

# Cancer Incidence in Western Region of Libya: Report of the Year 2009 from Tripoli Pathology-based Cancer Registry

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## Abstract

**Background and Aims:** Cancer incidence rates are increasing in developed and developing countries. In Libya, it is vital for policymakers to know basic cancer epidemiology in each region of the country to design broad cancer prevention plans. This study aimed to determine the incidence rates (age-standardized) of different cancers in the western region of Libya. **Materials and Methods:** All histological proven cancer cases recorded in the cancer registry of Pathology Department at the Tripoli Medical Center (TMC) during the year 2009 were evaluated. Data were included demographic characteristics, such as age, sex, residence, date of diagnosis, and histopathological diagnosis, which were coded using the World Health Organization's International Classification of Diseases-10<sup>th</sup> Revision. Cancer cases from outside the western region of Libya were excluded from the study. The incidence rates of cancer cases were standardized with reference to the age and sex distribution of the total regional population of Libya which was calculated based on the real census performed by Libyan statistics authority in 2006. **Results:** A total of 1013 patients were diagnosed and registered with cancer at TMC. Male accounted for 48.3% (489 patients) of the cases, and females for 51.7% (524 patients), with M:F ratio of 1:1.07. The overall mean age ( $\pm$ standard deviation) at the time of the first diagnosis was  $52.01 \pm 20.36$  years. The most frequent cancers in both genders were as follows: breast (10.8%), colorectal (10.7%), lung (9.2%), lymphoma (8.5%), and leukemia (8.3%), whereas in males, lung (14.1%), colorectal (11%), leukemia (9.4%), lymphoma (9%), and prostate 7.6% and in females, breast (20.6%), colorectal (10.5%), lymphoma (8%), uterine (7.4%), and leukemia (7.3%). **Conclusion:** Breast cancer was the most common cancer in females and lung cancer in males followed by colorectal cancer in both sexes. The information presented in this study can contribute to a better understanding of the epidemiology of various cancers in Libya and consequently, it provide a useful guide for the decision-makers to construct efficacious decisions about cancer control in Libya.

**Keywords:** Cancer, cancer incidence, Libya

## INTRODUCTION

The incidence of certain cancers is diverging between different populations and geographic locations. These differences may associate with environmental, ethnic and/or genetic causes.<sup>[1]</sup> There may be considerable discrepancies between developing and developed countries, considering the epidemiology of cancer diseases. Conversely, the in-progress fast industrialization and modernization in developing countries, by modifying the environment and people lifestyle, may change the epidemiologic patterns of various cancers in these regions.<sup>[2]</sup> The incidence of cancer is increasing in developing countries because of aging, and cancer-associated lifestyle factors such as smoking, obesity, and physical inactivity.<sup>[3-6]</sup>

Libya is a large country extends over 1,759,540 km<sup>2</sup> (679,362 sq mi), making it the 16<sup>th</sup> largest nation in the world by size. It is located in epidemiologic transition, and cancer is the third cause of death after ischemic heart diseases and road traffic accidents.<sup>[7]</sup> Therefore, it is imperative to illuminate the epidemiological status of cancers in different regions. Hence, it is essential for each region to elucidate the incidence and epidemiology of cancer disease in its own population. The aim of the present study is to provide the incidence

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rate (age-standardized) of different types of cancers in the eastern region of Libya.

## MATERIALS AND METHODS

### Study design and sitting

All histological proven cancer cases that were recorded in the cancer registry of the Department of Pathology at Tripoli Medical Center (TMC) during the year 2009 were reviewed in this retrospective study. TMC is the largest teaching hospital in Libya with bed capacity of around 1200 beds and the majority of cancer cases in this registry were from the northwestern region of Libya, on the Mediterranean Sea coast [Figure 1].

### Cases identification and data collection

Data were obtained from the computer records comprised demographic characteristics such as age, sex, residence, date of diagnosis, site of cancer, and histopathological diagnosis which were coded using the World Health Organization's International Classification of Diseases-10<sup>th</sup> Revision.<sup>[8]</sup> Duplicate entry checking was carried out by comparing the data obtained from the Department of Pathology and Laboratory data for all cancer cases that received from the different clinical units and clinics across the region. The diagnoses of the cases were based on the histopathological reports made by some histopathologists with extensive experience. Cancer cases from outside the western region of Libya were excluded from the study.

### Incidence rates and standardized incidence rates

Sex-specific and age-specific incidence rates for the year 2009 was defined as a number of new cancer cases per 100,000 members of the total population alive during the year 2009 in the western region of Libya. The incidence rates of cancer cases were standardized concerning the age and sex distribution of the total population of Libya which was calculated based on the real census performed by Libyan statistics authority in 2006.<sup>[9]</sup> In 2006, the Libyan population was estimated to be around 5,298,152. It comprised 31% of

the age under 15 years, 64.69% between 15 and 64 years and 4.24% above 64 years old. Furthermore, approximately 50.73% of the population were male and 49.27% of females. The sex ratio of the population was 1.029 males to 1.000 females, which is lower than global sex ratio.<sup>[9]</sup>

### Data analysis

Data were analyzed using the SPSS software version 20 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics expressed as mean, standard deviation (SD) and the frequency with percentages were calculated for interval and categorical variables, respectively. Chi-square test between categorical variables and Student's *t*-test for interval variables were used as appropriate. Results were considered to be statistically significant if the two-tailed *P* value was <0.05. Age-standardized rate (ASR) (per 100,000 persons) was calculated using the direct standardized method and world standard population.<sup>[10]</sup>

### Ethical consideration

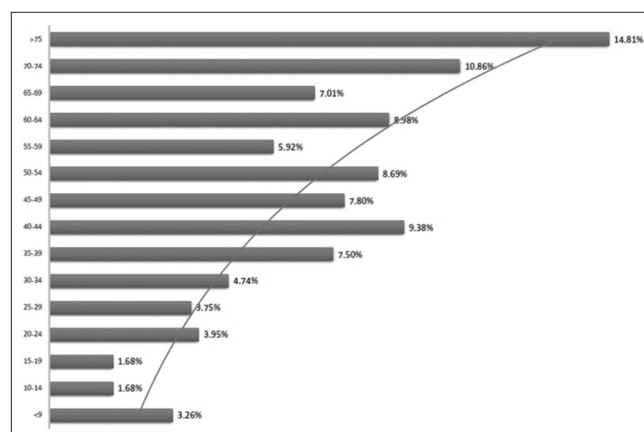
The study was conducted in accordance with the ethical principles of Helsinki Declaration. The protocol was approved by the Biotechnology Ethics Committee (BEC-BTRC-01-2017).

## RESULTS

During the year 2009, 10,119 new suspected cancer patients were admitted to TMC, of whom 7199 cases went through histopathology evaluation, and only 1013 patients were diagnosed and registered as malignancy. Male accounted for 48.3% (489 patients) of the cases, and females for 51.7% (524 patients), with male-to-female ratio of 1.0–1.07. The overall mean age ( $\pm$ SD) at the time of the first diagnosis was  $52.01 \pm 20.36$  years. The age distribution of all cancers and its differentiation according to the gender are presented in Figures 2 and 3, respectively. The elderly age groups of 70 years and above account for more than quarter (26%) of the cancer cases. Table 1 illustrates the frequency of the cancer cases and ASRs per 100,000 person-year, for each age group during the study. Figure 4 shows the principle cancer sites for both genders and for males [Figure 5] and females [Figure 6]. The most frequent cancers in both



**Figure 1:** Map of Libya shows area covered by Tripoli Pathology-based Cancer Registry

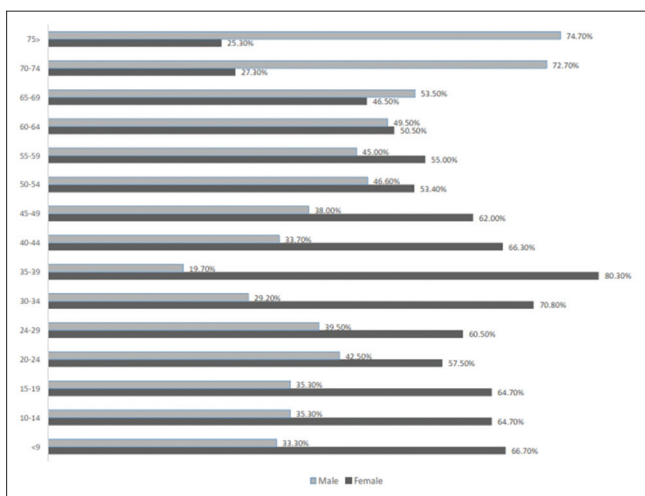


**Figure 2:** Age distribution (%) for all cancers

**Table 1: Total frequency and age-standardized rates per 100,000 person-year (2009)**

| Age group | Cancer number in males | Cancer number in females | Total cancer number | Total male population (year 2006) | Total female population (year 2006) | ASR of male | ASR of female | Total population (year 2006) | Total ASR per 100,000 |
|-----------|------------------------|--------------------------|---------------------|-----------------------------------|-------------------------------------|-------------|---------------|------------------------------|-----------------------|
| <9        | 11                     | 22                       | 33                  | 563,758                           | 539,182                             | 1.95        | 4.08          | 1,102,940                    | 2.992003191           |
| 10-14     | 6                      | 11                       | 17                  | 277,270                           | 265,623                             | 2.16        | 4.14          | 542,893                      | 3.131372112           |
| 15-19     | 6                      | 11                       | 17                  | 290,568                           | 282,458                             | 2.06        | 3.89          | 573,026                      | 2.966706572           |
| 20-24     | 17                     | 23                       | 40                  | 289,663                           | 283,624                             | 5.87        | 8.11          | 573,287                      | 6.97730805            |
| 25-29     | 15                     | 23                       | 38                  | 287,101                           | 279,357                             | 5.22        | 8.23          | 566,458                      | 6.708352605           |
| 30-34     | 14                     | 34                       | 48                  | 248,875                           | 243,953                             | 5.62        | 13.98         | 492,828                      | 9.739706348           |
| 35-39     | 15                     | 61                       | 76                  | 195,328                           | 195,472                             | 7.68        | 31.21         | 390,800                      | 19.44728762           |
| 40-44     | 32                     | 63                       | 95                  | 140,872                           | 140,977                             | 22.71       | 44.69         | 281,849                      | 33.70599151           |
| 45-49     | 30                     | 49                       | 79                  | 100,653                           | 98,489                              | 29.80       | 49.75         | 199,142                      | 39.67018509           |
| 50-54     | 41                     | 47                       | 88                  | 64,677                            | 67,942                              | 63.39       | 69.18         | 132,619                      | 66.35549959           |
| 55-59     | 27                     | 33                       | 60                  | 61,439                            | 60,838                              | 43.95       | 54.24         | 122,277                      | 49.06891729           |
| 60-64     | 45                     | 46                       | 91                  | 51,295                            | 43,832                              | 87.73       | 104.95        | 95,127                       | 95.66158924           |
| 65-69     | 38                     | 33                       | 71                  | 42,724                            | 37,294                              | 88.94       | 88.49         | 80,018                       | 88.73003574           |
| 70-74     | 80                     | 30                       | 110                 | 30,325                            | 27,526                              | 263.80      | 108.99        | 57,851                       | 190.1436449           |
| >75       | 112                    | 38                       | 150                 | 42,965                            | 44,072                              | 260.68      | 86.22         | 87,037                       | 172.3404989           |
| All ages  | 489                    | 524                      | 1013                | 2,687,513                         | 2,610,639                           | 18.19       | 20.07         | 5,298,152                    | 19.11987425           |

ASR: Age-standardized rates

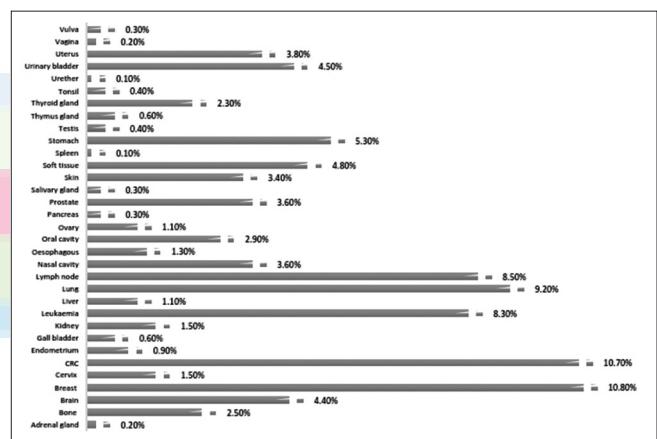


**Figure 3:** Distribution (%) of all cancers by age (years) and gender (males and females)

genders were as follows: breast (10.8%), colorectal (10.7%), lung (9.2%), lymphoma (8.5%), and leukemia (8.3%). In males, they were lung (14.1%), colorectal (11%), leukemia (9.4%), lymphoma (9%), and prostate 7.6%). In females, the most common cancers were breast (20.6%), colorectal (10.5%), lymphoma (8%), uterine (7.4%), and leukemia (7.3%). The most common cancers in females and males are shown in Table 2; these five cancers consisted of 51.7% and 48.3% of all female and male cancers, respectively.

## DISCUSSION

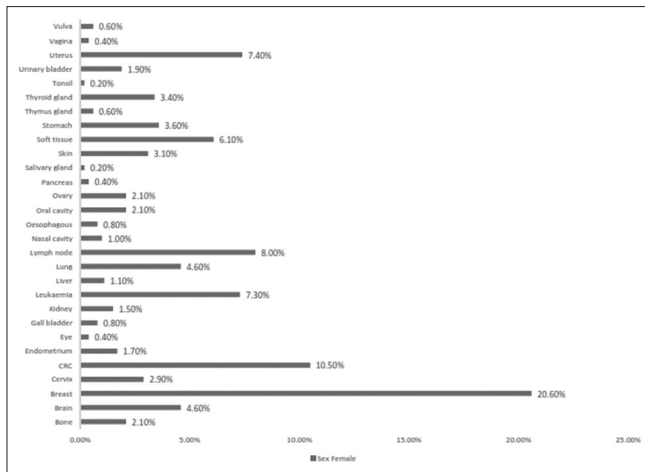
A substantial number of epidemiological studies on cancer incidence have been carried out in Libya to define the magnitude of the problem,<sup>[11-22]</sup> majority of these reports have



**Figure 4:** Distribution (%) according to the sites of primary cancers

not provided age-standardized incidence rate. The cancer registry of Pathology Department at TMC which utilized in this study has originated since 2006 and it has recorded cancer cases that were histopathology-based and almost, all cancers were recorded in the best of circumstances. The first report from this registry was recently published by our group which covered the cancer cases in the western region of Libya during the year 2008.<sup>[21]</sup> We have attempted in this study to provide the incidence rate (using ASR) of different types of cancers in the northeastern region of Libya for the year 2009.

In the present study, the gender ratio (male-to-female) for the incidence of cancer was 0.93 (male-to-female ratio: 1.0–1.07). The high rate of overall cancer cases found among Libyan females was inconsistent with previous reports from Libya. In a study carried out in northwest Libya, of all cancer cases, 51.1% were male and 49.9% female.<sup>[21]</sup> In a study by El Mistiri *et al.* on the epidemiology of cancers in northeast Libya this



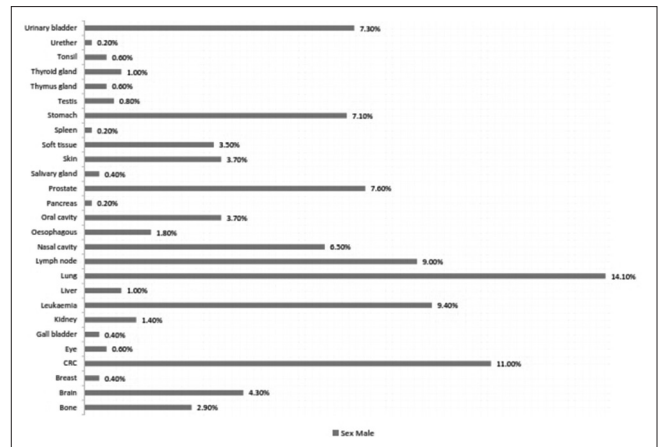
**Figure 5:** Distribution (%) according to the sites of primary cancers in females

male-to-female ratio was 1.2.<sup>[15]</sup> In this regard, it should be noted that in the all-mentioned studies, population gender was not equal.<sup>[22]</sup>

According to the results of the present study, ASR of cancer cases for the northwestern region of Libya in 2009 is 19.13 for both genders (18.19 in males and 20.07 in females). A study on cancer facts and figures in 2014 estimated that the most frequent cancers were prostate, lung, colorectal, bladder, and skin in males; and breast, lung, colorectal, uterine corpus, and thyroid in females, respectively.<sup>[11]</sup> The results of the present study, in this regard, were considerably different, in which only lung, colorectal and prostate cancers in males and breast, colorectal, and uterus corpus in females, are among the top five cancers in the list, respectively. Differences in the types and incidence rate of cancers in different geographic regions are due to of multiple factors. Several studies have identified numerous different types of cancer-causing agents, of which 5%–10% are genetic factors and 90%–95% environmental factors and lifestyle of people.<sup>[23]</sup> Hence, in the present study, the variation in the incidence rates in various types of cancers in the northern west Libya might be related to the mentioned factors.

In general, cancer incidence and mortality rates have been higher in developed countries.<sup>[24]</sup> This may be related to consumption of high-fat dairy products and high red meat diet, and physical inactivity with resulting obesity.<sup>[25,26]</sup> Yet, if dietary and lifestyle factors in lower income groups start to mirror those in higher income groups in the years to come, the differences in cancer incidence and mortality rates may start to be further converge.

Breast is the most common cancer among Libyan female patients with a frequency of 20%. This high rate of breast cancer is similar to the previous reports from Libya<sup>[12,14,15,17]</sup> and elsewhere.<sup>[27]</sup> It should be noted that only patients with breast cancer who have histological diagnosis were included in the analysis. Despite some controversy, studies show that



**Figure 6:** Distribution (%) according to the sites of primary cancers in males

**Table 2: Distribution of the most common cancers by gender during the year 2009**

|                     | Rank   |            |          |          |          |
|---------------------|--------|------------|----------|----------|----------|
|                     | 1      | 2          | 3        | 4        | 5        |
| <b>Females</b>      |        |            |          |          |          |
| Cancer              | Breast | Colorectal | Lymphoma | Uterus   | Leukemia |
| Frequency (%)       | 20.6   | 10.5       | 8        | 7.4      | 7.3      |
| <b>Males</b>        |        |            |          |          |          |
| Cancer              | Lung   | Colorectal | Leukemia | Lymphoma | Prostata |
| Frequency (%)       | 34.1   | 11         | 9.4      | 9        | 7.8      |
| <b>Both genders</b> |        |            |          |          |          |
| Cancer              | Breast | Colorectal | Lung     | Lymphoma | Leukemia |
| Frequency (%)       | 10.8   | 10.7       | 9.2      | 8.5      | 8.3      |

breast cancer screening with mammography saves lives.<sup>[28]</sup> Routine breast cancer screening does not help prevent breast cancer, but it can help find cancer early when it is most treatable. Based on the present study finding, it is logical to recommend such screening in Libya for the most women, and regular mammograms can begin at the age of 40, but specific recommendations vary by age and risk.<sup>[29]</sup>

The present study shows that colorectal cancer is the second most common cancer in both males and females. This finding is in agreement with previous studies from Libya which demonstrate that colorectal cancer is the most prevalent gastrointestinal malignancy in Libyan males and females.<sup>[12,13]</sup> Furthermore, the pattern of male-to-female ratio observed in the present study was comparable to those identified in earlier studies from Libya.<sup>[12,19]</sup> In contrast to western data,<sup>[30]</sup> wherein there is a significant preponderance of male distribution. Moreover, a recent study from eastern Libya illustrated that the majority of colorectal cancer patients were diagnosed in locally advanced or metastatic stage.<sup>[19]</sup> To achieve early detection of colorectal, a comprehensive cancer education program and a stricter adaption of a screening program for early detection as well as a screening of high-risk population for colorectal should be considered in Libya.



Age impacts colorectal cancer incidence more than any other demographic factor. Previous studies show that the incidence of sporadic colorectal cancer increases dramatically above the age of 50 years for all age groups.<sup>[31]</sup> The results in the present cohort suggested an older age distribution of colorectal cancer; this is in harmony with western reports which emphasized that >80% of colorectal cancer occurs above 50 years of age.<sup>[31]</sup>

Lung cancer is the first common single cancer among Libyan male patients (13.1%) and the third cause in both sexes (9.4%). This is similar to the findings reported from previous studies in east and west Libya. It is most likely due to the increase in smoking habits and industrial pollutions, but the improvements in diagnostic facilities, as well as referral, play an additional role. The smoking habit is high in Libya, and it is increasing with time. A recent study from North Africa including Libya examined the association between advertising/promotions exposure and adolescent cigarette smoking risk in North Africa, and possible mediation of this association by parent and peer smoking.<sup>[32]</sup> More significant increase in the incidence of lung cancer is expected in the coming years. Hence, additional measures are needed for tobacco control in Libya.

Non-Hodgkins lymphoma and leukemia are the fourth and fifth common neoplasm found in both sexes followed by gastric cancer. A study from eastern Libya describes the clinicopathological features of primary gastric cancer and found the majority of patients were diagnosed in locally advanced or metastatic stage of the disease;<sup>[17]</sup> Moreover, a clear association of *Helicobacter pylori* with intestinal type of gastric adenocarcinoma was found as in findings from other countries.<sup>[33,34]</sup>

The limitation of the present study is the data collected from the Cancer Registry of Pathology Department of a tertiary center which is limited to age, sex, and type of cancer. It lacks information related to patients' occupation, socioeconomic status, education, lifestyle family history, and risk factors for cancer development. However, Tripoli as a capital city of Libya has its inhabitants drawn from most of the Libyan regions, especially the western and southern Libya. It is the largest city by population and TMC is considered the largest hospital in Tripoli as well as the entire country. Hence, it remains a good option to select as representative population for inhabitants of western Libya.

## CONCLUSION

Breast cancer was the most common cancer found in females and lung cancer in males followed by colorectal cancer in both sexes. Despite the present study comprises only 1 year (2009) of data, the information presented provides a reasonably accurate description of cancer incidence in the western Libya and can contribute to a better understanding of the epidemiology of various cancers in Libya and consequently provide a useful guide for the decision-makers to construct efficacious decisions about cancer control program and policies in Libya.

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## Conflicts of interest

There are no conflicts of interest.

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