



Original article

Cancer incidence, mortality, and survival in Eastern Libya: updated report from the Benghazi Cancer Registry



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ABSTRACT

Purpose: Despite the increasing burden of cancer occurred over recent years in the African continent, epidemiologic data from Northern Africa area have been so far sparse or absent. We present most recently available data from the Benghazi Cancer Registry concerning cancer incidence and mortality as well as the most comprehensive survival data set so far generated for cases diagnosed during 2003 to 2005 in Eastern Libya.

Methods: We collected and analyzed data on cancer incidence, mortality and survival that were obtained over a 3-year study period from January 1st 2003 to December 31st 2005 from the Benghazi Cancer Registry.

Results: A total of 3307 cancer patients were registered among residents during the study period. The world age-standardized incidence rate for all sites was 135.4 and 107.1 per 100,000 for males and females, respectively. The most common malignancies in men were cancers of lung (18.9%), colorectum (10.4%), bladder (10.1%), and prostate (9.4%); among women, they were breast (23.2%), colorectum (11.2%), corpus uteri (6.7%), and leukemia (5.1%). A total of 1367 deaths for cancer were recorded from 2003 to 2005; the leading causes of cancer death were cancers of the lung (29.3%), colorectum (8.2%), and brain (7.3%) in males and cancers of breast (14.8%), colorectum (10.6%), and liver (7%) in females. The 5-year relative survival for all cancer combined was 22.3%; survival was lower in men (19.8%) than in women (28.2%).

Conclusions: This study provides an updated report on cancer incidence, mortality, and survival, in Eastern Libya which may represent a useful tool for planning future interventions toward a better cancer control.

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Introduction

Cancer has become a major public health problem in Africa over the last decades. About 847,000 new cancer cases (6% of the world total) and 591,000 deaths (7.2% of the world total) occurred in 2012 on the continent. Critically, these numbers are expected to double in the next 20 years [1].

This increased burden of cancer mainly depends on the growth and aging of the African population, which is estimated to rise by 50% overall (from 1.03 billion to 1.52 billion) and by 90% for those

aged 60 years or more (from 55 million to 105 million) between 2010 and 2030. Furthermore, the adoption of new lifestyles associated with economic transition including smoking, lack of physical inactivity (leading to obesity), and reproductive behaviors will contribute to an increased number of cancer cases in Africa in the years to come [2]. In addition, late cancer presentation and inadequate or unavailable treatment facilities decisively lead to the poorer prognosis of African patients compared with those from high-income countries [3].

Nevertheless, in most African countries, cancer continues to receive a relatively low public health priority because of limited resources and other pressing public health problems, including communicable infectious diseases such as AIDS or human immunodeficiency virus infection, malaria, and tuberculosis [4].

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During the last decade, epidemiologic data have increasingly become available from several African cancer registries, such as the Benghazi Cancer Registry (BCR), which was established in 2002 in Libya [5,6]. However, high-quality cancer registration, according to the International Agency for Research on Cancer's criteria, is still largely unsatisfactory in Africa, covering only 1% of the whole population in 2007 [7,8]. Unfortunately, the dramatic civil war broke out in 2011 has unavoidably contributed to negatively affected cancer registration process in Libya.

Nonetheless, in the present study, we provide an update on cancer incidence and mortality from the BCR for patients diagnosed with cancer in Eastern Libya during 2003 to 2005. More importantly, for the first time, we reported herein the most comprehensive survival data set ever generated for the Libyan population over the same time frame.

The availability of an updated population-based cancer registration system is a crucial element to guide planning and evaluating cancer controls programs in Libya.

Materials and methods

We collected and analyzed data on cancer incidence, mortality, and survival that were obtained over a 3-year study period from January 1, 2003 to December 31, 2005 from the BCR [5,6].

The BCR is a population-based registry established in 2002 and located in the Garyounis University, Faculty of Medicine, at the National Research Centre building, Benghazi. The area covered by the BCR is a wide region of Northeastern Libya with an estimated population of 1,582,160 inhabitants, according to 2006 estimates. Population data were derived from Libyan General Authority for Information, which release the estimation of the population resident in Libya by sex and age group. In the region of the Eastern district of Libya, cancer care services were provided predominantly by the adult Oncology and Hematology units in Aljumhuriya Hospital, the Radiotherapy unit in the Radiodiagnostic and Therapeutic Center, and by the Pediatric Oncology and Hematology unit in the Children Hospital, which were all based in Benghazi. All cancer patients from the Eastern region were referred to these units. The data on cancer incidence and mortality were actively collected by the staff of the BCR using case finding from different sources. These included cancer service units, general and regional hospitals, university hospitals, private hospitals and clinics, specialized hospitals and centers out of the region, pathology and hematology laboratories, and the district death registration offices. The Department of Pathology of Garyounis University, located in the city of Benghazi, is the most important source of information because it provides histopathology and cytology services for the whole of Eastern Libya. The registry staff visited death registration offices routinely to collect data on cancer mortality based on death certificates. The cause of death from cancer was mandatory reported in all hospitals, and cases coded as death caused by cancer are matched with the data of the BCR. The death registration system was adequate but not complete in all parts of the Eastern district of Libya especially for the year 2003.

Data were provided up to the latest complete year of registration (2005). Registration included all malignant tumors with the exception of nonmelanoma skin cancer and myelodysplastic syndrome that was excluded from the analyses. Registrations were considered microscopically verified when diagnosis is based on a malignant histologic or cytologic reports.

Tumors were classified according to the third edition of the International Classification of Diseases for Oncology [9]. The staff of the Modena Cancer Registry, Italy, contributed to the training of registrars in coding techniques and in software use. Coding practices (including basis and the date of diagnosis) were defined according to the current international guidelines [10,11]. Age standardization of

incidence rates was carried out using the direct method and the world standard population [12]. The registry used statistical and data entry software developed by the Modena Cancer Registry; it includes a variety of rules for checking the validity of the data, based on the International Agency for Research on Cancer or the International Association of Cancer Registries check programs [13]. To calculate the crude incidence rate from the BCR data, we summed the number of cases for each cancer type and the underlying Benghazi region population for each of the strata defined by age and gender within each year across the study period. Specifically, age was grouped into 18 categories (0–4, 5–9, 10–14, 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, 75–79, 80–84, and 85 years or more) and gender was coded as male or female. Survival was estimated using the actuarial method and defined as the time, in years, between the date of diagnosis and the date of death or last follow-up. We considered lost to follow-up the people alive with the last update before December 31, 2007. Relative survival (RS), expressing the probability of cancer survival after adjustment for competing causes of death, was estimated as the ratio of the observed survival among the cancer patients and the survival that would have been expected if they had experienced the same death rates as the general population from which they derive. The expected survival was estimated from the Libyan population life tables by the Ederer II method [14].

We constructed life tables of all-cause mortality in the general Libyan population, by single year of age, sex, and calendar year of death. We used the United Nations Population Division life tables (*World Population Prospects: The 2012 Revision*) for Libya for the calendar periods 2000 to 2005 and 2005 to 2010 to estimate the background mortality in the Eastern Libya population for the years 2003 to 2005. The life tables were obtained abridged by 5-year age group up to the age of 85 years. They were interpolated using the Elandt-Johnson method [15] and extended from ages 80 to 99 years using the Gompertz distribution to produce complete life tables up to the age of 99 years. To obtain life tables for single calendar years, life tables were assigned to the midyear of each period (i.e., 2003 and 2007) and linearly interpolated.

The 95% confidence intervals for RS were estimated from the standard error according to Greenwood's method [16]. Furthermore, we estimated 5-year age-standardized RS for each cancer and for all cancers combined, using the international Corazziari's standard for cancer survival analysis [17].

Results

Almost 80% of all cancers were verified by histology or cytology and only a small proportion were documented by a death certificate (death certificate only = 8.5%) or other (e.g., clinical evaluation = 12.5%; Table 1). Furthermore, 154 cases were recorded as unspecified (4.7%).

Incidence

Overall, excluding nonmelanoma skin cancer and myelodysplastic syndrome, a total of 3307 new cancer cases were diagnosed in Eastern Libya during the calendar period 2003 to 2005, with a slight male excess (52% of all cancer cases). The incidence of disease was found to increase with age, presenting a median age at diagnosis of 61 years for males and 50 years for females.

The world age-standardized incidence rate (ASIR) was found to be 135.4 and 107.1 per 100,000 males and females, respectively, with a cumulative risk of being diagnosed with an invasive cancer during 0 to 74 year period which was higher for men than for women, accounting for 14.9% and 11.2%, respectively. Among men, cancers of lung (18.9%, 327 over 1.731), colorectum (10.4%), bladder

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