

## ARTICLE

# Cancer Incidence in Western Libya: First Results from Tripoli Medical Center

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## Abstract

**Background.** Cancer is a major problem and monitoring of its incidence is important. **Aim:** To estimate cancer incidence in western Libya. **Methods:** Data were collected retrospectively from Tripoli Medical Center during 2008. Classification of cancer diagnosis was made according to the International Classification of Disease. **Results:** A total of 1051 cancer cases were found (50.1% males and 49.9% females). Age-wise, 31% were younger than 15 years, 64.6% between 15 and 64 years and 4.2% above 64 years old. In females, most common cancers were breast (23.7%), colorectal (9.4%) and uterine (8.6%). In males, they were lung (15.6%), colorectal (12.3%) and prostate (9.9%). In females there were two peaks (in age group 40-44 and in those older than 75). **Conclusions:** Cancer incidence in western Libya increases with age. Most common cancer in men was lung cancer and in women was breast cancer. Further larger studies are needed to confirm such findings. Public health education, including antismoking and tobacco

control, as well as awareness campaigns regarding early detection of cancer are needed to reduce cancer mortality.

**Keywords:** Cancer, Western Libya, Lung, Breast, Epidemiology, Cancer incidence.

## Introduction

Cancer is a major cause of death worldwide including Libya. New cancer cases and cancer deaths have steadily increased. e.g. new cases increased from 12.7 in 2008 to 14.9 millions. Cancer deaths increased from 7.6 in 2008 to 8.2 million deaths estimated for 2012 (1,2). The most common cancer deaths are from lung (1.59 million deaths), liver (745000 deaths), stomach (723000 deaths), colorectal (694000 deaths), breast (521000 deaths) and esophageal (400000 deaths) (1) cancer. In developed countries, cancer incidence patterns have been studied well (3,4), but less is known in the developing countries, especially using population-based registration data (5). In Libya, accurate

and continuous incidence studies are lacking. Studies have covered only parts of Libya such as the eastern part (6-8).

For informed and proper planning of health care services such as those related to screening, prevention, early diagnosis and treatment, accurate data is needed. Cancer registries are being developed and these may be used to help bring incidence figures and distribution figures together as one step towards developing national system and plan for cancer studies and management. Regional comparisons can also be made for example: in certain cancers such as colorectal cancer, similar incidence and gender distribution were found in Libya and Tunisia (9).

Changes in cancer types, distribution and outcomes may also provide an insight into possible associations with changes that took place in a community when studies conducted at different points of time are compared. Thus, it is of utmost importance to report current situation with incidence of various types of cancer in larger part of Libya, i.e. western part which is lacking up to date information. To our knowledge, there is no published study on cancer

incidence in western Libya and hence this study was carried out.

**Materials and Methods**

In a retrospective manner, data was collected from Tripoli Medical Center (TMC) registry. The biggest teaching hospital in Libya with capacity of more than 1200 beds. The majority of cancer cases from western Libya were included in the registry of this center, during the year of 2008. In 2006, the Libyan population was estimated to be about 5,298,152. It comprised 31.00% of the age under 15 years, 64.69% between 15 and 64 years and 4.24% above 64 years old. Also approximately 50.73% of the population were males and 49.27% females. Sex ratio of the population was 1.029 males to 1.000 females, which is lower than global sex ratio (10).

All cancer cases were coded using the International Classification of Diseases (ICD). Duplicate entry checking was done by comparing the data obtained from the department of pathology and laboratory for all cancer cases with that received from the clinical units of

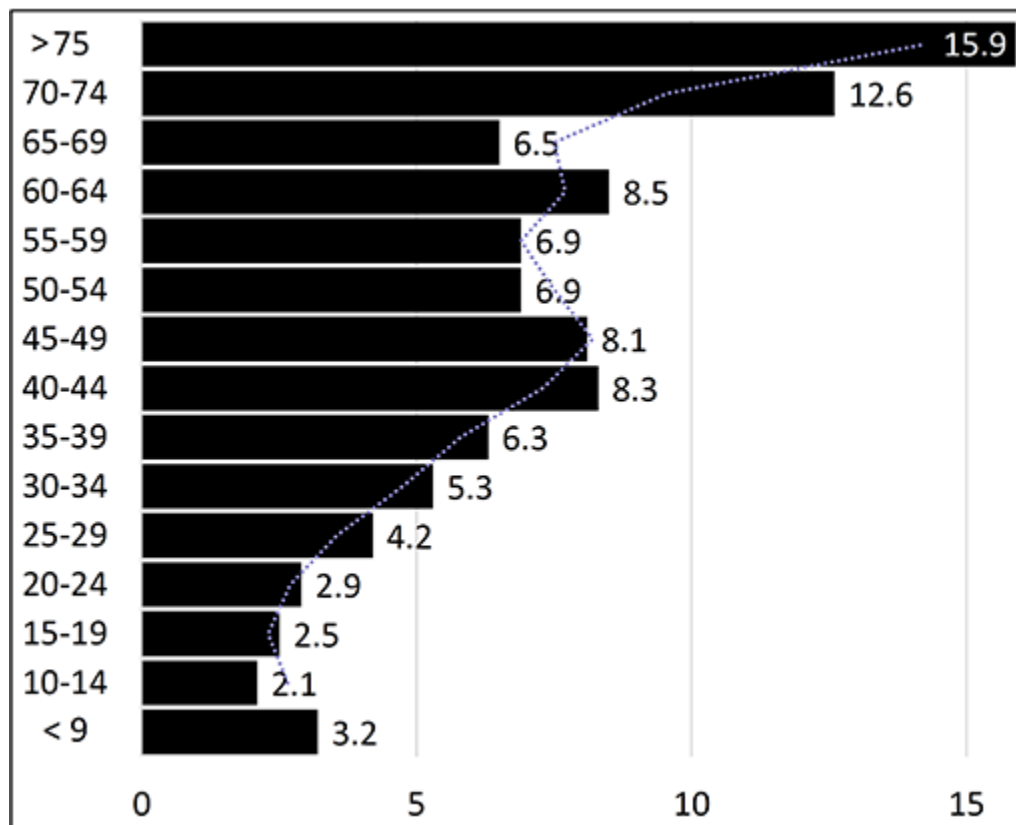
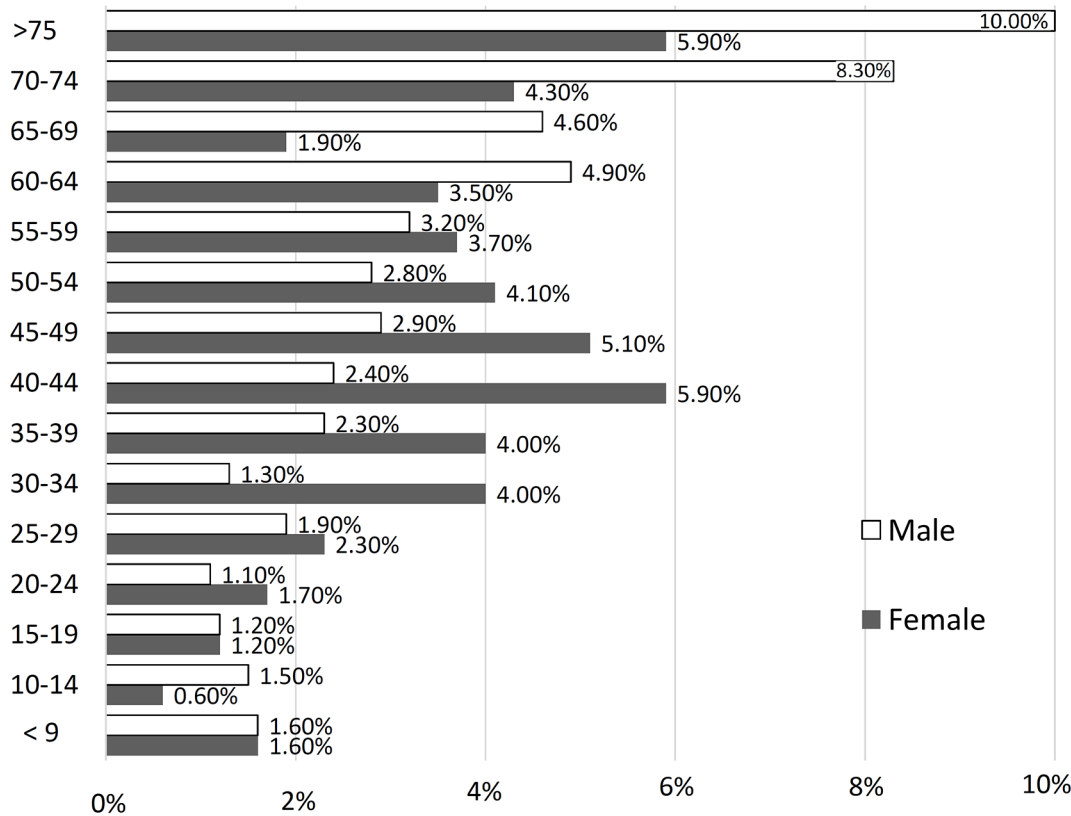


Figure 1. Distribution of cancer cases in 2008 in western Libya according to age.



**Figure 2.** Distribution of cancer cases in western Libya in 2008, by age group differentiating males and females.

the hospital. This cancer registry database was used to identify all cases of cancer by ICD 10 in western Libya. Information obtained from computer records comprised age, sex, date of diagnosis, site of the cancer and ICD 10. According to ICD-10, malignant neoplasms were coded between (C00 – C97). The diagnoses of the cases were based on the histopathological reports made by a number of histopathologists with extensive experience. We have excluded the non-Libyan cases and the cases outside the western regions of Libya.

Data were analyzed using the SPSS software and expressed as mean and standard deviation (SD) unless otherwise indicated. Student t-test was used to establish the significance of differences between mean values of two continuous variables. Whenever  $p < 0.05$  difference was considered significant. The study was approved by the Biotechnology Ethics Committee (BEC-BTRC-01-2017).

## Results

A total of 1051 cancer cases were registered in TMC during 2008 (50.1% were males, and 49.9% were females).

Although cancer incidence appeared to be more with increasing age for the whole patients population (Figure 1), however, it seems that there are two peaks in case of female patients (Figure 2).

The most common tumors were breast cancers (12.1%), followed by colorectal (10.8%) and lung (10.2%) (Fig. 3). In males, the most common tumors were lung cancer (15.6%), followed by colorectal cancer (12.3%), and prostate cancer (9.9%) (Figure 4b), while in females, they were breast cancer (23.7%), followed by colorectal cancer (9.4%), and uterine cancer (8.6%) (Figure 4a).

The age standardized rate (ASR) in 2006 was 19.8 per 100,000 and was higher for women (20.1 per 100,000) compared to men (19.6 per 100,000) (Table 1).

## Discussion

The incidence rate of most cancer types in the western region of Libya was remarkably lower than the eastern region. In certain cancers, the incidence was much higher than the surrounding countries, especially for breast cancer

**Table 1.** Age standardized rate (ASR) of Libyan cancer patients by sex and age group /100,000 population in the year 2006

Age Group	Male	Female	Total	Total population M 2006	Total population Female 2006	Age Standard Rate male per 100000	Age Standard Rate female per 100000	Total population 2006	Age Standard Rate Total Per 100000
≤9	17	17	34	563758	539182	3.015478273	3.152924245	1102940	3.08267
10-14	16	6	22	277270	265623	5.770548563	2.258840537	542893	4.052364
15-19	13	13	26	290568	282458	4.47399576	4.60245417	573026	4.537316
20-24	12	18	30	289663	283624	4.14274519	6.346430485	573287	5.232981
25-29	20	24	44	287101	279357	6.966189599	8.591157551	566458	7.767566
30-34	14	42	56	248875	243953	5.625313913	17.21643103	492828	11.36299
35-39	24	42	66	195328	195472	12.2870249	21.4864533	390800	16.88843
40-44	25	62	87	140872	140977	17.74660685	43.97880505	281849	30.86759
45-49	31	54	85	100653	98489	30.79888329	54.828458	199142	42.68311
50-54	29	43	72	64677	67942	44.83819596	63.28927615	132619	54.29086
55-59	34	39	73	61439	60838	55.33944237	64.10467142	122277	59.70052
60-64	52	37	89	51295	43832	101.374403	84.41321409	95127	93.55914
65-69	48	20	68	42724	37294	112.349031	53.62792943	80018	84.98088
70-74	87	45	132	30325	27526	286.8920033	163.481799	57851	228.1724
≥75	105	62	167	42965	44072	244.3849645	140.6788891	87037	191.8724
Total	527	524	1051	2687513	2610639	19.60920747	20.07171424	5298152	19.83711

(in females) and colon cancer (for both sexes) (8). The age-standardized incidence rate for all sites combined (except nonmelanoma skin cancer) was 118 per 100,000 for men and 95 per 100,000 for women in 2003 (7). Our results are in agreement with several studies from Jordan, Egypt (11), Saudi Arabia (12), and Korea (13), which showed that cancer incidence rates were much higher in men than in women. This is probably related to unhealthy life style and habits such as smoking which are much more common among males and compared to females. However, with increasing smoking among women, and for other reasons it seems that the incidence in males and females are getting more alike.

In North Africa, it was observed that the overall cancer rate, e.g. age standardized on world population ranges in men from 94.0/100,000 to 162.9/100,000, and in women from 84.7 to 164.0/100,000 (13). The most common cancers are similar to those observed in Europe, i.e. lung, breast, colon and prostate but different from subsaharan Africa where infection-related cancers are predominant (13).

In the current study, the most common cancers in males were lung (15.6%), colorectal (12.3%), prostate (9.9%), urinary bladder (7%) and stomach (5.5%) (Fig. 4b). While in females, they were breast cancer (23.7%), colorectal (9.4%), uterus (8.6%), soft tissue (5.3%) and stomach (5.2%) (Figure 4a). A study looking at cancer cases during the period 2003-2005 in eastern Libya (15), found comparable results. The most common cancers in men were lung (18.9%), colorectal (10.4%), bladder (10.1%), and prostate (9.4%). In women, they were breast (23.2%), colorectal (11.2%), uterine body (6.7%), and leukemia (5.1%) were the most common cancers (15). The origin-wise distribution of cancer in the present study follows to a large extent international pattern (Figure 3), with the most common cancers being breast (12.1%) followed by colorectal (10.8%) and lung (10.2%).

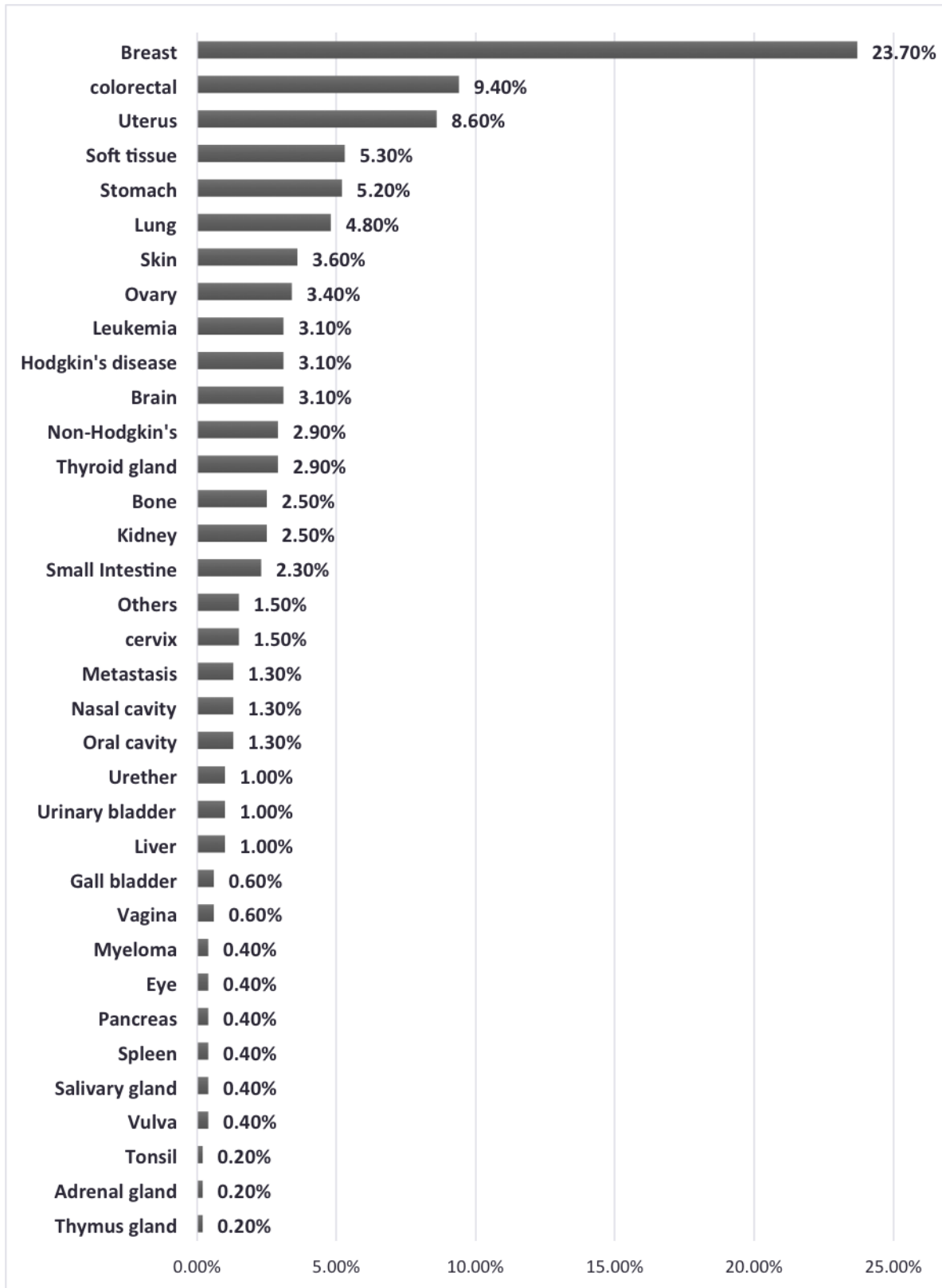
In 2012, in a study of cancers in eastern Libya (8), some changes seemed possible as it was observed that in men cancer of colon accounted for 22.3%, followed by lung (20.3%), prostate (16.1%), pancreas (4.2%) and liver (4.2%). In women, breast cancer (41.5%), remained the most common followed by colon cancer (16.4%), uterine (8%), ovary (5.5%) and pancreas (3.1%). In 2012, records of the main oncology clinic in eastern Libya, colorectal cancer was found to be the second most common cancer, forming 19% of malignancies, with fluctuation in ranking

and incidence in different cities/villages (16). Accordingly, it was felt that Libya may have the highest rate in North Africa.

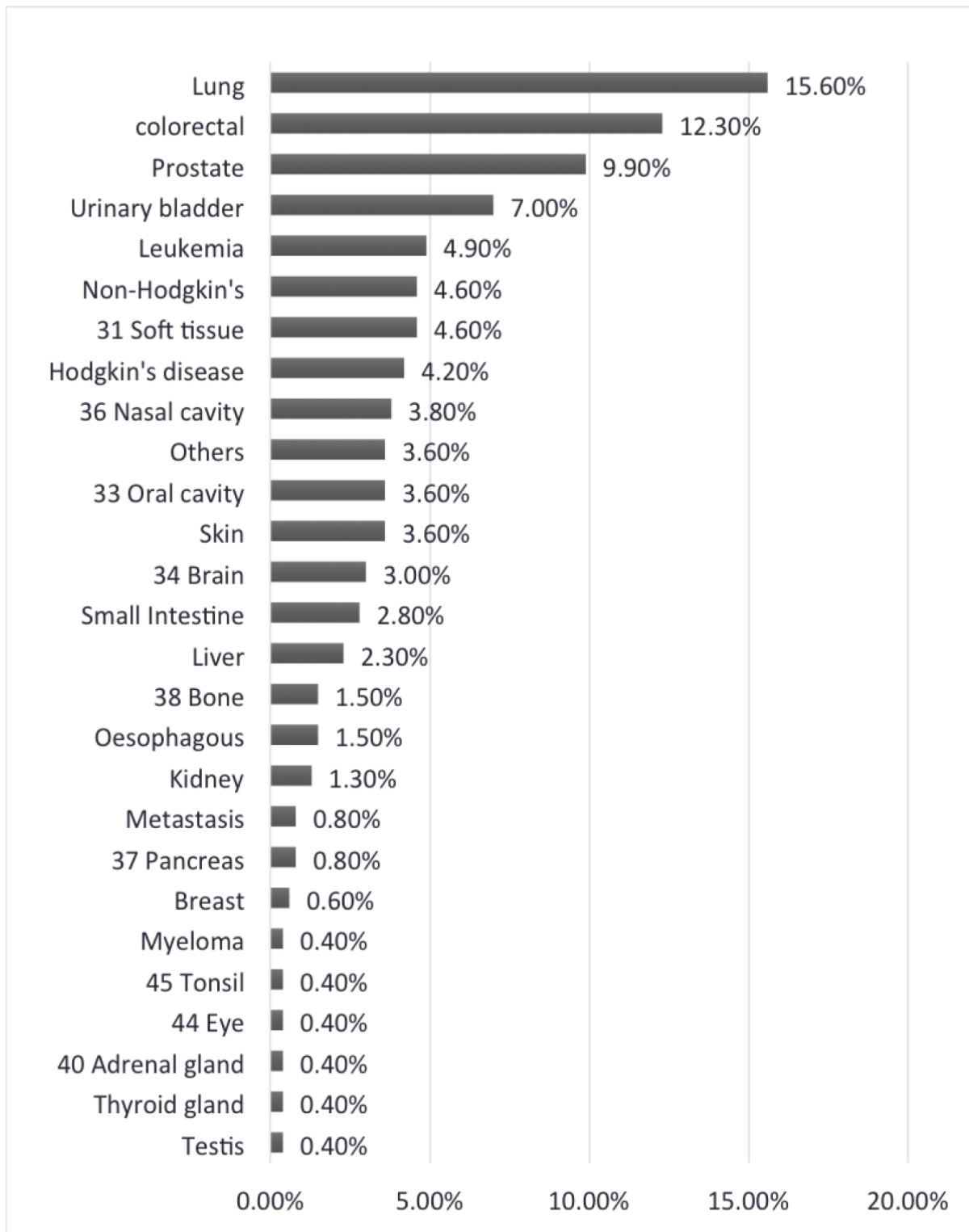
Earlier, in 1981-1985 (17), although lung cancer was the most common among males (22.4%) and breast cancer among females (29.8%), other types had different incidence, e.g. ovarian cancer was 7.8%, colorectal cancer was 4.6%, primary tumors of liver 1.9% and bladder was 0.5%.

One can notice the increase in the percentage of colorectal cancer. There might be several reasons that are related to changed lifestyle especially diet with decreased roughage and increased consumption of soft and sweet diet and drinks. This may well be related also to flora and other bacteria colonizing large intestine and their related secretions and toxins with prolonged intestinal transit because of reduced fiber in diet and consequent prolonged exposure of mucosa to such changes. A recent review (18), Enteropathogenic *Escherichia coli* (EPEC) was blamed of secreting various toxins that can weaken, usurp, and use many host cellular systems. A recent study revealed EPEC in colorectal cancer patients which colonised intracellularly in colon mucosa of colorectal carcinoma whereas extracellular strain was found in mucosa of normal colon cells. The evidence on the role of dietary fibre in colorectal cancer aetiology has been recently upgraded by experts from probable to convincing (19). A serious cause for major concern in Libya that the majority of colorectal cancer patients especially in Benghazi, were diagnosed at a late stage. Therefore, a comprehensive cancer education program and screening of high risk patients should be considered in this part of Libya (20).

Lung cancer is a major health issue both in the western and in the eastern parts of Libya. In 2012, worldwide, there were , there were 1.82 and 1.59 million new lung cancer cases and deaths worldwide, respectively (21). Breast cancer remains the most common cancer for females in both the western and eastern regions of Libya (6-8). The incidence of gastrointestinal cancers, including carcinomas of the liver, and esophagus was similar in both regions. The observed minimal differences in the prevalence of some cancers in both regions may attributed to similar environmental factors, lifestyle, and eating habits. Clear differences in cancer incidence rates between the western and the eastern parts of Libya were observed, mainly for skin melanoma, which is usually associated with race and sunburn. For instance, the incidence of prostate cancer in



**Figure 4A.** Cancer distribution according to site of primary cancer showing incidence rates for all cancer sites in western Libya in 2008 among females



**Figure 4B.** Cancer distribution according to site of primary cancer showing incidence rates for all cancer sites in western Libya in 2008 among males.

the eastern region was found to be about 8% per 100,000 (7) or 16.1% per 100,000 (8), while that in the west it was only 9.9%. Previously, the incidence of colorectal cancer in both males and females was found to be similar with Tunisian patients (9).

This study has its limitations, such as non-inclusion of detailed information regarding coverage area and age data in cancer registries and coverage of the whole of Libya. Mortality rates and other possible etiological associations should be examined in future studies. However, Tripoli, as a capital, has its inhabitants drawn from most of Libyan regions especially the western and southern Libya. It is the largest city by population and TMC is considered the largest hospital in Tripoli and as well as the entire country. It thus, remains a good choice to select as representative population for inhabitants of western Libya.

The incidence rate of cancer cases increased with increasing age in most cancer types (Figure 1 and 2), which is expected. However, when comparing (22) average age of some cancers like breast between Libyan patients and patients from the subsaharan Africa (e.g. Nigeria) and Northern Europe e.g. Finland, it was found to occur at earlier ages in Libya and Nigeria when compared to Finland. Looking at figure 2 in this study one can clearly see that there are two peaks for cancer in females, one at the age of 40-44 and the other in those older than 75 years. The former may be contributed to by breast cancer which comprises 23.7% of all cancers affecting females between 1981 and 1985, where majority of females with breast cancer in Libya were found to be of a younger age group (72.3% below 50 years) (17).

A recent review (23) that looked at cancer in north Africa, it indicated that infection-related cancers are common in North African countries (Morocco, Algeria, Tunisia, Libya and Egypt), due to infections such as *H. pylori*, hepatitis B virus, hepatitis C virus and human papilloma virus. It has found that infection-related cancers most commonly comprise bladder cancer, cervical cancer, liver cancer, stomach cancer, and nasopharyngeal cancers. However, the above study did not restrict publication dates, which may affect the outcome as lifestyle and healthcare are changing for instance, in one study in eastern Libya, *H. pylori* infection was found to be associated with gastric cancer (24).

In conclusion, cancer incidence in western Libya is lower than in eastern Libya, but it remains within the reported

range for North African countries. Increases in incidence with age. The most commonly found cancers in the western and the eastern regions are those of lung, breast, and colon, while pancreas and ovary are less commonly seen in western than in the eastern region. Lung cancer was the most frequent cancer diagnosed in men and breast cancer in women. Larger national epidemiological and etiological association studies are needed. Plans should be carefully made to improve health strategies and cancer prevention and screening plans to guide scientific research applicable to Libya's socioeconomic status. Public health education, including antismoking and tobacco control, as well as awareness campaigns regarding early detection of cancer are very important to reduce cancer mortality.

There are other limitations of the study due to the lack of information about the family history of cancer, lifestyle habits, mean of BMI. All these information were hard to find. However, this is the best of what can gather as a start to document and study.

#### **Disclosures**

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#### **Authors Contribution**

All authors contributed to the conduct of the research and preparation of the manuscript. They all endorsed the final version of the article.

#### **Compliance with ethics principles**

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

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