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REVIEW ARTICLE

Oral cancer in Libya and development of regional oral cancer registries: A review



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Abstract The aims of this paper are three-fold: (1) to summarize the current epidemiological data on oral cancer in Libya as reported in the published literature and as compared to other national oral cancer rates in the region; (2) to present both the history of the early development, and future goals, of population-based oral cancer tumor registries in Libya as they partner with the more established regional and international population-based cancer tumor registries; and, (3) to offer recommendations that will likely be required in the near future if these nascent, population-based Libyan oral cancer registries are to establish themselves as on-going registries for describing the oral cancer disease patterns and risk factors in Libya as well as for prevention and treatment. This comprehensive literature review revealed that the current baseline incidence of oral cancer in Libya is similar to those of other North Africa countries and China, but is relatively low compared to the United Kingdom, the United States, and India. The recently established Libyan National Cancer Registry Program, initiated in 2007, while envisioning five cooperating regional cancer registries, continues to operate at a relatively suboptimal level. Lack of adequate levels of national funding continue to plague its development. . .and the accompanying quality of service that could be provided to the Libyan people.

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1. Background and aims

A cancer registry is an organization which systematically collects, stores, analyzes, interprets and reports data on subjects with cancer. There are two main types of cancer registries: hospital-based cancer registries and population-based cancer registries (dos Santos Silva, 1999; Morse et al., 1995; O'Brien et al., 2013; Pollock and Birch, 2008).

Hospital-based cancer registries deal with recording information of cancer patients seen in a particular hospital. The data collected are mainly used for administrative purposes and for evaluating clinical performance. To a certain extent; these data may benefit epidemiological purposes, the main limitation being that hospital-based registries usually cannot define their catchment populations as a geographically defined source for all their cases. In contrast, population-based cancer registries deal with data collection on all new cases of cancer occurring within a well-defined population living in a well-defined geographical region. This critical characteristic allows population-based registries to fulfill their main purpose which is to produce useful epidemiological data, specifically prevalence and incidence statistics on cancer burden that are vital in establishing public health priorities for a defined geographical, and usually politically-defined, population. Further, these data from population-based registries are also useful both for the planning and conducting of etiological studies into the causes of cancer for that well-defined population, as well as for monitoring and analyzing the efficacy of implemented cancer control activities on that population (dos Santos Silva, 1999).

The first population-based cancer registry in the world was set up in Hamburg, Germany in 1926. Based upon routine visits at regular intervals to both hospitals and medical practitioners in that city, new cancer patients identified and recorded with those data transferred to a central listing in the registry which was compared weekly with official death certificates. Subsequently, with Hamburg serving as the model, two state cancer registries were then established in the United States, one for New York State in 1940, the other in Connecticut in 1941 (but with registered cases retrospectively collected back to 1935). The public health value of these early population-based registries for both the study and control of cancer led, over the next 15 year period, to the rapid growth of population-based cancer registries around the world, with approximately 20 being established in various countries by 1955 (dos Santos Silva, 1999). This growth continued and even

accelerated over the next 70 years until at present in 2013, more than 300 population-based cancer registries, which collectively cover about 11% of the world's population, exist world-wide (Curado et al., 2007).

The availability of these world-wide data from population-based cancer registries, and the rapid development of established standardized protocols for the collection of those data across these registries, led to the centralized publishing of these cancer data from these worldwide cancer registries within the Cancer Incidence in Five Continents series of monographs (CI5, 1966–2013). This centralized reporting and publishing via CI5 monographs began with Volume I which was published in 1966 and reported on worldwide cancer statistics from 1960 to 1962 covering 35 populations as reported from 32 population-based registries in 29 countries. There are now ten volumes published by CI5, the latest being Volume X published in 2013 and which reported on cancer statistics from 2003 to 2007 now covering more than 300 populations as reported from 290 registries in 68 countries (Curado et al., 2007; Forman et al., 2013).

Table 1 shows the history of the North Africa geographical regional coverage in the ten successive volumes of CI5, which has been both recent and sporadic (Curado et al., 2007; Forman et al., 2013). The initial North Africa regional contributions to the CI5 dataset appeared in Volume VI which first reported on 1986–89 cancer statistics from the Sétif Cancer Registry in Algeria and then again on Volume VII on the 1990–93 cancer statistics. A second North Africa site, the regional cancer tumor registry in Algiers, Algeria contributed cancer data in Volume VIII of the CI5 monograph series for cancer statistics from 1993 to 1997. In CI5 monograph series published in 2007, three North Africa cancer registries contributed 1998–2002 cancer statistics to Volume IX, these data coming from the initial-regional contributor, the one in Sétif, Algeria, and two first-time contributors, the cancer registries in Gharbiah in Egypt and the Central Region in Tunisia. Most recently, four North Africa cancer registries contributed to the latest CI5 monograph series; the two cancer registries in Sétif, Algeria and Gharbiah, Egypt contributed data for cancer statistics from 2003 to 2007 and two contributors where for the first time, Benghazi Cancer Registry in Libya along with North Registry in Tunisia contributed data for cancer statistics from 2003 to 2005 to CI5 monograph series.

The aims of this paper are tri-fold: (1) to summarize the current epidemiological data on oral cancer in Libya as reported in the published literature and as compared to

Table 1 North Africa geographical coverage in the ten successive volumes of cancer incidence in five continents.

Cancer Registries	Vol. I	Vol. II	Vol. III	Vol. IV	Vol. V	Vol. VI	Vol. VII	Vol. VIII	Vol. IX	Vol. X
Algeria, Algiers	–	–	–	–	–	–	–	1993–97	–	–
Algeria, Sétif	–	–	–	–	–	1986–89	1990–93	–	1998–2002	2003–2007
Egypt, Gharbiah	–	–	–	–	–	–	–	–	1999–2002	2003–2007
Libya, Benghazi	–	–	–	–	–	–	–	–	–	2003–2005
Tunisia, Central Region	–	–	–	–	–	–	–	–	1998–2002	–
Tunisia, North	–	–	–	–	–	–	–	–	–	2003–2005

Curado et al. (2007), Forman et al. (2013).

other national oral cancer rates in the region; (2) to present both the history of the early development, and future goals, of population-based oral cancer tumor registries in Libya as they partner with the more established regional and international population-based cancer tumor registries; and (3) to offer recommendations that will likely be required in the near future if these nascent, population-based Libyan oral cancer registries are to establish themselves as on-going registries for describing the oral cancer disease patterns and risk factors in Libya as well as for prevention and treatment.

2. How the literature search was conducted

Representative relevant publications were surveyed from searches in the Pubmed, Dentistry and Oral Sciences Source (DOSS) and Embase databases, as well as Google Scholar, and local resources were contacted. Search terms included oral cancer, mouth cancer, tongue cancer, oral neoplasms, mouth neoplasms, tongue neoplasms and Algeria, Egypt, Morocco, Sudan, Tunisia, Western Sahara, Algiers, Tangier, Tunis, Cairo, Casablanca, Khartoum, Rabat, Libya, Libyan, Benghazi, Tripoli, Bayda, Musrata, Sabha, Sabratha. Publication type and language type limits were not applied to results, and the time period searched was from the beginning of available database coverage (Pubmed 1946, DOSS 1946, Embase 1974) through November 2013. The retrieved information and articles were reviewed and cited with the focus on oral cancer in Libya.

3. A quick overview picture of Libya, the country

Libya, the second largest of the five North Africa countries located on the coast of the Mediterranean Sea with a total area of 1.8 million square kilometers of landmass, not only has the lowest absolute total population (6.6 million) of these five countries, but also has—by far—the lowest population density of these five, e.g., a population density of 3.7 persons/km² as compared to regional population densities in the other North African countries which range from highs of 80.4/km² in Egypt, 70.8/km² in Morocco and 66.7/km² in Tunisia down to 14.5/km² in Algeria (Wiki/North Africa, 2015).

This sparse Libyan population is distributed unevenly (90% of its people live in 10% of its landmass) with over than two thirds living in the coastal areas where the population density (mostly concentrated in the largest two cities of Tripoli and Benghazi) is about 50/km², as compared to a density of < 1

person/km² for those Libyans living in nomadic or semi-nomadic groups in the vast non-coastal desert areas which make up 90% of Libya's landmass (Library of Congress, lweb2, 2005). About 97% of the Libyan population is Sunni Muslim, of Arab and Berber extraction, distributed across some 140 tribes and clans.

4. Oral cancer in Libya: chronological findings from published epidemiological articles and reports

The earliest published epidemiological article with descriptive data on oral cancer in Libya was a 2001 article that analyzed cancer mortality rates based upon 1221 cancer deaths across the full spectrum of cancers occurring in Libya between 1991 and 1996 (see Table 2a), and reported that cancer deaths for all sites combined constituted 8.7% of all deaths with an overall age-standardized cancer mortality rate of 76.5 per 100,000. This report only tangentially included a very limited picture of oral (i.e., lip, oral cavity and pharynx) cancer mortality which they reported ranked as 11th in cancer mortality in Libya during this five year period. While reporting that oral cancers accounted for only 1.7% of all cancer deaths in Libya, they did nevertheless pointedly state in their small section on oral cancer that “further investigations to isolate the relative importance of risk factors, causes and pre-cancerous conditions” would be required to facilitate effective preventive programs targeting oral cancers (Singh and Al-Sudani, 2001).

That first epidemiologic article focused solely on oral cancers in Libya was a case series report published in 2005 on 75 Libyan cases of intraoral minor salivary gland tumors that had occurred between 1977 and 2000 (see Table 2a), as based upon records in the Faculty of Dentistry at Benghazi. While this study found that pleomorphic adenoma was the most predominant minor salivary gland tumor constituting 30.6% of all cases (which confirmed the ‘type of tumor’ findings as previously reported in most published studies worldwide), the frequency detected in Libya was lower than those reported elsewhere with its peak occurrence in both males and females being in the fourth decade. The next most common tumor reported was mucoepidermoid carcinoma (25.3% of all cases). In all, 61.3% of all cases of minor salivary gland tumor was malignant with the palate being the most common site (Jaber, 2006).

As with most developing countries, Libya has no well-established population-based cancer registries covering the entire population nor has it any comprehensive system for death registration. The Benghazi Cancer Registry (BCR), a population-based cancer registry that had been established in

Table 2a Summary of published findings of oral cavity and pharynx cancer in Libya listed in chronological order based on date of publication. Summary of journal-published articles:

Year of publication	Published series/author(s)	Region(s) reported on	Age group reported	Oral cavity and pharynx tumor/cancer reported	Major findings reported
2001	R. Singh, Al-Sudani O.E. Cancer mortality in Benghazi, Libya 1991–96	Benghazi, Libya	All	Oral cavity and pharynx cancer (Other cancers reported)	<ul style="list-style-type: none"> All cancer mortality constituted 8.7%, ($n = 1221$) of all deaths Oral and pharynx cancer ranked the eleventh 1.7% of all cancer deaths
2005	M.A. Jaber 1977–2000	Benghazi, Libya	15–86	Minor salivary gland tumors	<ul style="list-style-type: none"> The two leading tumors: Pleomorphic adenoma 30.6%, mucoepidermoid carcinoma 25.3% % malignancy 61.3%
2006	Mufid El Mistri et al. 2003 “1st cancer incidence report from BCR”	Eastern Libya, BCR	All	Oral cavity and pharynx cancer (Other cancers reported)	<ul style="list-style-type: none"> It accounted for 4% of all cancers in males It accounted for 2.2% of all cancers in females
2008	M. Elarbi et al. 1991–2007, 17 years review; 1st article	Benghazi, Libya	0–18	Orofacial tumors	<ul style="list-style-type: none"> % of all tumor cases: malignant 3.7%, benign odontogenic 16.4%, benign non odontogenic 79%
2009	R. El Gehani et al. 1991–2007, 17 years review; 2nd article	Benghazi, Libya	All	Benign orofacial tumors	<ul style="list-style-type: none"> % of all benign tumors: <ul style="list-style-type: none"> Odontogenic 36.5% Non odontogenic 63.5%
2009	K. Subhashraj et al. 1991–2007, 17 years review, 3rd article	Benghazi, Libya	All	Primary malignant orofacial tumors	<ul style="list-style-type: none"> % of cancer origin out of all cancer cases: <ul style="list-style-type: none"> Epithelial 82% Mesenchymal 7% Immune system 11%
2009	R. Zanetti et al. “Review of North Africa cancer registries data”	Regional reports from North Africa: <ul style="list-style-type: none"> Morocco 2005 Algeria ‘98–2002 Tunisia ‘99–2003 Libya 2004 Egypt ‘99–2002 Compared to: <ul style="list-style-type: none"> Pool Europe ‘98–2002 	All	Nasopharynx (Other cancers reported)	ASIR in North Africa countries; in Morocco, Algeria, Tunisia, Libya: <ul style="list-style-type: none"> Male: range 3.4–5.4 Female: range 1.4–1.9 While in Egypt: <ul style="list-style-type: none"> Male: 1.2 Female: 0.4 Pool Europe: <ul style="list-style-type: none"> Male: 0.5 Female: 0.2
2010	M.A. Jaber, S.H. Abu Fanas 1979–2004	Benghazi, Libya	All	Squamous cell carcinoma	Cases studied showed, the most common: <ul style="list-style-type: none"> Age: 40–70 Site: tongue 27% Clinical feature: Ulcer 30.3% Delayed detection was frequent with late clinical Stage III or IV
2010	Mufid El Mistiri et al. 2004 “Update cancer report from BCR”	Eastern Libya, BCR	All	Oral cavity and pharynx cancer. (Other cancers reported)	<ul style="list-style-type: none"> It accounted for 4% of all cancers in males It accounted for 3.6% of all cancers in females
2011	Mohammed Shafi Moona, Itrat Mehdi	Sabratha, Libya	32-year old	Nasopharynx	Case report
2012	I. Mohammed et al.	Tripoli, Libya	20-year old	Osteoid osteoma	Case report, tumor described as rare

BCR: Benghazi Cancer Registry, ASR: age standardized incidence rate (per 100,000).

2002 under the auspices of the National Research Center in Benghazi University, which previously was called Garyounis University. The BCR reports cancer statistics for a wide area of northeastern Libya (approximately 28% of the total Libya population), and issued its first report in 2006 on cancer inci-

dence in eastern Libya in 2003, followed by an 2010 update report of the 2004 cancer incidence and mortality published in 2010, as shown in [Table 2a](#). This 2006 BCR first report on all cancers in eastern Libya in 2003 included oral cancer data and showed that cancer of the head and neck was the

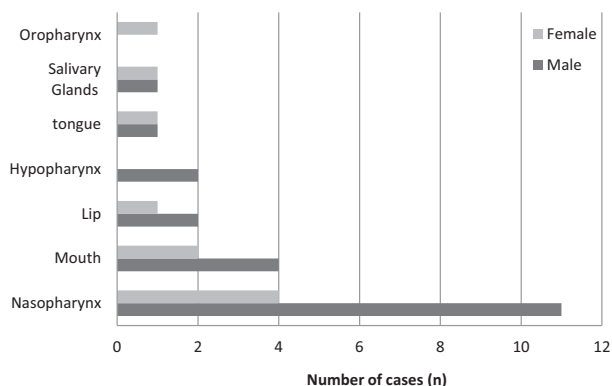


Figure 1 Oral and pharynx cancer; the new cases reported in eastern Libya in 2003 and their distribution by site and sex ($n = 31$). (El Mistiri et al., 2006.)

third most frequently reported malignancies in males (9% of all cases) after lung and colorectal cancers. Most oral cavity and pharynx cancer cases that were reported in that first report by the BCR occurred in ages above 45 years. The distribution of oral and pharynx cancer incidence by site and sex in eastern Libya in the year 2003 is presented in Fig. 1. The follow-up 2010 BCR update report on the all cancers in 2004 noted that the number of new cases of oral and pharynx cancer, which had slightly increased in males, was noted to have doubled in females (El Mistiri et al., 2006, 2010).

In 2006 and 2007, the Sabratha Cancer Registry in western Libya, which had been set up in 2006 by the African Oncology Institute (AOI) in Sabratha, published two online reports on oral cancer (see Table 2b, Abusaa et al., 2006, 2007). This registry, which covers approximately 9% of Libyan population, consists of two units: a population-based cancer registry covering western Libya (Alegelat, Aljameil, Zwara, Sabratha, Zawia, Surman, Altawaila, Zulten, Rigdalen, Abukamash, and Alassa) and a hospital-based cancer registry at the African Oncology Institute. These reports revealed head and neck cancer accounted for 5% and 4.8% of all cancers patients, respectively in 2006 and 2007. The most common cancer site in 2006 was the oral cavity followed by the nasopharynx while in 2007 the nasopharynx was the most common site which was in agreement with the eastern Libya 2003 findings (Abusaa

et al., 2006, 2007; El Mistiri et al., 2006). Fig. 2 shows the comparison of specific oral cavity and pharyngeal cancer site’s distribution between 2003 eastern and 2007 western Libya reports (Abusaa et al., 2007; El Mistiri et al., 2006).

As for the other geographic regions of Libya, there are no cancer registries either in the Tripoli region nor in the southern part of Libya, which combined account for nearly 60% of the total Libyan population. Consequently the descriptive picture of oral cancer in the Tripoli region and in the southern part of Libya remains unclear, and thus for the country as a whole the picture is quite incomplete. While a few cohort studies and case reports have been published about the population of these two regions (Akhtar et al., 1993; Moona and Mehdi, 2001; Mohammed et al., 2013), the data from these two types of epidemiological studies do not permit meaningful comparisons with the current descriptive picture of oral cancer in the western and eastern regions of Libya.

In 2008–2009 (see Table 2a), three articles (Elarbi et al., 2009; El-Gehani et al., 2009; Subhashraj et al., 2009)—also by the Faculty of Dentistry at Benghazi—formed a series of reports describing the findings from one retrospective study on different benign and malignant oral tumors with the detailed distribution of biopsied lesion type from these articles reported in Table 3 and illustrated in Fig. 3. These articles reported on data from the medical reports and biopsy files of 2390 patients who had maxillofacial biopsies performed at the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry at Benghazi during a period of 17 years between 1991 and 2007. In this study, primary malignant tumors constituted 8% of all cases and premalignant epithelial lesions of mucosa and skin 6% of all cases, while benign odontogenic/non-odontogenic tumors constituted 16% of all cases. Of the primary malignant tumors (i.e., cancer cases), 82% were tumors of epithelial origin (carcinoma), 11% were tumors of immune system and 7% were tumors of mesenchymal origin (sarcoma). For malignant tumors, the male to female ratio was 1.4:1 and the mean age of these cancer patients was 46 years for males and females combined. Squamous cell carcinoma (SCC) accounted for 41% of all primary malignant tumors, or 3.4% of all biopsied cases. Among the epithelial tumors, SCC was the most common neoplasm (50.6%), with a male: female ratio of 1.6:1 (El-Gehani et al., 2009; Subhashraj et al., 2009). One of these three articles reported on orofacial tumors in 213 Libyan children patients who had

Table 2b Summary of published findings of oral cavity and pharynx cancer in Libya listed in chronological order based on date of publication. Summary of online-published reports:

Year of publication	Published series/author(s)	Region(s) reported on	Age group reported	Oral cavity and pharynx tumor/cancer reported	Major findings reported
2006	Abusaa et al. (2006) “1st annual report from Sabratha cancer registry”	Western Libya; except Tripoli	All	Oral cavity and pharynx cancer (Other cancers reported)	<ul style="list-style-type: none"> • Head and neck cancer contributed to 5% of all cancers • Male to female ratio was 2:1 • Most common site was oral cavity followed by nasopharynx
2007	Abusaa et al. (2007) “2nd annual report from Sabratha cancer registry”	Western Libya; except Tripoli	All	Oral cavity and pharynx cancer (Other cancers reported)	<ul style="list-style-type: none"> • Head and neck cancer contributed to 4.8% of all cancers • Male to female ratio was 4:1 • Most common site was nasopharynx

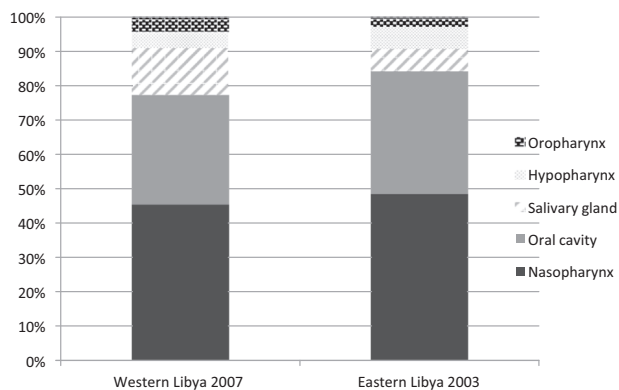


Figure 2 Comparison of percentages of oral cavity and pharynx cancer sites between 2003 eastern Libya ($n = 31$) and 2007 western Libya ($n = 22$) reports. (Abusaa et al., 2007; El Mistiri et al., 2006.)

been treated at the Faculty of Dentistry at Benghazi over this time period. They found that malignant tumors constituted only 3.7% of the 213 cases, a finding they described as being low in comparison to other reports from Africa and Israel, which they attributed specifically to the low number of children found with Burkitt's lymphoma in Libya (Elarbi et al., 2009).

Another retrospective study published in 2010 addressed the pattern of occurrence of oral SCC in Libya based upon the hospital records of all 122 patients subsequently diagnosed with oral SCC who had been referred to the Department of Oral and Maxillofacial Surgery at the Faculty of Dentistry at Benghazi in the period 1979–2004 from different regions of Libya (see Table 2a). The study found that tongue and floor of the mouth were the most common sites for SCC with ulceration and swelling being the most common clinical signs. It was noted that most of the patients presented for examination

between 6 and 12 months after their initial symptoms of SCC, and were found to be at TNM Stages III and IV and already exhibited tumor metastasis to lymph nodes and distant metastatic spread as the most common clinical stages at time of presentation to clinic. Among the 84.4% ($n = 103$) of the oral SCC patients for whom tobacco smoking records were available, most were either regular or occasional tobacco smokers (Jaber and Abu-Fanas, 2010).

Comparatively, the two western Libya reports from Sabratha Cancer Registry demonstrated: (1) higher SCC incidence than did the eastern Libya report (Subhashraj et al., 2009, 67% of cancer cases vs. 50.6%); (2) that 60–70% of oral cavity and pharyngeal cancer occurred above the age of 60; and (3) that 50% of the cases were detected in Stage IV, a late presentation stage, which matched the findings found in eastern Libya (Jaber and Abu-Fanas, 2010).

5. Oral cancer incidence rates: Libya vs. other countries

Fig. 4 shows the relative age-adjusted cancer incidence rates of oral cavity and pharyngeal cancers in Libya in comparison to those of other countries around the world, specifically India, the United States, the United Kingdom and China, as well as other North Africa countries (Cancer Research/United Kingdom, 2009; Curado et al., 2007; El Mistiri et al., 2006, 2010; Ganguly et al., 2006; Howlader et al., 2013; Salim et al., 2009; Subhashraj et al., 2009; Tazi et al., 2009; Yang et al., 2005; Zanetti et al., 2010). These data clearly illustrate the fact that the published data on oral cancer incidence in Libya is similar to those of other North Africa countries and China, but is relatively low compared to the United Kingdom, the United States, and India. Speculatively, this might be attributed to cultural and religious behaviors these countries share, like prohibition of alcohol consumption which alcohol is considered a risk factor for oral cancer synergized by cigarette smoking, the only exception being the findings for China

Table 3 Distribution of most common orofacial tumors of different origins out of 2390 patients (ranked from most to least common based on total number of cases) in a period of 17 years (1991–2007) in Benghazi, Libya.

Tumor	Rank	Total	Male	Female	Most age group in years	Most tumor site
Squamous cell carcinoma	1	81	51	30	51–60	Tongue
Fibroma	2	59	23	36	–	Cheek
Keratocystic odontogenic tumor	3	52	32	20	21–30	Post mandible
Ameloblastoma	4	33	23	10	11–20	Post mandible
Pleomorphic adenoma	5	28	7	21	31–40	Palate
Haemangioma	6	27	13	14	–	Tongue
Mucoepidermoid carcinoma	7	24	12	12	31–40	Palate
Central giant cell tumor	8	21	6	15	–	Mandible
Papilloma	9	19	10	9	–	Palate
Adenoid cystic carcinoma	9.5	14	4	10	31–40, 61–70	Palate
Fibrous dysplasia	9.5	14	7	7	–	Maxilla, mandible
Neurofibroma	10	8	4	4	–	Tongue, mandible
Lymphangioma	11	5	2	3	–	Tongue
Burkitt's lymphoma	12	4	2	2	0–10	Maxilla
Other malignancies of epithelial origin	NA	41	24	17	11–80	NA
Other benign odontogenic tumors	NA	63	29	34	0–70	NA
Other benign non-odontogenic tumors	NA	84	30	54	–	NA

(–): not available, (NA): not applicable.

Elarbi et al. (2009), El-Gehani et al. (2009), Subhashraj et al. (2009).

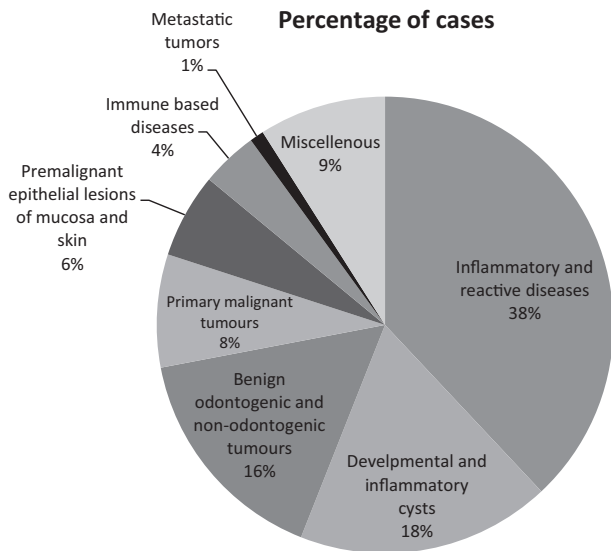


Figure 3 Distribution of results for 2390 patients underwent biopsy for various reasons in the orofacial region during a period of 17 years (1991–2007) in Benghazi, Libya. (Elarbi et al., 2009; El-Gehani et al., 2009; Subhashraj et al., 2009.)

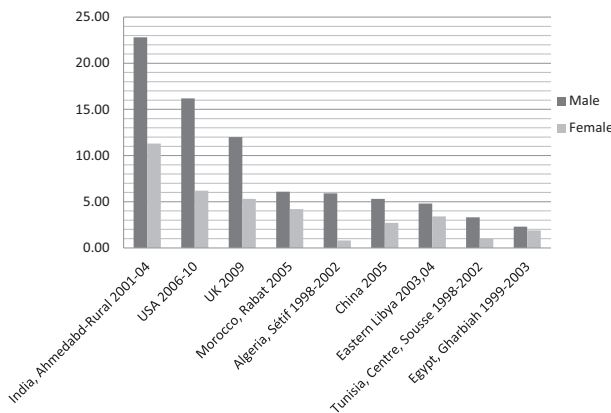


Figure 4 Age-adjusted cancer incidence rates (world standard – per 100,000) of oral cavity and pharynx incidence by sex in North Africa countries compared with USA, India, UK and China. (Cancer Research/United Kingdom, 2009; Curado et al., 2007; El Mistiri et al., 2006, 2010; Ganguly et al., 2006; Howlader et al., 2013; Salim et al., 2009; Subhashraj et al., 2009; Tazi et al., 2009; Yang et al., 2005; Zanetti et al., 2010.)

where smoking and drinking are not culturally prohibited thus leaving the findings from China as atypical and unexplained at this time. However, one must remain very cautious in drawing any cross-country conclusions on oral cancer incidence as regards Libya given that these data from Libya are grossly incomplete. Only two regions representing only ~40% of the total Libyan population (which includes western and eastern Libya, but excludes the 60% of the Libyan population living in the Tripoli region and southern region) even have established tumor registries at the present time, and the available oral cancer incidence rates from Libya only come from one of these two reporting regions.

6. History and recommendations for future developments of the Libyan oral cancer tumor registry

In Libya, the health care system, like most nations in the world, is not entirely state run but rather a mixture of public and private care. “The country’s major hospitals are in Tripoli and Benghazi, and private health clinics and diagnostic centers, offering newer equipment and better service, compete with the public sector. However, if they can afford it, many Libyans nonetheless travel to Tunisia or to Europe if they need sophisticated medical treatment” (Library of Congress, Icw2, 2005). The city of Sabha has the Sabha medical center which is the referral hospital for the entire southern region (ICRC in Libya, 2013). In Al kufrah, there are three medical hospitals providing medical care to the east southern part of Libya (ICRC in Libya, 2013).

The main tertiary oral health care centers in Libya are the three dental schools, which are located in Benghazi, Tripoli and Sabha and were established in 1977, 1988 and 1993, respectively. These three centers have served as oral cancer patient referral centers for the Libyan population since their establishment and, as such, are valuable oral cancer data resources which still need to be developed further in order to realize their full potential. It is strongly recommended that these centers focus their future activities to collect and maintain oral cancer data so they can serve as a national oral cancer tumor registry, fully up to international cancer tumor registry standards.

The first documented idea of establishing a population-based cancer registry in Libya was born in a formal meeting of Libyan health policy leaders in 2002. The idea arose in response to an initial interest expressed in implementing a breast cancer screening for the population of all Libya; however, this initial interest was dampened, and action eventually thwarted, by the realization at that meeting that given the lack of reliable national, or even regional, data on the prevalence of breast cancer in Libya, the importance—much less the impact—of such a screening activity could not be assessed. As regards oral cancer, the Benghazi Cancer Registry, established as a regional cancer as well as oral cancer population-based registry in 2002, while successful in providing a minimal data set on oral cancer incidence in eastern Libya needs to be either expanded into a national population-based oral cancer registry or joined by two to three other regional population-based oral cancer registries in Libya. Regardless of whether the organizational format is a single national Libyan oral cancer population-based registry, or multiple regional population-based oral cancer registries, it is now vital to establish a Libyan national oral cancer registry system which collects more clinical details (such as stage and the different risk factors) in a uniform manner which will contribute to best guide Libyan health policy leaders as they take on the public health tasks of assessing, preventing, detecting and treating—as well as increasing professional and public awareness of—cancer of the oral cavity.

As the Libyan government grows over the coming decades to address the wide range of services that Libyans require and need on a prioritized basis, innovative and low cost approaches to continuing the development of these nascent beginnings of a national oral cancer tumor registry system in Libya will have to be utilized. For example, this function—

over the next decade until full government funding with salaried staff is a reality for staffing these three newly developed oral cancer tumor registries, could be incorporated as part of dental students' graduation requirements to be supervised by faculty instructors. Student tasks (under faculty supervision) could include, but not be limited to, data collection, entry and storage as well as oral cancer screening trips to cover rural areas.

Although the health system in Libya seems to be covering the population to a certain extent in terms of diagnosis and treatment, persistent data documentation and registration are insufficient. Furthermore national mortality statistics in Libya needs improvement as it is an important source that together with data from population-based cancer registries can yield the most reliable estimates of cancer burden in the country. This oral cancer population-based registry system should be incorporated into one national system of population-based registries for all cancers, one that needs to widen to cover all population and data collecting/storing mechanisms, and one that will require enhancement and monitoring by government authorities. Clearly, the southern Libyan population that lives a nomadic or semi-nomadic life-style lives in areas relatively remote from health care centers, and will demand the development of special oral cancer registry data collection techniques as well as special programs to reach them for the purpose of health education and health screening. One viable approach that would simultaneously serve diagnostic as well as awareness and educational needs in this remote region of Libya might be a bi- or tri-annual visit schedule across these southern regions by a team with a well-equipped mobile unit to cover that remote area including a small, high-quality portable oral cytology laboratory.

In 2007, Libya's Secretary of Health and Environment decided to initiate this effort as they established the Libyan National Cancer Registry Program. This program envisions that five cancer registries (Benghazi Cancer Registry, Tripoli Cancer Registry, Sabha Cancer Registry, Musrata Cancer Registry and Sabratha Cancer Registry) will cover the whole country (Abusaa et al., 2006). Still six years after its establishment, the National Cancer Registry Program progress continues to operate at a relatively suboptimal level largely due to insufficient national funding. This has resulted in Libyan cancer data and reports that not only vary considerably across the five regions, but also appears to report data—at best—on a sporadic basis, and certainly not in desirable or utilitarian manner, i.e., at repeated, predetermined routine intervals. Until this important initiative in oral cancer is routinely supported by national funds, the absence of adequately trained, highly motivated full-time staff backed by modern software and computer systems will continue to plague its development. . . and the accompanying quality of service that might well provide to the Libyan people. High-quality, accurate population-based cancer registries, accompanied by equally high-quality mortality statistics, serve to minimize the under-reporting and under-diagnosing of cancer cases, and in that high-quality mode help the country present the most accurate and realistic cancer burdens, which, in turn, also helps better understanding the nature of the disease nationally (and regionally), and thus better guides health policy leaders in establishing proper diagnostic, treatment and prevention services throughout Libya.

7. Ethical statement

This literature review was conducted ethically in all aspects. It is clear from any kind of plagiarism, all the reviewed relevant articles and resources were properly cited, and finally as a literature review and historical overview of oral cancer and its reporting in Libya, this paper did not require Institutional Review Board (IRB) review.

Conflict of interest

None of the authors has any financial or other conflicts of interest related to this paper.

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