Gynecologic Oncology 133 (2014) 409–415

Contents lists available at ScienceDirect

Gynecologic Oncology

journal homepage: www.elsevier.com/locate/ygyno

Impact of socioeconomic status and ethnic enclave on cervical cancer incidence among Hispanics and Asians in California

Marie-Anne Froment [a,*], Scarlett L. Gomez [c,d], Audrey Roux [b], Mindy C. DeRouen [c], Elizabeth A. Kidd [a]

[a] Department of Radiation Oncology, Stanford University Medical Center, Stanford, CA, USA
[b] Department of Radiation Oncology, Hôpital Maisonneuve-Rosemont, Montreal, QC, Canada
[c] Cancer Prevention Institute of California, Fremont, CA, USA
[d] Department of Health Research and Policy, School of Medicine, Stanford, CA, USA

HIGHLIGHTS

- Cervical cancer cases from four of the SEER program registries were reviewed.
- Influence of enclave and nativity on cervical cancer incidence is reported.
- More efforts should be done to increase Pap smear screening in those groups.

ARTICLE INFO

Article history:
Received 8 January 2014
Accepted 18 March 2014
Available online 24 March 2014

Keywords:
Cervical cancer
Ethnicity
Socioeconomic status
Incidence rate

ABSTRACT

Objective. This study aimed to evaluate the incidence of cervical cancer by nativity [United States (US) versus non-US], neighborhood socioeconomic status and ethnic enclave among Hispanics and Asians in California.

Methods. Using data from the California Cancer Registry, information on all primary invasive cervical cancer (Cca) patients diagnosed in California from January 1, 1990 through December 31, 2004 was obtained. We analyzed the influence of enclave, socioeconomic status and nativity on Cca incidence.

Results. Among the 22,189 Cca cases diagnosed between 1990 and 2004, 50% were non-Hispanic white, 39% Hispanic and 11% Asian women, and 63% US-born. Seventy percent of the Cca cases were squamous cell carcinoma, 19% adenocarcinoma and 11% other histologies. Higher incidence of Cca was observed in high enclave (76%) and low socioeconomic status (70%) neighborhoods. By ethnic group, US-born women showed lower rates of squamous cell carcinoma compared to foreign-born women. Hispanics living in low socioeconomic and high enclave had 12.7 times higher rate of Cca than those living in high socioeconomic, low enclave neighborhoods. For Asian women incidence rates were 6 times higher in the low socioeconomic, high enclave neighborhoods compared to those living in high socioeconomic, low enclave neighborhoods.

Conclusion. More targeted outreach to increase Pap smear screening and human papilloma virus vaccination for women living in high enclave neighborhoods can help decrease the incidence of Cca in these groups of women.

Invasive cervical cancer (Cca) used to be the principal cause of cancer death for women in the United States. Since the introduction of the Pap smear, the incidence of Cca has declined considerably [1]. However, 12,360 new Cca cases and 4020 deaths related to this disease are still expected in 2014 [2]. Moreover, significant disparities exist based on ethnicity and socioeconomic status (SES) [3–9]. For example, according to the Center for Disease Control and Prevention, Hispanic women show a higher rate of Cca than US women from all other ethnicities [8]. Discrepancies also exist between different Asian subgroups with more Cca cases in Vietnamese women compared to other Asians ethnicities [10,11]. Additionally, foreign-born (FB) women and women living in higher poverty counties seem to have a greater incidence of Cca [3], and SEER data also demonstrate a 30% higher incidence and 71% higher mortality rate from Cca for women living in counties with high poverty as compared to wealthier counties [4].

California, with its large and diverse population, provides a unique opportunity for studying the influence of both ethnicity and SES on Cca. Hispanic and Asian populations represent two of the largest and fastest growing immigrant and minority populations in the United States and California. In 2011, the California population was 14% Asian and 38% Hispanic [12]. These two ethnic groups include women from many different countries of origin and cultures, as well as immigration

* Corresponding author at: Department of Radiation Oncology, Hôtel-Dieu de Québec, 11 Côte du Palais, Québec, QC G1R 2J6, Canada. Fax: +1 418 691 5268.
E-mail address: Marie-Anne.Froment@mail.chuq.qc.ca (M.-A. Froment).

http://dx.doi.org/10.1016/j.ygyno.2014.03.559
0090-8258/

histories, all of which can influence their lifestyle and risk factors, as well as their SES and access to health care. Additionally, these populations continue to immigrate, allowing for an analysis on the impact of place of birth (nativity). Finally, subpopulations of these minorities show different degrees of integration facilitating the study of the influence of neighborhood, including the SES and enclave features. Here, we refer to ethnic enclaves as neighborhoods that maintain more cultural mores and are ethnically distinct from the surrounding area.

This study aimed to evaluate the impact of nativity, SES and ethnic enclave on the incidence of Cca in California to identify particularly high risk populations to target with Cca screening and vaccination programs.

Methods

Cancer cases from the California Cancer Registry (CCR), comprising four of the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program registries [13] were reviewed. Information on all California residents diagnosed with primary Cca (International Classification of Diseases for Oncology, 3rd Edition [ICD-O-3] site code 153.9) from January 1, 1990 through December 31, 2004 was obtained. Data were restricted to this time period due to available population estimate data defined by nativity and the neighborhood factors of interest.

Primary Cca cases were classified according to histologic type as squamous cell carcinoma (histology codes 8050–8130), adenocarcinoma (histology codes 8140–8490), and others (histology codes 8000–8046 and 8500–9582). Tumors were classified by stage (SEER summary stage) as localized, regional (regional extension, regional nodes, regional extension and nodes, and regional NOS), distant, and unknown (blank and unspecified).

Classification of Asian race was improved by application of the North American Association of Central Cancer Registries Pacific Islander Identification Algorithm [14], and Hispanic ethnicity was improved by application of the North American Association of Central Cancer Registries Hispanic Identification Algorithm [15].

Because patients in the cancer registry with unknown birthplace data are more likely to be US-born than those with available data [16–19], a method on the basis of patients' social security numbers (SSN) to classify patient immigrant status, as described previously [20], was developed. Among Asian subgroups, registry data on nativity were available for 79.4% (76.4% from hospital medical records and 3.1% from death certificates) of eligible cases. For the 20.6% of cases with unknown birthplace, statistical imputation using the patient's SSN was used to determine immigrant status, as SSN sequences are associated with its year of issue. By comparing the age of SSN issue with self-reported birthplace in previously interviewed cancer patients ($n = 1836$) and based on maximization of the area under the receiver operating characteristic curve and confirmation with logistic regression modeling, patients receiving a SSN before age 25 years were considered US-born, and those who had received an SSN at or after age 25 years as foreign-born. This age cut point resulted in 84% sensitivity and 80% specificity for assigning foreign-born status across the Asian populations. The 1.8% of cases with missing or invalid SSNs was assigned an immigrant status on the basis of the ethnicity–sex–age birthplace distribution of the overall sample. Incidence rates for US-born Korean, South Asian and Vietnamese patients were not computed due to small case ($N = 27$ for all 3 groups) and population numbers.

Among Hispanics, registry data on nativity were available for 77.6% (74.3% from hospital medical records and 3.4% from death certificates) of eligible cases. We estimated nativity for the minority of patients with unknown birthplace as above. For Hispanics, those who received their SSN before age 20 years were considered US-born and those who received their SSN at or after age 20 years were considered foreign-born. The cut point of 20 years was determined by comparisons with self-reported nativity from interviews with 1127 Hispanic cancer patients [16,17] as noted above. The age cut point of 20 years resulted in 81% sensitivity and 80% specificity for detecting foreign-born status in Hispanics. The 5.0% of Hispanic cases with missing or invalid SSNs were assigned a nativity status based on the known distribution of nativity within matched strata of race/ethnicity, sex, and age in the overall California Cancer Registry patient population. Analyses for detailed Hispanic subgroups (e.g., Mexican and Puerto Rican) could not be conducted given the substantial proportion (>40%) of cases classified as "Hispanic, not otherwise specified" on Hispanic origin. Approximately 84% of California Hispanics are of Mexican origin [21,22], followed by 9% of Central American origin [22]. By using patient residential address and small-area (census tract) information from the 2000 US Census, we classified neighborhood SES for all patients and ethnic enclave status for every Hispanic and Asian patient. Analyses using these variables were limited to the pericensal period between January 1st, 1998 and December 31st, 2002, and included 7373 cases of Cca among NH Whites, Hispanics, and Asian subgroups. A neighborhood-level measure of SES based on a previously described index that incorporates 2000 US Census data on education, occupation, unemployment, household income, poverty, rent, and house values was assigned [23]. Ninety five percent (95.2%) of patients' address at diagnosis was geocoded to a census tract. The remaining cases without a street address or whose address could not be precisely geocoded (4.8%) were randomly assigned to a census tract within their ZIP code of residence. Based on residential census tracts, each patient was assigned to a quintile of neighborhood SES according to the statewide distribution of the SES index across all census tracts in California [24]. For the analysis, quintiles 1 to 2 (lower SES) and quintiles 3 to 5 (higher SES) were combined.

Patients were classified according to neighborhood Hispanic (for Hispanic race/ethnicity) and Asian (for Asian/Pacific Islander race/ethnicity) enclave status based on the concept of an ethnic enclave as a geographic unit with higher concentration of foreign-born race/ethnicity-specific residents and language(s) than other geographic units in California. As described previously [24–26], residence in an enclave was characterized by applying principal components analysis [27] to 2000 US Census block group level data on selected census variables, which was, in turn averaged to the census tract level. For Hispanics, data on linguistic isolation, English fluency, Spanish language use, Hispanic ethnicity, immigration history, and nativity were included. For Asians, data on linguistic isolation, English fluency, Asian language use, Asian race, and immigration history were included. Each case was assigned to a quintile of neighborhood ethnic enclave status based on the distribution of the enclave index across all census tracts in California [23]. Quintiles 1 to 3 (lower enclave status) and quintiles 4 to 5 (higher enclave status) were combined for the analysis.

From the 1990 and 2000 US Census Summary File 3 (SF-3), population counts to estimate incidence rates by sex, race/ethnicity, immigrant status, and 5-year age group for California were obtained. For intercensal years, the foreign-born Hispanic and Asian population sizes were estimated by using cohort component interpolation and extrapolation methods [28], adjusting estimates to the populations by age and year provided by the US Census for years 1990 to 2004, based on data availability. Data from the 5% integrated public use microdata sample of the census to estimate age- and birthplace-specific population counts for the Asian ethnic groups [26,29] were also used by smoothing with a spline-based function [30]. For the analyses of neighborhood SES and ethnic enclave status, 2000 US Census population estimates by race/ethnicity and sex at the census tract level were used. Because census data on nativity are not available at the census tract level, the database containing nativity data was separate from the one containing neighborhood SES and ethnic enclave status, and these variables could not be cross-classified.

Statistical analyses

SEER Stat software 8.0 [15] was used to compute age-adjusted incidence rates (directly standardized to the 2000 US standard million