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Cancer Among Arab Americans in the Metropolitan Detroit Area

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Detroit is home to one of the largest populations of Arab Americans outside of the Middle East, yet little is known about the cancer distribution in this ethnic group. The authors of this study created an Arab/Chaldean surname list and matched it with the Detroit SEER Registry to identify cancer cases of probable Arabic descent. We then determined proportional incidence ratios (PIR) for specific cancer sites among metropolitan Detroit Arab Americans as compared to non-Arab Whites, and contrasted the results with Middle Eastern data. Arab/Chaldean men had greater proportions of leukemia (29%), multiple myeloma (46%), liver (64%), kidney (33%), and urinary bladder (26%) cancers. Arab/Chaldean women had greater proportions of leukemia (23%), thyroid (57%), and brain (35%) cancers as compared with non-Arab White men and women. The cancers with significantly increased PIRs in the Detroit Arab/Chaldean population also are frequently diagnosed in Middle Eastern countries. (*Ethn Dis.* 2004;14:141–146)

Key Words: Cancer, Arab American, Epidemiology, Ethnicity

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Introduction

Arab Americans constitute one of the fastest growing immigrant groups in American metropolitan areas,[1,2] yet little is known regarding cancer incidence and mortality in this population. Studies of migrant Middle Easterners have been performed in Australia,[3] where higher rates of liver and bladder cancers were reported in men, stomach and gallbladder cancers in women, and thyroid cancers in both sexes. Migrant studies are difficult to perform in this country because denominator data are not available from the US Census Bureau. Persons of Arab descent do not have a separate racial/ethnic classification; rather, they are grouped with 'White' on US Census forms.

At least 250,000 Arab-Americans and Chaldeans (Iraqi Christians) are estimated to live within metropolitan Detroit (Macomb, Oakland, and Wayne counties), representing one of the largest concentrations of immigrant Arabs in the United States.[1] The US Census 2000 estimates the number of Muslim-Origin persons in metropolitan Detroit at 124,585, representing 2.8% of the total population.[4] Undercounting, historically a problem among minority populations,[5] may account for the discrepant estimates. This area is also home to the Metropolitan Detroit Cancer Surveillance System (MDCSS), a founding member of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program and a rich resource of cancer incidence information. Unfortunately, the SEER registry, which is dependent upon medical chart review for demographic information, lacks complete data on Arab descent. Therefore, cancer incidence patterns are poorly defined among this growing ethnic group in metropolitan Detroit.

In this study, we developed an Arab/Chaldean surname index to identify cancer cases of probable Arab/Chaldean descent in the MDCSS and to determine proportional incidence ratios (PIR) for specific cancer sites among metropolitan Detroit Arab/Chaldeans as compared to non-Arab Whites. These results were also compared with cancer data available from Middle Eastern and North African countries.

Methods

Determining the proportional incidence of specific cancer sites for metropolitan Detroit Arab/Chaldeans was a 3-step process. The first step was the creation of an Arab/Chaldean surname list. The second step involved matching this list with the MDCSS Registry to identify cases of probable Arab/Chaldean descent. For some names, it was also necessary to supplement the surname using first names drawn from a second list created by the research team. The final step was to determine proportional incidence ratios. The study was reviewed and approved by the Wayne State University Institutional Review Board.

Collection of Arab/Chaldean Surnames

Arab/Chaldean surnames were derived from the following sources:

Michigan Department of Community Health birth and death records, which list birthplace of the decedent or ancestry of the infant. The countries identified as Middle Eastern/North African included: Algeria, Bah-

Studies of migrant Middle Easterners have been performed in Australia,[3] where higher rates of liver and bladder cancers were reported in men, stomach and gallbladder cancers in women, and thyroid cancers in both sexes.

rain, Djibouti, Egypt, Ethiopia, the Gaza Strip, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, North Africa, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen, and the Western Sahara.

MDCSS. Surnames from records that included a birthplace from the list above were included in the surname list.

Arab/Chaldean community outreach groups and professional groups such as the Arab Community Center for Economic and Social Services (ACCESS), Arab-American and Chaldean Council (ACC), National Arab-American Medical Association, the Chaldean Federation, and churches and mosques assisted us by supplying Arab/Chaldean surnames.

Two Arab-speaking research assistants searched metropolitan Detroit telephone directories for Arab and Chaldean surnames.

First names were collected from the last 2 sources named above, as well as an Internet listing of baby names.[6]

Surnames that recurred most frequently were considered as a proxy for the most common Arab/Chaldean surnames. The total number of non-unique surnames gathered from all sources was 91,000, which was reduced to 14,761 unique names. The first draft was reviewed and edited by authors (AK and HF), eliminating many non-Arab/Chaldean names that had arisen from the Department of Community Health's vital statistics. A consensus was reached regarding those names that should be discarded. Surnames that could potentially identify both Arab/Chaldean and non-Arab/Chaldean persons were kept as a separate file.

Following the first review of the surname list, a "soundex" match using the first 3 letters of the edited surname list was performed with the SEER database in order to capture additional names with similar beginnings and alternative spellings. At the same time, the consultants agreed on several name endings that could be used to systematically delete non-Arab/Chaldean surnames. Examples of such endings selected were -wich, -ian, -ski, and -berg. The resulting list, after additions and deletions, was again reviewed and edited by several of the authors (AK, HF, WS). The final master Arab/Chaldean surname list contained 9,225 unique names.

The first name list also underwent a revision and editing process by AK. The first name list was used to improve the probability of identifying Arab/Chaldean cases with surnames common to both Arab/Chaldeans and non-Arab/Chaldeans (eg, George, Michael, and Simon). For those surnames that might identify non-Arab/Chaldeans (equivocal surnames), a match on both first and last name was required to be included in the proportional incidence analysis.

For female cases, the maiden name listed in MDCSS was the first choice for matching. If maiden name was not present in the case file, the usual surname matching criteria were applied.

Quality Control

Several quality control measures were used to ensure that the surname list identified as many Arab/Chaldeans as possible with a minimum number of false positives. Three different telephone validation methods were used to estimate the accuracy of the list, using the 6 metropolitan Detroit directories. The standard procedure for each telephone quality control check was:

A telephone call was placed to a residence with a telephone number for a given surname on the list.

The person who answered was asked whether he or she had that last name; if not, the caller asked to speak to someone with that surname.

The respondent was then asked if he or she considered him/herself to be of Arab ancestry. The caller spoke in Arabic if the respondent did not understand English.

The first quality control measure was performed using all surnames obtained from non-state sources (approximately 20,000 non-unique names). To approximate a 2.5% sample, a telephone number from a metropolitan Detroit telephone directory was obtained for every 40th surname on the alpha-ordered list. Of the 380 households that were contacted, 340 respondents (89.5%) identified themselves as Arab/Chaldean.

The second quality control method used a surname list ordered by frequency of names. Equivocal surnames were included. Three telephone directories representing areas with sparse Arab/Chaldean populations were the source for telephone numbers. Households with the 50 most frequent names were contacted. Forty-three of the 50 names were found in at least one of the directories, and 29 of the names were contained in all 3 directories. Of the forty-three names found at least once, 42 (97.7%) considered themselves to be of Arab/Chaldean descent.

For the third quality control step, a list of approximately 1% of the surnames from all reportable cases, independent of ethnicity, in the MDCSS was obtained. This list was checked against the Arab/Chaldean master surname list for overlap. The 5 overlapping surnames on both lists were not con-

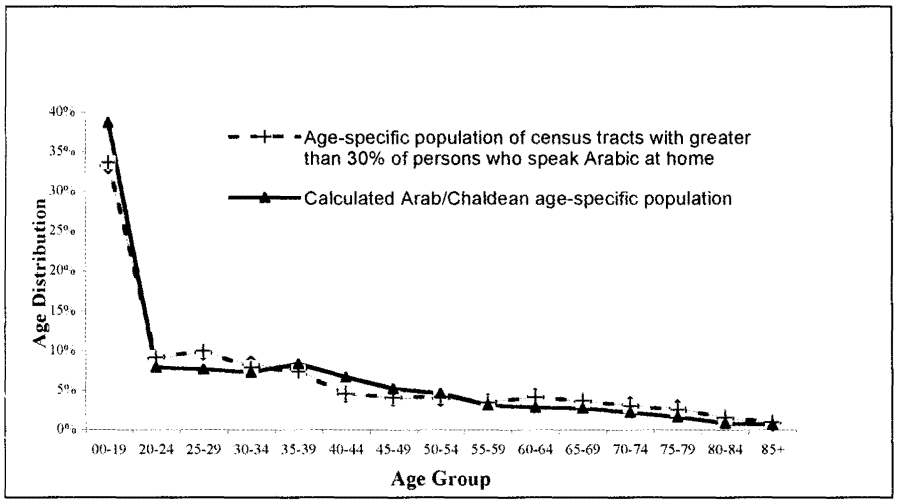

Fig 1. Calculated Arab/Chaldean residents in Detroit compared to 1990 US Census information on proporation of Arabic-speaking persons in same area.

tacted. Households with the remaining 143 surnames were contacted, using the 3 telephone directories that cover the most densely populated Arab/Chaldean areas. Of the 143 households contacted, 143 (100%) identified themselves as non-Arab.

A calculation was also performed to determine if the number of MDCSS cases identified by the surname match was reasonable. The calculation was made with the assumption that Arab/Chaldean age-specific cancer incidence rates are similar to those of Whites. White age-specific cancer incidence rates were used to calculate a theoretical age-specific Arab/Chaldean population. The resulting numbers closely matched estimates of the metropolitan Detroit Arab population made by another independent group.[1] Further verification of the matched MDCSS case population, was conducted by comparing the theoretical population calculated, as described above, with 1990 US Census information on the proportion of Arabic-speaking persons using metropolitan Detroit census tracts[7] (Figure 1). The theoretical age-specific Arab/Chaldean population was similar to the 1990 age-specific population of census tracts with greater than 30% of persons who speak Arabic at home.

Statistical Analysis

SAS (Statistical Analysis System)™ was used to calculate age-adjusted proportional incidence ratios (PIR) and 95% confidence intervals (CI). The cancer sites that are routinely reported by SEER in their annual Cancer Statistics Review are included here. If there were fewer than 10 Arab/Chaldean cases for a particular cancer site, a PIR was not calculated. Although the MDCSS contains separate data for colon, rectal, and rectosigmoid junction cancers, the 3 cancer sites were aggregated into a single category of colorectal cancer. Similarly, oral cavity and pharynx is an aggregation of cancers of the lip, tongue, salivary gland, mouth floor, gum, nasopharynx, oropharynx, hypopharynx, and tonsil. The specific cancer sites were stratified by sex and age (<40 years, 40–49, 50–59, 60–69, and 70 years and older). These age-stratifications were used to determine the age-adjusted PIRs.

Age-adjusted cancer site-specific PIRs were calculated by the formula below.[8] In general, the PIR is the observed number of Arab/Chaldean cases divided by the number of Arab/Chaldean cases expected if the Arab/Chaldean population had the same proportion of cancer as that of the non-Arab White population. Proportional incidences were used because incidence rates are not calculable without denominator data.

$$PIR = \frac{\sum d_i}{\sum t_j(d^*_j/t^*_j)}$$

where d_j = number of Arab/Chaldean site-specific cases for age group j

t_j = total number of Arab/Chaldean cases for age group j

d^*j = number of non-Arab White site-specific cases for age group j

t^*j = total number of non-Arab White cases for age group j

RESULTS

The total number of matches of the surname list and the SEER database for the years 1973–2002 was 7006; 3475 male and 3531 female. Among men and women combined, Arab/Chaldeans had 63% greater than expected proportions of liver cancer, 44% greater thyroid, 29% greater leukemia, 28% greater Hodgkin's, 26% greater brain, 25% greater kidney, and 24% greater urinary bladder cancers than non-Arab Whites (Table 1). Non-Arab Whites, however, experienced 35% more skin melanoma, 27% more esophagus, and 20% more oral cavity cancers than Arab/Chaldeans.

When stratified by sex, the cancer sites with a greater PIR for Arab/Chaldean men were liver (64%), multiple myeloma (46%), kidney (33%), leukemia (29%), and urinary bladder (26%). Sites with a greater PIR for non-Arab White men were melanoma (45%), testis (36%), esophagus (36%), and oral cavity and pharynx (25%).

The proportions of thyroid, brain, and leukemia cancers were 57%, 35%, and 23% greater, respectively, for Arab/Chaldean women than non-Arab White women. Skin melanoma was again

Table 1. Age-Adjusted Proportional Incidence Ratios (PIRs) for Arab/Chaldeans in the Detroit metropolitan area, 1973–2002

Cancer Site	Number of Cases Observed	Number of Cases Expected	PIR (95% Confidence Interval)
Male and females			
Oral cavity and pharynx	148	185.5	0.80 (0.67, 0.94)
Esophagus	43	59.3	0.73 (0.52, 0.98)
Stomach	151	129.3	1.17 (0.99, 1.37)
Colorectal	784	830.6	0.94 (0.88, 1.01)
Liver	63	38.6	1.63 (1.25, 2.09)
Gall bladder	27	21.5	1.25 (0.83, 1.83)
Pancreas	154	154.4	1.00 (0.85, 1.17)
Larynx	86	89.1	0.97 (0.77, 1.19)
Lung/bronchus	962	1017.3	0.95 (0.89, 1.01)
Skin melanoma	170	261.0	0.65 (0.56, 0.76)
Urinary bladder	407	328.5	1.24 (1.12, 1.37)
Kidney	199	159.6	1.25 (1.08, 1.43)
Brain and other nervous system	140	111.2	1.26 (1.06, 1.49)
Thyroid	147	102.2	1.44 (1.22, 1.69)
Hodgkin's	81	63.4	1.28 (1.01, 1.59)
Non-Hodgkin's	253	237.9	1.06 (0.94, 1.20)
Multiple myeloma	84	68.0	1.24 (0.99, 1.53)
Leukemia	261	201.9	1.29 (1.14, 1.46)
Males			
Oral cavity and pharynx	99	131.7	0.75 (0.61, 0.92)
Esophagus	30	46.9	0.64 (0.43, 0.91)
Stomach	96	86.6	1.11 (0.90, 1.35)
Colorectal	443	463.2	0.96 (0.87, 1.05)
Liver	45	27.4	1.64 (1.20, 2.20)
Pancreas	83	83.8	0.99 (0.79, 1.23)
Larynx	71	77.0	0.92 (0.72, 1.16)
Lung/bronchus	632	679.3	0.95 (0.86, 1.01)
Melanoma	83	152.2	0.55 (0.43, 0.68)
Prostate	862	844.4	1.02 (0.95, 1.09)
Testis	40	62.4	0.64 (0.46, 0.87)
Urinary bladder	330	262.3	1.26 (1.13, 1.40)
Kidney	141	105.8	1.33 (1.12, 1.57)
Brain and other nervous system	77	68.0	1.13 (0.89, 1.41)
Thyroid	35	29.1	1.20 (0.84, 1.67)
Hodgkin's	48	40.0	1.20 (0.89, 1.59)
Non-Hodgkin's	135	136.6	0.99 (0.83, 1.17)
Multiple myeloma	55	37.7	1.46 (1.10, 1.90)
Leukemia	161	125.1	1.29 (1.10, 1.50)
Females			
Oral cavity and pharynx	49	53.3	0.92 (0.68, 1.21)
Esophagus	13	14.3	0.91 (0.48, 1.55)
Stomach	55	44.8	1.23 (0.92, 1.60)
Colorectal	341	368.1	0.93 (0.83, 1.03)
Liver	18	12.2	1.48 (0.87, 2.33)
Gall bladder	18	14.2	1.27 (0.75, 2.01)
Pancreas	71	70.3	1.01 (0.79, 1.27)
Larynx	15	15.9	0.94 (0.53, 1.55)
Lung/bronchus	330	355.2	0.93 (0.83, 1.04)
Melanoma	87	114.1	0.76 (0.61, 0.94)
Breast	1086	1044.1	1.04 (0.98, 1.10)
Cervix uteri	506	597.8	0.85 (0.77, 0.92)
Corpus uteri	214	228.0	0.94 (0.82, 0.92)
Ovary	138	133.8	1.03 (0.87, 1.22)
Urinary bladder	77	77.9	0.99 (0.78, 1.24)
Kidney	58	56.8	1.02 (0.78, 1.32)
Brain and other nervous system	63	46.7	1.35 (1.04, 1.73)
Thyroid	112	71.5	1.57 (1.29, 1.88)
Hodgkin's	33	26.9	1.23 (0.85, 1.72)
Non-Hodgkin's	118	104.4	1.13 (0.94, 1.35)
Multiple myeloma	29	30.2	0.96 (0.64, 1.38)
Leukemia	100	81.4	1.23 (1.00, 1.49)

greater in non-Arab White women (28%), as was cervical cancer (15%) compared with Arab/Chaldean women.

DISCUSSION

This study represents an initial effort to describe cancer patterns among Arab Americans, a growing segment of the population that has not been well characterized for health and disease status. An Arab/Chaldean surname database was developed and used to identify Arab/Chaldean cancer cases in the Detroit SEER database. Multiple methods of identifying and validating Arab/Chaldean surnames (and first names) were employed to maximize the sensitivity and specificity of the surname database. In addition, our estimates of the age-specific Arab/Chaldean population closely approximated the US Census counts of Arab-speaking households in the Detroit metropolitan area.

Our results bore some similarities to the limited literature that was available from Middle Eastern countries. Data from only 2 Middle Eastern population-based cancer registries are easily available. Other cancer data were utilized from cancer registries based in large cancer treatment centers, such as Cairo University or the American University of Beirut. Incidence data from these non-population-based sources may be a reflection of the treatment expertise of the center, rather than a true indication of the population's cancer rates.

Lung cancer is common among male Israeli non-Jews and men in Kuwait, Gaza, and Lebanon.[9–11] Bladder cancer is reported often among men in Kuwait, Gaza, Lebanon, Egypt, and Israeli non-Jews.[9–11] Lymphoma and leukemia are frequently diagnosed in Egypt, Lebanon, and Gaza.[10,11] Liver cancer is a common digestive cancer in Gaza and Kuwait.[10,11] The male Detroit Arab-American population had increased PIRs of liver, bladder, kidney, leukemia, and multiple myeloma.

Proportionately fewer cancers of testis, oral cavity, and esophagus among Arab/Chaldean men and fewer cervical cancers among women were noted.

Breast cancer is among the most common cancer diagnoses for female Israeli non-Jews and women from Kuwait, Lebanon, Gaza, and Egypt.[9–11] Lymphoma is frequently diagnosed in Kuwait, Lebanon, Gaza, Egypt, and among Israeli non-Jewish women[9–11]; leukemia is also common in Gaza and Lebanon.[10,11] Brain cancer is a leading cancer diagnosis for women in Gaza and Lebanon,[10,11] while thyroid cancer is a malignancy common to Kuwaiti women.[9] In our study, Arab-American women had proportionally more leukemia, brain, and thyroid cancers compared with non-Arab Whites. A trend among Arab/Chaldean women for more liver and gall bladder cancers was also evident. Liver cancer appears to be fairly common in Gaza and Kuwait,[9,10] while the migrant study conducted in Australia noted an increase in female gallbladder cancer.[3]

Proportionately fewer cancers of testis, oral cavity, and esophagus among Arab/Chaldean men and fewer cervical cancers among women were noted. Melanoma was significantly less common among both Arab/Chaldean men and women. Similarly, these cancers, reported to be significantly less common for Arab/Chaldean men and women, are also uncommon cancers in the Middle East.

These similarities highlight the fact that migrant populations possess similar cancer patterns to their home country when first emigrating to their country of adoption, and eventually develop most cancers at rates comparable to those of the native population in their new homeland.[12] Migrants from the Middle East arrived in Detroit in either of 2 waves. The first wave began at the turn of the century; the second wave began after World War II,[1] and continues to the present day. Descendants of the first wave of immigrants would be more likely to experience cancer rates comparable to non-Arab Whites, perhaps accounting for non-significant PIRs for lung and colon cancer, neither of which are among the top 5 cancer diagnoses in Gaza and Egypt.[10] On the other hand, more recent immigrants may be experiencing cancer patterns similar to their homeland, namely lymphoma and leukemia, liver and bladder for men; thyroid and brain cancer for women. A hereditary predisposition for these cancers may also exist among Middle Eastern immigrants.

Several limitations to this study deserve mention. The authors attempted to create a surname list that was as inclusive as possible that would identify a minimum number of non-Arab/Chaldean persons. The final list was decided by consensus. Three reviewers, who are very active in the Arab community, decided on the final list. Only 89.5% of telephoned persons with a surname from the list identified themselves as Arab or Chaldean indicating the difficulty we encountered in creating such a list. Many names from the Chaldean community such Abraham, George, and Simon are often found in a non-Arab White community. Yet, the reviewers felt a large proportion of the population might be missed if these names were simply removed. To minimize this obstacle, we developed a first name list and required both a first and last name match with these equivocal surnames. Another limitation of this study was its omission of information on time of immigration to the United States; consequently, we were unable to determine if the Arab/Chaldean cancer cases represent first or subsequent generation immigrants.

One intriguing finding from this study requires additional research. The smoking rate (39%)[13] among Arab Americans in the Detroit metropolitan area is substantially greater than national (23%)[14] and Michigan (26%) rates.[15] Despite this, some smoking related cancers were either significantly less (25% fewer oral cavity and pharynx, and 36% fewer esophageal cancers) or more (26% greater bladder) common among Arab/Chaldeans compared with non-Arab White men, while the lung and larynx proportional incidence was similar for the 2 groups. Oral cavity cancers are not common in the Middle East,[9–11] except in Egypt where it ranks third in frequency.[10] Some of the increased bladder cancer risk could be related to the high rates seen in parts of the Middle East. As much as 50% of bladder cancer in Egypt and other parts of the Middle East is related to bilharzia (*Schistosoma haematobium*).[10] Perhaps the increased bladder PIR is due to first generation immigrants who were exposed to this pathogen in their home country. However, the majority of bilharzial-related cancers in Africa are of squamous cell histology,[12] while over 90% of the bladder cancers in our population were of transitional cell origin.

This descriptive study was the first to determine cancer patterns in Middle Eastern immigrants to the United States. Although we made multiple efforts to ensure that our surname list was as complete as possible, we view our results as preliminary. Remembering that proportional data are not necessarily an accurate reflection of population-based incidence rates is a particularly important point; yet, it is reassuring to note that the patterns seen in our proportional incidence study were similar to those identified in the migrant study of Middle Easterners to Australia, which was able to calculate incidence rates.[3] Until US denominator data are available and complete ethnicity data are present in the medical chart, improved estimates will be difficult to obtain. These types

of data are useful for hypothesis generation, as well as following trends among the growing Arab/Chaldean population. Specifically, additional migration studies should be done to improve our understanding of gene-environment interactions for cancers in this unique population.

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AUTHOR CONTRIBUTIONS

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Supervision: Schwartz