ovarian and endometrial cancers. A family history of endometrial or ovarian cancer puts a woman at a twofold risk of developing the same

cancer. Additionally, women who have a family history of HNPCC are at increased risk for carrying a HNPCC genetic insult which puts them at a tenfold increased risk of endometrial or ovarian cancer [28, 29]. Strikingly, more than 50% of women in Lynch syndrome families will present with a gynecologic cancer as their first malignancy [30]. While there are some preliminary reports that screening can improve survival rates, the impact of screening on mortality from ovarian and endometrial cancers is still an area of active research [31]. Additionally, well-established germline mutations in breast cancer susceptibility genes such as BRCA1 and BRCA2, which have founder effects leading to increased risk for breast cancer incidence and mortality [32–38], are likely associated with the high rates of breast cancer incidence and mortality rates [12] and high rates of ovarian cancer mortality in TT.

The identification and elucidation of genetic pathways of cancer susceptibility genes have led to the development of gene-specific genome forward treatment algorithms. The benefit of genetic testing for endometrial and cervical cancers is minimal since they are not driven by known inherited mutations. However, the situation is different for ovarian cancer. In most developed countries, standard of care guidelines suggest that women who are diagnosed with ovarian cancer should receive genetic counseling and offered genetic testing, regardless of their family history of cancer [39, 40]. This is due to the recent understanding that germline BRCA1 and BRCA2 mutations account for approximately 15% of invasive ovarian carcinomas and that approximately one-third of women with hereditary ovarian cancer lack close relatives with cancer [41–43]. In addition, there are new treatment modalities involving PARP inhibitors for ovarian cancer in the context of BRCA1 and BRCA2 genomic insults [44]. In TT, this option is not currently available despite a recent study which reported that 10.4% of those tested had mutations in BRCA1 and BRCA2 [45]. To reduce the ovarian cancer burden, TT should consider increasing the capacity for genetic sequencing and counseling through the implementation of evidence-based strategies [46]. Given that BRCA1 and BRCA2 mutations are also implicated in breast cancer, increasing the capacity for genetic sequencing and counseling would be prudent to reduce the burden of both ovarian cancer, and breast cancer as well, in TT.

Although there are no ongoing screening efforts for gynecologic cancers in TT, collection of complete and accurate epidemiologic data at the population-level (e.g., risk factors, incidence and mortality estimates), and complete and detailed clinical-level data, especially in an electronic health records system, are needed for additional analysis, increased knowledge and ultimately for promotion of targeted interventions for gynecologic cancer prevention to address the high mortality rates. The predicted global burden of cancer is projected to increase to more than 20 million incident cancer cases per year (compared to an estimated 14.1 million incident cases in 2012 [47]) and more than 13 million cancer deaths (compared to 8.2 million deaths in 2012 [47]) by 2030 [48]. And it is expected that less developed regions of the world, including in the Caribbean, will bear a large proportion of the burden, which accounted for 57 and 65% of incident cancer cases and cancer deaths, respectively, in 2012 [47]. Among Caribbean countries specifically, incident cancer cases are projected to increase to almost 137,000 (up from approximately 91,000 in 2012) and cancer deaths are projected to increase to more than 83,000 (up from approximately 53,000 in 2012) by year 2030 [49].

This study has shown that in TT, the burden of gynecologic cancers is quite high and several factors, including older age, African ancestry, geographic residence, tumor stage at diagnosis and treatment non-receipt, and low screening rates (for the case of cervical cancer), are important predictors of gynecologic cancer mortality. While TT has been designated as a high-income economy by the World Bank and has a universal healthcare system for its nationals, MIRs for cervical, endometrial, and ovarian cancers are similar to those of low- and middle-income nations rather than other high-income nations. This is likely related to the capacity of the healthcare system in TT for cancer screening, diagnosis, and treatment. Furthermore, our analyses of the most up-to-date, currently available cancer surveillance data from the National Cancer Registry of TT demonstrated that IARC's GLOBOCAN 2012 estimates of incidence and mortality rates, as well as MIRs for cervical, endometrial, and ovarian have been underestimated. It is important to note, however, that our study data are different than that used by IARC (which are from estimated national mortality data for 2012 and include modeled survival and partitioned data). We used age-specific incidence data from the TT National Cancer Registry for the period 1995–2009, and mortality rates for the period of 2000–2008, projected to 2012. It is conceivable that MIRs for TT and other Caribbean nations are much higher still given that a recent study in Grenada [9] examining cervical cancer, reported a mortality rate of 16.7 per 100,000, compared to 12.0 per 100,000 reported elsewhere [3]. Findings from the present study suggest that in TT, mortality from gynecologic cancers is relatively high, indicating that improved effectiveness of the cancer care continuum for these cancers (and likely other sites as well) is needed in this Caribbean nation. Additionally, it is clear that strengthening of the cancer registry is essential for improved cancer surveillance, which will improve data quality to support future epidemiologic research, an integral part of the estimation of the cancer burden and improving care across the cancer care continuum. It is our hope that findings from this study will contribute to the implementation of future policies for a national program for cervical cancer screening and timely follow-up, as well as national programs for gynecologic cancer prevention and control, particularly among the most vulnerable, at-risk populations in TT.

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Fig. 1.

The final analytic sample included 3,915 incident cases of gynecologic cancer cases diagnosed among women age ≥ 20 years ($N = 3,915$: cancer of the cervix uteri, 1,795; cancer of the corpus uteri, 1,259; cancer of the ovary, 861) reported to the National Cancer Registry of Trinidad and Tobago from 1 January 1995 through 31 December 2009

Fig. 2.

Cervix uteri cancer mortality-to-incidence rate ratios (MIRs) across global regions and select countries, including Trinidad and Tobago. All MIRs were calculated using cancer mortality and incidence rates estimated by the World Health Organization, International Agency for Research on Cancer, and GLOBOCAN 2012. The TT* cervix uteri cancer MIR (0.53) was calculated using data from the Trinidad and Tobago Cancer Registry analytic dataset of gynecologic cancers described herein (1995–2009). Inset: Cervix uteri cancer MIRs by TT Regional Health Authorities, 1995–2009. *NWRHA* North West Regional Health Authority;

NCRHA North Central Regional Health Authority; *SWRHA* South West Regional Health Authority; *ERHA* Eastern Regional Health Authority; *TRHA* Tobago Regional Health Authority

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Fig. 3.

Corpus uteri cancer mortality-to-incidence rate ratios (MIRs) across global regions and select countries, including Trinidad and Tobago. All MIRs were calculated using cancer mortality and incidence rates estimated by the World Health Organization, International Agency for Research on Cancer, and GLOBOCAN 2012. The TT* corpus uteri MIR (0.48) was calculated using data from the Trinidad and Tobago Cancer Registry analytic dataset of gynecologic cancers described herein (1995–2009). Inset: Corpus uteri cancer MIRs by TT Regional Health Authorities, 1995–2009. *NWRHA* North West Regional Health Authority,

NCRHA North Central Regional Health Authority, *SWRHA* South West Regional Health Authority, *ERHA* Eastern Regional Health Authority, *TRHA* Tobago Regional Health Authority

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Fig. 4.

Ovarian cancer mortality-to-incidence rate ratios (MIRs) across global regions and select countries, including Trinidad and Tobago. All MIRs were calculated using cancer mortality and incidence rates estimated by the World Health Organization, International Agency for Research on Cancer, and GLOBOCAN 2012. The TT* ovarian cancer MIR (0.65) was calculated using data from the Trinidad and Tobago Cancer Registry analytic dataset of gynecologic cancers described herein (1995–2009). Inset: Ovarian cancer MIRs by TT Regional Health Authorities, 1995–2009. *NWRHA* North West Regional Health Authority;

NCRHA North Central Regional Health Authority; *SWRHA* South West Regional Health Authority; *ERHA* Eastern Regional Health Authority; *TRHA* Tobago Regional Health Authority

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Table 1

Descriptive statistics of adult gynecologic cancer cases (age ≥ 20 years) diagnosed in Trinidad and Tobago, 1995–2009, *N* = 3,915

	Overall N = 3,915 n (%)	Cervix Uteri, n = 1,795 n (%)	Corpus Uteri, n = 1,259 n (%)	Ovary, n = 861 n (%)
Sociodemographic characteristics				
Age at diagnosis (years), mean ± SD	58.5 ± 14.9	54.8 ± 15.3	63.9 ± 12.1	58.3 ± 15.4
Age at diagnosis (years)				
<45	780 (19.9)	530 (29.5)	78 (6.2)	172 (20.0)
45–60	1,295 (33.1)	612 (34.1)	381 (30.3)	302 (35.1)
>60	1,840 (47.0)	653 (36.4)	800 (63.5)	387 (44.9)
Ethnic ancestry				
Indian	1,334 (34.1)	578 (32.2)	444 (35.3)	312 (36.2)
African	2,112 (53.9)	978 (54.5)	677 (53.8)	457 (53.1)
Mixed	469 (12.0)	239 (13.3)	138 (11.0)	92 (10.7)
Marital status				
Married, living as married	1,475 (37.7)	703 (39.2)	473 (37.6)	299 (34.7)
Single, never married	688 (17.6)	350 (19.5)	189 (15.0)	149 (17.3)
Separated, divorced, widowed	810 (20.7)	372 (20.7)	309 (24.5)	129 (15.0)
Unreported	941 (24.0)	369 (20.6)	288 (22.9)	284 (33.0)
Geographic residence (RHA)				
Northwest (NWRHA)	1,089 (27.8)	506 (28.2)	352 (28.0)	231 (26.8)
North Central (NCRHA)	986 (25.2)	443 (24.7)	329 (26.1)	214 (24.9)
Southwest (SWRHA)	1,410 (36.0)	636 (35.4)	452 (35.9)	322 (37.4)
Eastern (ERHA)	271 (6.9)	143 (8.0)	76 (6.0)	52 (6.0)
Tobago (TRHA)	159 (4.1)	67 (3.7)	50 (4.0)	42 (4.9)
Clinical characteristics				
Initial mode of detection				
Clinical	1,766 (45.1)	797 (44.4)	612 (48.6)	357 (41.5)
Incidental or other	22 (0.6)	7 (0.4)	10 (0.8)	5 (0.6)
Unreported	2,127 (54.3)	991 (55.2)	637 (50.6)	499 (58.0)
Stage				
Localized	1,425 (36.4)	655 (36.5)	613 (48.7)	157 (18.2)
Regional	802 (20.5)	497 (27.7)	187 (14.8)	118 (13.7)
Distant	597 (15.2)	133 (7.4)	153 (12.2)	311 (36.1)
Unreported	1,091 (27.9)	510 (28.4)	306 (24.3)	275 (31.9)
Grade				
I—Well differentiated	247 (8.9)	93 (5.2)	211 (16.8)	43 (5.0)
II—Moderately differentiated	567 (14.5)	337 (18.8)	180 (14.3)	50 (5.8)
III—Poorly differentiated	592 (15.1)	336 (18.7)	187 (14.8)	69 (8.0)
IV—Undifferentiated/anaplastic	38 (1.0)	18 (1.0)	11 (0.9)	9 (1.1)
Unreported	2,371 (60.6)	1,011 (56.3)	670 (53.2)	690 (80.1)

	Overall N = 3,915 n (%)	Cervix Uteri, n = 1,795 n (%)	Corpus Uteri, n = 1,259 n (%)	Ovary, n = 861 n (%)
Surgical treatment receipt				
No	1,301 (33.2)	915 (51.0)	185 (14.7)	201 (23.3)
Yes	1,834 (46.9)	549 (30.6)	852 (67.7)	433 (50.3)
Unreported	780 (19.9)	331 (18.4)	222 (17.6)	227 (26.4)
Chemotherapy receipt				
No	2,206 (56.4)	1,088 (60.6)	826 (65.6)	292 (33.9)
Yes	925 (23.6)	375 (20.9)	208 (16.5)	243 (39.7)
Unreported	784 (20.0)	332 (18.5)	225 (17.9)	227 (26.4)
Radiotherapy receipt				
No	1,483 (37.9)	422 (23.5)	570 (45.3)	491 (57.0)
Yes	1,206 (30.8)	845 (47.1)	305 (24.2)	56 (6.5)
Unreported	1,226 (31.3)	528 (29.4)	384 (30.5)	314 (36.5)
Hormone therapy receipt				
No	3,055 (78.0)	1,444 (80.4)	987 (78.4)	624 (72.5)
Yes	74 (1.9)	18 (1.0)	47 (3.7)	9 (1.0)
Unreported	786 (20.1)	333 (18.6)	225 (17.9)	228 (26.5)
Immunotherapy receipt				
No	3,124 (79.8)	1,459 (81.3)	1,032 (82.0)	633 (73.5)
Yes	2 (0.1)	1 (0.1)	1 (0.1)	0 (0.0)
Unreported	789 (20.1)	335 (18.7)	226 (18.0)	228 (26.5)
Deceased				
Yes	2,049 (52.3)	896 (49.9)	595 (47.3)	558 (64.8)
No/unknown	1,866 (47.7)	899 (50.1)	664 (52.7)	303 (35.2)

Proportions may not sum to 100 due to rounding

Table 2

Multivariable-adjusted mortality risks among incident gynecologic cancer cases (age ≥ 20 years) by cancer site, diagnosed in Trinidad and Tobago, 1995–2009, by age at diagnosis, ancestry, geographic residence, stage, and treatment status

	Cervix Uteri, n = 1,795 HR (95% CI)	Corpus Uteri, n = 1,259 HR (95% CI)	Ovary, n = 861 HR (95% CI)
Age at diagnosis (years)			
<45	1.00 (ref)	1.00 (ref)	1.00 (ref)
45–60	1.14 (0.96, 1.37)	1.34 (0.84, 2.13)	1.35 (1.04, 1.76)
>60	1.35 (1.14, 1.61)	1.86 (1.20, 2.91)	1.67 (1.30, 2.15)
Ancestry			
Indian	1.00 (ref)	1.00 (ref)	1.00 (ref)
African	1.24 (1.06, 1.44)	1.33 (1.09, 1.63)	1.32 (1.08, 1.61)
Mixed	1.11 (0.89, 1.39)	1.09 (0.80, 1.47)	1.62 (1.21, 2.17)
Geographic residence (RHA)			
Northwest (NWRHA)	1.00 (ref)	1.00 (ref)	1.00 (ref)
North Central (NCRHA)	1.08 (0.90, 1.31)	0.75 (0.59, 0.94)	0.99 (0.77, 1.26)
Southwest (SWRHA)	1.39 (1.16, 1.66)	1.29 (1.04, 1.59)	1.35 (1.08, 1.68)
Eastern (ERHA)	1.21 (0.93, 1.58)	0.82 (0.56, 1.19)	1.15 (0.80, 1.67)
Tobago (TRHA)	0.81 (0.56, 1.17)	1.01 (0.69, 1.47)	0.60 (0.40, 0.91)
Stage			
Localized	1.00 (ref)	1.00 (ref)	1.00 (ref)
Regional	1.81 (1.50, 2.19)	1.67 (1.28, 2.18)	1.80 (1.21, 2.66)
Distant	3.05 (2.36, 3.94)	2.78 (2.15, 3.59)	1.91 (1.36, 2.68)
Unreported	3.48 (2.89, 4.19)	3.57 (2.82, 4.52)	5.25 (3.69, 7.47)
Receipt of any treatment			
Yes	1.00 (ref)	1.00 (ref)	1.00 (ref)
No	3.00 (2.60, 3.48)	4.05 (3.32, 4.96)	5.09 (4.11, 6.30)

Bold values indicate statistical significance