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Original article

Demographic and Clinicopathological Characteristics of Ovarian Cancer: A Retrospective Study from One Libyan Tertiary Centre

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Abstract
Ovarian cancer is the most lethal gynecological malignancy worldwide, largely due to its late-stage presentation and diagnostic delay. Despite a growing understanding of histological heterogeneity, clinicopathological data from Libya remain scarce. This study aimed to describe the epidemiological and clinicopathological characteristics of ovarian cancer in a Libyan patient population. This retrospective study included 114 patients diagnosed with ovarian cancer at Tripoli University Hospital. Data including Age at diagnosis, histological type and subtype distribution, and tumor laterality were collected from pathological records. Data were analyzed descriptively, and categorical variables were presented as frequencies and percentages. The age at diagnosis ranged from 15 to 83 years (mean 43.5 ± 17 years, median age 45 years). The most commonly affected age group was 30–44 years, accounting for 36% of cases. Epithelial ovarian carcinoma was the predominant histological type, representing 76% of all cases. Among the epithelial subtypes, serous adenocarcinoma was the most common (~41%), followed by endometrioid carcinoma (~20%), mucinous cystadenocarcinoma (~10%), and clear cell carcinoma (~5%). Non-epithelial tumors account for 24% of cases, of which granulosa cell tumors were the most frequently observed, representing 18% of the total study cohort. Bilateral ovarian involvement was observed in 50% of cases, while unilateral disease accounted for the remaining 50%, with right-sided tumor being more common (35%) than the left side (15%). This study presents one of the largest clinicopathological descriptions of ovarian cancer from Libya to date. Our findings reveal a younger age at diagnosis compared with Western countries. The histological profile is characterized by an elevated proportion of endometrioid and mucinous carcinoma relative to the global average. A high rate of bilateral ovarian involvement strongly suggests advanced disease at diagnosis. These results highlight the need to expand the national cancer registry in Libya to include pathological type data. In addition, improve access to genetic testing, particularly BRCA1 and BRCA2, and establish region-specific early detection programs across North Africa.
Keywords. Ovarian Cancer, Histological Subtypes, Age Distribution, Tumor Laterality, Libya

Introduction

Ovarian cancer is the eighth most common cancer among women worldwide and the leading cause of death from gynecological malignancies [1-3]. Despite advances in surgical techniques and chemotherapy, ovarian cancer remains associated with poor survival outcomes. The high mortality rate associated with ovarian cancer is largely attributable to advanced stage at diagnosis. The 5-year survival rate for stage I epithelial cases is 92%, but it falls to between 17% and 28% for those with advanced-stage malignant tumors. The delayed diagnosis is partially attributed to the fact that early-stage disease often presents with vague or non-specific symptoms. Furthermore, the absence of robust and effective screening protocols contributes to the diagnostic challenges faced by clinicians [4]. Ovarian cancer is a highly heterogeneous disease with diverse histological subtypes, each characterized by distinct pathogenesis, molecular alterations, treatment response, and prognosis [5]. The vast majority of ovarian cancers (around 90%) originate in the epithelial cells [6, 7].

Epithelial cancer is further categorized into several subtypes: high-grade serous carcinoma, low-grade serous carcinoma, clear cell carcinoma, endometrioid, and mucinous ovarian tumors [8,9]. Non-epithelial cancer constitutes the remaining 10% of cases. Non-epithelial types are typically diagnosed at an early stage, predominantly in younger individuals. These include sex cord-stromal tumors and germ cell tumors [9]. Globally, epidemiological trends of ovarian cancer show disparity between regions. In general, the incidence increases with advanced age, and it's known as a major risk factor for ovarian cancer [10-12]. The highest incidence rates were observed in Northern Europe and North America. Notably, recent studies indicate increasing incidence in parts of Asia and Eastern Europe, while rates are declining in several high-income countries [3]. Furthermore, the prevalence of ovarian cancer has been shown to vary by histological subtype across different geographical regions and populations. Although epithelial ovarian cancer is still the dominant type worldwide, the particular frequency of its subtypes, including serous, endometrioid, clear cell, and mucinous, exhibits distinct regional variations [13]. These epidemiological and histological subtype variations can be related to different factors, including genetic predisposition, lifestyle, environmental factors, and hormonal factors among different populations [14-16]. In addition to histological subtype variations, the anatomical side of the primary cancer, whether it is unilateral or bilateral, serves as a vital prognostic indicator [17,18].

Ovarian cancer staging is based on the FIGO staging system (International Federation of Gynecology and Obstetrics) ranging from stages I to IV, with stage I representing the least advanced disease and stage IV representing the most advanced disease [19]. The majority of cases are detected at advanced stages when treatment options are less effective,

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leading to poor outcomes [4,12]. Additionally, ovarian cancer survival rates vary significantly across different geographical regions and populations. High-income countries such as the United Kingdom and the United States report better survival outcomes due to improved diagnosis and treatment infrastructure, despite similar challenges with early detection [20, 3]. In contrast, Population-based studies in Africa indicate that ovarian cancer survival rates remain considerably lower than those reported in developed countries [21]. The low survival rates reflect disparities in early detection, treatment access, and healthcare infrastructure. However, low- and middle-income countries, including those in North Africa, face limitations in cancer surveillance, genetic testing, and access to specialized oncology care [22]. The scarcity of national cancer registries in several African countries, including Libya, further complicates epidemiological assessments and hinders accurate estimation of disease burden.

In Libya, studies on ovarian cancer are limited. According to the first comprehensive national cancer registry report in Libya, ovarian cancer accounts for around 4.6% of all cancers affecting women in Libya [23]. In addition, a research paper from 1983 identified substantial differences in histological subtype patterns between Benghazi and Poland, noting that germ cell growths appeared most common in Benghazi, while epithelial variations were the dominant form in European countries [24]. However, the lack of comprehensive epidemiological surveillance highlights the importance of regional studies aimed at identifying patterns of disease presentation, risk factors, and clinical outcomes among Libyan women. In general, most of the available data are derived from tertiary centers, which serve as referral facilities for large populations. Consequently, existing studies may disproportionately reflect more advanced or complex cases. In this study, we aim to utilize an existing demographic and clinicopathologic database to describe the ovarian cancer pattern among Libyan patients. In addition, this work aims to compare all of the findings among Libyan ladies with the global trends. Understanding local disease patterns is essential for guiding health care policy, improving early diagnosis and treatment strategies within the Libyan healthcare system.

Patients And Methods

This retrospective cohort study was conducted at Tripoli University Hospital, a tertiary referral hospital in Tripoli, Libya. The study included all female patients diagnosed with ovarian cancer between January 2012 and December 2021. Data were collected from the pathology department and extracted from pathology records using a structured data collection sheet. Variables included: Age at diagnosis, histological subtype, tumor laterality (right, left, bilateral). Histological classification was performed according to the World Health Organization (WHO). Cases with incomplete diagnostic confirmation and non-cancerous tumors or metastatic cancer were excluded.

Statistical Analysis

Data were analyzed using descriptive statistics, and continuous variables were stated as mean ± standard deviation (SD). Results were expressed as frequencies and percentages and presented in tables and charts.

Ethical Considerations

Ethical approval for this study was obtained from the (Scientific Research and Ethics Committee at the University of Tripoli) under approval number (010/200). Patient identifiers were removed before analysis. The study used retrospective anonymized data and complied with institutional ethical standards.

Results

During this work, we collected 114 cases of ovarian cancer diagnosed at Tripoli University Hospital, the major tertiary hospital in Tripoli, over 10 years, from January 2012 to December 2021. The study analyzed the demographic and clinicopathological characteristics of patients diagnosed with ovarian cancer.

Demographic characteristics

Age Distribution of ovarian cancer

The age at diagnosis ranged from 15 to 83 years, with a mean of 43.5 ± 17 years and a median of 45years. The highest frequency of ovarian cancer occurred in the 30–44-year age group, followed by the 45–59-year age group, representing ~36% and ~25% of cases, respectively. A significant percentage (17%) occurred in women younger than 30. The least common age group was observed in patients above 75 years (5%), as shown in (Table 1 and Figure 1).

Table 1. Age group distribution of ovarian cancer cases (2012-2021)

Age Group (years)	Number of Cases	Percentage (%)
15–29	19	~17%
30–44	41	~36%
45–59	28	~25%
60–74	19	~17%
≥75	7	~5%
Total	114	100%

N=114 Median age=45 years, Mean Age= 43.5 years

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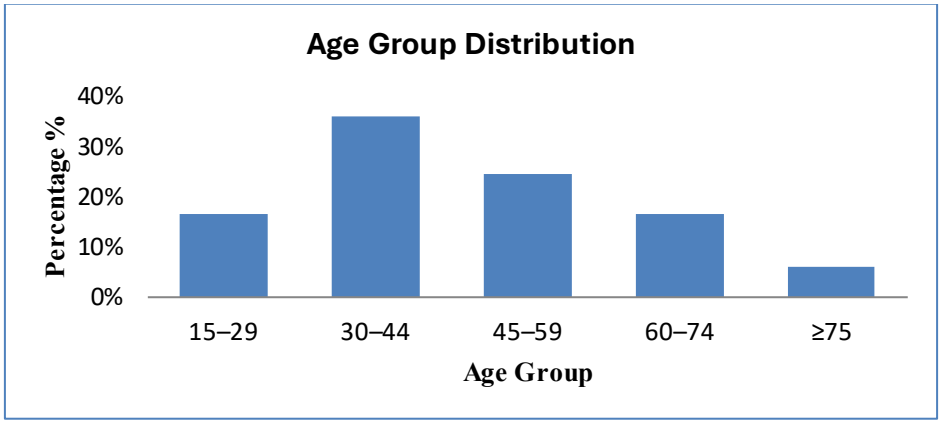

Figure 1. Age group distribution of ovarian cancer

Clinicopathological characteristics of ovarian cancer

Histological types and subtypes distribution

Regarding the histological types, epithelial cancer was found to be the most common type (~76%), while about 24% of ovarian cancer was non-epithelial origin (Figure 2). The most prevalent epithelial subtype was serous adenocarcinoma, accounting for around 41% of all cases. This was followed by endometrioid carcinoma (~20%), mucinous cystadenocarcinoma (~10%), and clear cell carcinoma (~5%), which were seen in decreasing order of frequency (Figure 3). Granulosa cell tumor represents the most common non-epithelial subtype (~18%). The remaining ~6% include dysgerminomas and teratomas with malignant transformations, among other subtypes. Histological subtypes are shown in (Table 2).

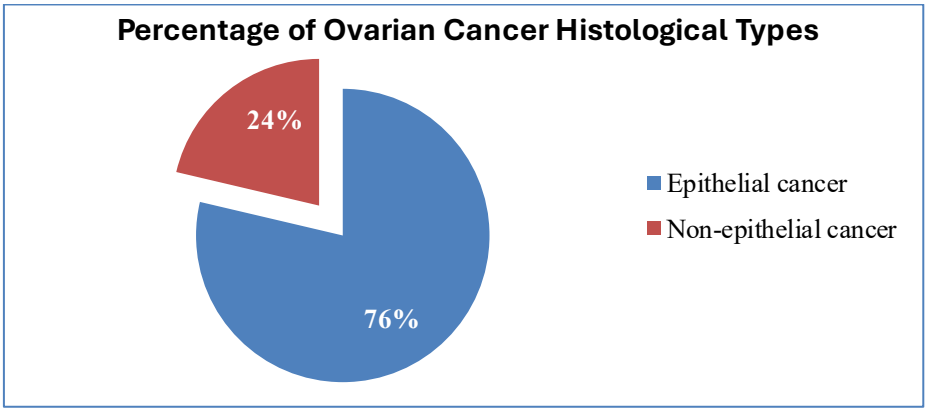

Figure 2. Histological types of ovarian cancer

Table 2. The most common histological subtypes of Ovarian Cancer

Histological subtype	Percentage (%)
Serous adenocarcinoma carcinoma	~41%
Endometrioid adenocarcinoma	~20%
Mucinous cystadenocarcinoma	~10%
Granulosa cell tumor	~18%
Clear cell carcinoma	~5%
Dysgerminomas	~4%
Immature teratoma with malignant transformation	~2%
Total	100%

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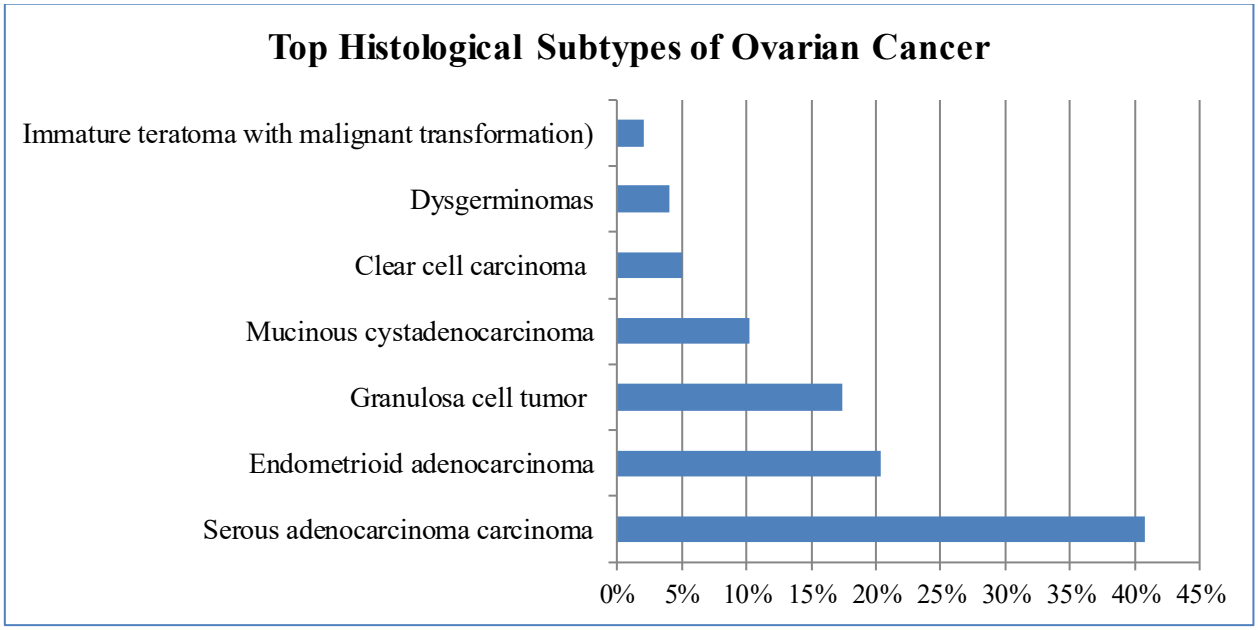

Figure 3. Top Histological Subtypes of Ovarian Cancer

The distribution pattern of laterality of ovarian cancer

The anatomical distribution of ovarian cancer showed that bilateral involvement (involving both ovaries) was found in 57 patients (50%) at the time of diagnosis. Among unilateral cases, 17 patients (15%) presented with left ovarian cancer and 40 patients (35%) with right ovarian cancer (Figure 4). The ovarian cancer bilateral involvement was equal to unilateral involvement in the overall studied population.

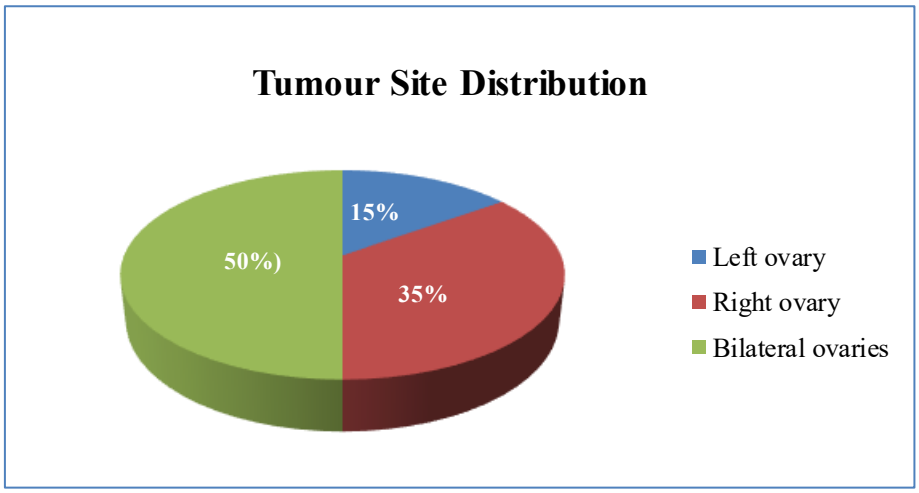

Figure 4. Tumor Site Distribution

Discussion

This hospital-based retrospective cohort study provides crucial insights into epidemiological and histopathological characteristics of ovarian cancer among Libyan women diagnosed at Tripoli University Hospital in Tripoli. Our findings reveal patterns consistent with certain global trends. However, they also demonstrate distinctive regional features.

The mean age at diagnosis in this cohort study was 43.5 ± 17 years. A notable finding is a relatively younger age at diagnosis, with a peak incidence observed in the 30- 44-year age group (Figure 1). Furthermore, a significant portion (~ 17%) of cases was observed among women under the age of 30 (Table 1). In many Western nations, like the United States and the United Kingdom, ovarian cancer rates predominantly affect postmenopausal women aged 55 and older, with the median age at diagnosis being around 63 years [10, 12]. However, within developing countries, ovarian cancer is frequently diagnosed at a younger age [25]. Similar trends towards younger age distributions have been documented in Tunisia, where patients often present at a younger age compared to Western populations [26]. This finding suggests a regional North African pattern. Several factors could contribute to the younger age of onset observed in the Libyan population. The first factor is potential genetic predispositions such as inherited BRCA1 and BRCA2 mutations, which are known to lead to an earlier onset of the disease [27, 28]. Second, reproductive and hormonal factors, including delayed childbirth, early menarche, and lower rates of oral contraceptive use, may also contribute to this elevated risk among younger women in this population [29]. Third, a proportion of younger cases in our cohort consisted of non-epithelial

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tumors, particularly granulosa cell tumors (Figure 3), which are known to occur more frequently at early age [30, 31]. However, these hypotheses need validation through population-based studies and systematic germline testing.

In the present study, the epithelial ovarian carcinomas accounted for the majority of cases (76%, Figure 2). Our finding is broadly consistent with global epidemiological patterns, where epithelial ovarian carcinomas represent 90% of all ovarian cancers [6, 7]. As presented in (Table 2 and Figure 3), serous adenocarcinomas remain the most prevalent subtype of ovarian cancer among epithelial subtypes (~41%). Following serous adenocarcinomas, endometrioid carcinomas exhibited the second-highest rate (~20%), followed by the mucinous subtype (~10%). Clear cell carcinomas were the least frequently observed epithelial subtypes (~5%). This result is in accordance with the international epidemiological consensus [14, 32, 13, 16]. Globally, high-grade serous adenocarcinoma accounts for the largest proportion of epithelial ovarian cancer [33]. The predominance of serous adenocarcinoma in our study (~41%, Table 2) is clinically significant, as this type is characterized by late-stage presentation, aggressive behavior, and acquired platinum resistance [34].

Previous studies have demonstrated that the high-grade serous adenocarcinomas arise predominantly from fallopian tube epithelium rather than from ovarian epithelium itself. This evolving understanding of tumor origin has meaningful implications for surgical prevention strategies, including opportunistic salpingectomy [35, 36]. On the other hand, the high prevalence of endometrioid carcinoma in our cohort (~20%, Table 2) is higher than the globally reported range of approximately 10-12% of all ovarian malignancies [11, 13, 32]. In addition, as shown in Figure 3, the proportion of mucinous carcinoma is also higher than figures described in most Western series (~10%), in which mucinous carcinoma accounted for 3-4% of epithelial ovarian cancer. However, our results are closer to the high proportions observed in some regions, such as in Central America and Eastern Europe, suggesting considerable geographic variation [37]. The relatively low proportion of clear cell carcinoma in our cohort aligns with the global average but is lower than the average reported in Eastern Asia, which shows a relatively higher proportion [37, 13].

Some studies suggest that the incidence of epithelial ovarian cancer, particularly endometrioid, mucinous, and clear cell subtypes, may be higher in specific geographic regions due to the prevalence of endometriosis or other metabolic factors [38-40]. Furthermore, oral contraceptive use is a known protective factor that reduces the risk of ovarian cancer, particularly the endometrioid subtype [13]. According to a study conducted in 2013, Africa had the lowest percentage of women using contraceptives among those aged 15-45 years [41]. This observation is consistent with our finding of an elevated proportion of endometrioid carcinoma and may also contribute to the younger mean age at diagnosis. The reason for such demographic differences remains unclear and highlights the critical need for ongoing surveillance of incidence and risk factor trends. Non-epithelial tumors were also represented in our study, with granulosa cell tumors constituting 18% of all cases (Figure 3). This proportion is higher than that reported in many Western series and may partly explain the younger median age in our cohort [42]. These findings reflect the histological heterogeneity of ovarian cancer that we mentioned in the literature.

As presented in (Figure 4), bilateral ovarian involvement was observed in approximately 50% of cases. Unilateral involvement more commonly affects the right ovary (~35%) than the left (~15%). Bilateral ovarian involvement is often associated with a higher FIGO stage and significantly worse survival outcomes compared with unilateral disease across all studies [43, 17, 18]. In our cohort, the high rate of bilateral ovarian involvement (~50%) suggests that many patients present with advanced disease. This reflects the consequences of the absence of effective screening programs and the non-specific nature of early ovarian cancer symptoms [44]. The predominance of right-sided ovarian involvement has been attributed to anatomical, embryological, and lymphatic drainage asymmetries between the two ovaries [45]. There are conflicting findings reported across studies about the prognostic significance of tumor laterality in ovarian cancer. Some studies have indicated that patients with left-sided ovarian cancer often experience better clinical outcomes than those with right-sided ovarian cancer [46]. In contrast, a study conducted in 2022 revealed that ovarian cancer laterality did not demonstrate significant prognostic differences between right- and left-sided tumors [43]. These inconsistencies across studies may reflect variations in the sample population, histological subtypes, staging, and treatment protocol rather than an effect of laterality. Nevertheless, bilateral ovarian involvement has been more consistently associated with a higher FIGO stage, higher tumor grade, and poorer prognosis [17, 18]. Given that this research was conducted in one of the main hospitals in Tripoli, these results likely reflect the national burden of advanced ovarian cancer cases referred to tertiary centers. However, the inability to make a laterality analysis stratified by histological subtypes is acknowledged as a limitation of this study. The likelihood of bilateral involvement is one of the most distinguishing features between the different types of epithelial ovarian cancer [18]. Therefore, future studies with complete staging data should examine this relationship. Moreover, prospective studies are needed to validate and confirm the prognostic relevance of tumor sidedness in ovarian cancer with particular attention to the role of genetic alterations including BRCA1 and BRCA2 pathogenic variants. Such investigations would contribute to more precise patient stratification and improved prediction of clinical outcomes.

Limitations

There are several limitations that should be considered when interpreting the results. Firstly, as a single-center retrospective study conducted at a tertiary referral center, selection bias cannot be excluded, and the patient population may not be representative of the broader Libyan population with ovarian cancer. Secondly, staging data (FIGO stage) were unavailable for all patients, preventing a stage-stratified analysis of histological subtypes and tumor laterality. Thirdly, germline genetic testing, particularly for BRCA 1/2, was not routinely conducted during the study period, preventing

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assessment of hereditary cancer burden in this cohort. Fourthly, survival outcomes were not captured in this study, which limits conclusions regarding prognosis. Despite these limitations, this study provides valuable baseline data on ovarian cancer in Libya and establishes a foundation for future prospective multicenter research.

Conclusion

This study presents demographic and clinicopathological profiles of ovarian cancer within a Libyan patient cohort. It identifies a significantly younger age at the time of diagnosis compared with Western populations. Most cases are epithelial in origin, particularly the serous subtype, and the frequent occurrence of bilateral disease involvement suggests that many patients present with advanced disease. These patterns are consistent with findings reported in neighboring North African and Middle Eastern countries, suggesting shared genetic, reproductive, and health care access factors. These results underscore the urgent need for complete national cancer registries in Libya. Future research should include molecular testing, full staging, and long-term survival of ovarian cancer in Libya. This will lead to better public health plans and medical advice for the early detection and treatment of the disease.

Conflict of interest. Nil

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