Arab world females: Between the similarities and the disparities in cancer burden

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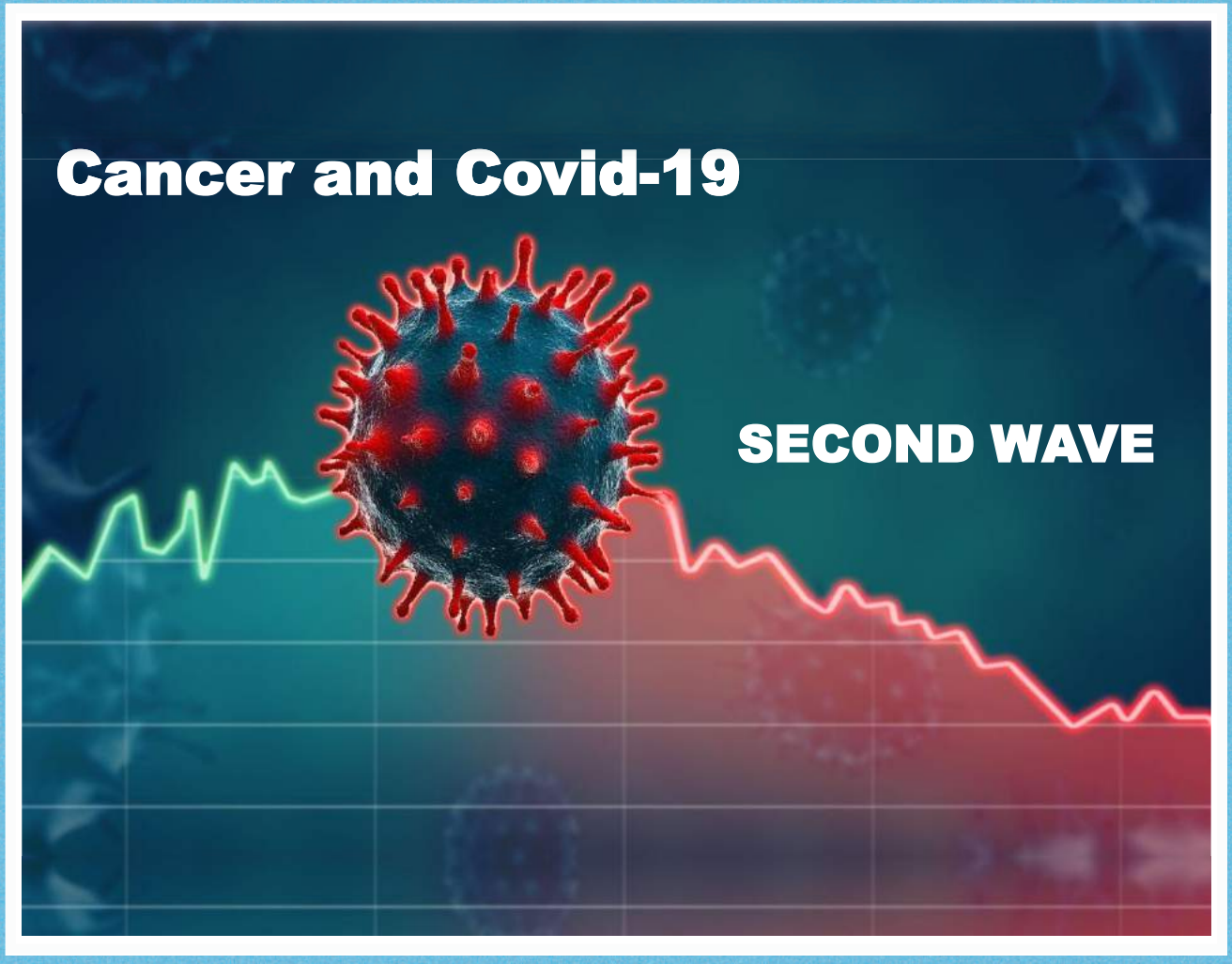
THE GULF JOURNAL OF ONCOLOGY

The Gulf Journal of Oncology

GJO

Indexed By PubMed and Medline Database

Issue 36, May 2021
ISSN No. 2078-2101



The Official Journal of the Gulf Federation For Cancer Control

Issue 36, May 2021
ISSN NO. 2078-2101

Table of Contents

Original Articles

Review Articles

Case Reports

Conference Highlights/Scientific Contributions

Original Article

Similarities and disparities in cancer burden among Arab world females

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Abstract:

Introduction: Cancer is the leading cause of increased morbidity and mortality worldwide. This work aims to study the Arab–world females' cancers (AFCs), the similarities and disparities from epidemiological, economic and development–indices points of view.

Materials and Methods: Descriptive – Analytical review of the 2018 Global Cancer Observatory concerning AFCs. Data on various cancers were compiled and compared among the countries in the regions and the world females' cancers (WFCs)

Results: A total estimate of 227,494 new AFCs; 2.64% of WFCs, with an average crude incidence rate of 111.7* and an age–standardized rate of 134.5*, compared to 228* and 182.6* of WFCs, respectively. Death cases estimated to be 122,903; 2.95% of WFCs, with an average crude mortality rate of 60.3* and age–standardized rate of 75.4*, compared to 110.2* and 83.1* of WFCs, respectively. Five–year prevalent cases were 530,735; 2.33% of WFCs, with an average proportion of 260.5*, compared to 603.5* of WFCs. Mortality to Incidence Ratio was 0.54 (range 0.36 – 0.80), compared to 0.58, 0.52, 0.49 in the medium human development index, upper–middle–income countries and world countries, respectively.
*/100,000 population

Conclusions: Despite the demographic and cultural similarities among the Arab communities, there are apparent disparities in AFCs. A systematic approach is required to address these remarkable differences in cancer ranking and rates among Arab countries themselves and when compared to other world groups and nations.

Keywords: Cancer, Arab–world Females

Introduction:

Cancer is the second leading cause of death globally and is responsible for an estimated 9.6 million deaths in 2018. Approximately 70% of cancer deaths occur in low–income countries (LICs) and middle–income countries (MICs), where advanced–stage presentation and inaccessible diagnoses/treatments are common. Compared to more than 90% of treatment availability in high–income countries (HICs), less than 30% is available in LICs. The cancer burden is expanding in countries of all income levels due to the growth and aging of the population[1–3].

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The Arab world countries that are members of the League of Arab States are 22 in total. They spread over the Middle East and North–Africa region with over 400 million population, 48.2% are females. While these countries share a set of historical, geopolitical, social, and cultural characteristics, the economy, human resources and development vary widely across the region. The Arabic countries are classified into three categories according to their gross national income: LICs, including Comoros, Djibouti, Mauritania, Yemen, and Somalia; MICs, including Algeria, Egypt, Iraq, Jordan, Lebanon, Libya, Morocco, Palestine, Sudan, Syria, and Tunisia; and HICs, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE)[4]. The available published literature indicates that cancer incidence rates rise in Arabic countries, which means that its burden will be immense in the future[5].

There are striking disparities in the global cancer burden in women, yet few publications highlight cancer occurrence in this population, particularly for cancers that are not sex–specific. Estimated 2012 overall cancer death rates, in general, are higher among women in LICs and MICs than HICs, despite their lower overall incidence rates, primarily due to inadequate access to early detection and treatment. Furthermore, incidence rates of cancers associated with economic development (e.g., lung, breast, colorectum) are rising in several LICs and MICs[2]. These inequities highlight the urgent need in LICs and MICs for sustainable investments in the entire continuum of cancer control, from prevention to palliative care, and in developing high–quality population–based cancer registries[6].

In this work, we aim to describe and analyze all females' cancers in the Arabic countries (abbreviated as Arab world females' cancers – AFCs), which are not limited to breast and gynecological cancers only, to understand some of the cancers' similarities and disparities of AFCs. We explored some of the comparisons in AFCs in between the Arabic countries themselves and with World's Females' Cancers (WFCs) and other countries' groups of specific human development–index and income levels.

Methods and materials:

The 2018 Global Cancer Observatory (GCO), an international cancer database, was used as the primary source of the findings of this work[7]. A literature search was conducted on April 11, 2020, via PubMed medical search engine using the words: ("Female"[Mesh]) AND ("Neoplasms"[Mesh]) AND ("Arabs/epidemiology"[Mesh]), without any results. Google Scholar was also used too using the words: (Female AND cancers AND Arabs), but the results were mostly country– and cancer–specific and not comprehensively covering the AFCs spectrum. We calculated the mortality to incidence ratio (MIR) for each country from the GCO mortality and incidence numbers. Also, we calculated the female to male ratios for the population, cancer incidence, mortality and prevalence of the Arabic countries.

Results:

In 2018, there was a total estimate of 227,494 new AFCs; about 2.64% of the 8,622,539 WFCs, with an average crude incidence rate (CIR) of 111.7 per 100,000 and age–standardized incidence rate (ASIR) of 134.5 per 100,000, compared to 228 and 182.6 per 100,000 of WFCs, respectively. Death cases estimated to be 122,903; 2.95% of the 4,169,387 WFCs, with an average crude mortality rate (CMR) of 60.3 per 100,000 and age–standardized mortality rate (ASMR) of 75.4 per 100,000, compared to 110.2 and 83.1 per 100,000 of WFCs, respectively. Five–year prevalent (5Y Prev.) cases were 530,735; about 2.33% of the 22,826,472 WFCs, with an average proportion of 260.5 per 100,000, compared to 603.5 per 100,000 of WFCs. The ratio of females to males in the Arabic countries were (45.7:54.3) for the population, (54:46) for the incidents, (48:52) for the deaths and (58.4:41.6) for the 5Y Prev. Overall Mortality to Incidence Ratio (MIR) was 0.54. The details are in Table 1.

Thirty cancer types were recognized in the GCO. While the highest cancer in the number of new cases, deaths and 5Y Prev. was breast cancer, the lowest in the number of new cases was Kaposi sarcoma, in deaths was oropharyngeal carcinoma and of 5Y Prev. was mesothelioma. The mean MIR was 0.54. More details in Table 2.

Table 3 is addressing the top ten incident and fatal AFCs compared to that at WFCs and, Table 4 is showing the general metrics of AFCs (incidence with CIR and ASIR, deaths with CMR and ASMR, 5Y Prev. and general MIR) compared with these metrics in World countries in general and with different World countries' groups, which include: very high Human Development–Index (HDI), high HDI, medium HDI, low HDI, HIC, upper–middle–income countries (UMIC), lower–middle–income countries (LMIC) and LICs. Mean MIR in AFCs was 0.54, compared to 0.58, 0.52, 0.49 in medium HDI, UMICs and general world countries, respectively.

Figure 1 shows the estimated incident cases and deaths of AFCs in 2018 and 2030 in the sequence of their numbers in 2018. Not all the AFCs in the Arabic countries are in one fashion of increase in this projection; for example, the estimated incident cases in 2030 in Syria, Yemen and UAE, and the estimated deaths in 2030 in Syria, Saudi Arabia and UAE, all have a notable

Arab Countries	Total Pop. No.^	F% to M	F Incid.	F% to M	CIR*	ASIR*	F Mort.	F% to M	CMR*	ASMR*	5Y Prev.	F% to M	MIR
Algeria	42008	49.5	29112	54.8	140	140.6	13391	45.5	64.4	65.9	76491	60.1	0.46
Bahrain	1567	36.7	568	54.2	99	122.6	293	48.6	51.1	73.2	1693	59.9	0.52
Comoros	832	49.6	320	62.7	77.6	116.8	226	61.6	54.8	89.8	585	66.6	0.71
Djibouti	971	49.8	446	**66.2 (H)**	92.1	111.4	290	61.4	59.9	76.5	762	**68.8 (H)**	0.65
Egypt	99376	49.4	65693	51	133.7	151.4	38814	45.4	79	90.9	150292	58.4	0.59
Iraq	39340	49.4	14020	55.4	72.2	107	7241	49.9	37.3	58.7	32473	59.2	0.52
Jordan	9904	49.4	5893	54.1	120.5	162.3	2687	46.2	55	78.6	15462	60.6	0.46
Kuwait	4197	42.6	2043	57	114.3	150.6	808	48.7	45.2	75.2	6278	62.6	0.40
Lebanon	6094	49.8	8485	49.1	**279.4 (H)**	**248.9 (H)**	3983	44.4	**131.2 (H)**	109	22250	53.2	0.47
Libya	6471	49.6	3159	50.1	98.4	109.4	1488	44.1	46.4	55.9	7611	55.4	0.47
Mauritania	4540	49.6	1660	60.7	73.7	111	1104	57.1	49	78.2	3031	65.7	0.66
Morocco	36192	**50.5 (H)**	27495	52.1	150.6	139.3	14225	43.2	77.9	71.8	64866	59.4	0.52
Oman	4830	33.8	1331	40.1	81.5	108.5	594	**35.3 (L)**	36.4	55.8	3778	44.3	0.45
Palestine**	5053	49.3	2394	53.2	96.1	157	1260	47.7	50.6	89.9	5854	58.3	0.53
Qatar	2695	**25.1 (L)**	491	**39 (L)**	72.6	127.9	234	34.8	34.6	80.7	1528	**43.1 (L)**	0.48
Saudi Arabia	33554	42.7	12222	49.9	85.2	104	4419	42	**30.8 (L)**	**42.6 (L)**	38783	54.8	**0.36 (L)**
Somalia	15182	50.2	6380	64.2	83.7	149.5	5123	**62.5 (H)**	67.2	**126.5 (H)**	8390	66.3	**0.80 (H)**
Sudan	41512	50	15528	60.3	74.8	109.8	9833	57.3	47.4	73.4	27462	63.1	0.63
Syria	18284	49.5	12820	55.3	141.6	175.7	7090	50.5	78.3	99.1	24589	59.6	0.55
Tunisia	11659	50.6	7348	46.2	124.6	102	4017	39.8	68.1	53.2	18053	51.6	0.55
UAE	9542	27.9	2642	56.1	99.1	173.8	977	47	36.7	86.6	8333	60.8	0.40
Yemen	28915	49.5	7444	56.5	**52 (L)**	**81 (L)**	4806	52.9	33.6	57.7	12171	58.2	0.65
TOTAL (22)	**422718**	**45.7**	**227494**	**54**	**111.7**	**134.5**	**122903**	**48**	**60.3**	**75.4**	**530735**	**58.4**	**0.54**
World countries	**7500000**	**49.6**	**8622539**	**47.7**	**228**	**182.6**	**4169387**	**43.6**	**110.2**	**83.1**	**22826472**	**52.1**	**0.49**

Table 1: 2018 Arab world countries and their total population, incidence, mortality, five–year prevalence, mortality to incidence ratio with female to male ratio in the alphabet (Abbreviations: ^ Total "males and females" Population number in thousands; H: Highest; Incid: Incidence; F% to M: Females percent to Males; L: Lowest; Mort.: Mortality; *Per 100 000; CIR & CMR: Crude Incidence & Mortality Rate; ASIR & ASMR: Age Standardised Incidence & Mortality Rate; 5Y Prev.: 5–year prevalence; MIR: Mortality to Incidence Ratio; **Palestine named in the GCO as Gaza strip and West bank) [7].

inconsistent increase in comparison with the estimates in the figure's adjacent countries.

Discussion:

Our study showed that the AFCs' average CIR / ASIR and CMR / ASMR are all lower than that of WFCs, and these lower rates are also consistent in the 5Y Prev. proportions. The average MIR was 0.54, compared to 0.58, 0.52, 0.49 in medium HDI, UMIC, and all the world countries, respectively. Thirty cancer types were recognized in this work, and the highest cancer in the number of new cases and deaths and 5Y Prev. in AFCs was breast cancer with MIR calculated to be 0.37, compared to 0.3 breast cancer MIR on the world scale.

This work's results were extracted from the 2018 GCO, an interactive web–based platform presenting global cancer statistics to inform cancer control and research. The data presented in the GCO are supposed to be the best available estimate for each country worldwide. However, caution must be exercised when interpreting the data, recognizing the current limitations in cancer data quality and coverage, particularly in LIC and MIC[7]. For example, the 2018 annual report of the Iraqi cancer registry reported 17,890 new incident cancers in Iraqi females (57% of the total 31,502 with CIR of 94.84/100,000) and that the top ten in Iraqi females were breast, thyroid, colorectal, leukemia, lung, ovary, CNS, non–Hodgkin lymphomas, skin, and stomach[8]. This is compared to 14,020 new incidental cancers by GCO (55% of the total 25,320 with a

Cancers in Females	ICD	Incid. No.	CIR*	ASIR*	Mort. No.	CMR*	ASMR*	5Y Prev.	MIR
Bladder	C67	4735	2.3	3.1	2552	1.3	1.6	11297	0.54
Brain, CNS	C70–72	5522	2.7	3.1	4500	2.2	2.6	14206	0.82
Breast	C50	**81382 (H)**	**40 (H)**	**46.7 (H)**	**29831 (H)**	**14.6 (H)**	**17.7 (H)**	**213857 (H)**	0.37
Cervix uteri	C53	10907	5.4	6.6	7578	3.7	4.8	25488	0.69
Colorectum	C18–21	15048	7.4	9.2	8613	4.2	5.3	33926	0.57
Corpus uteri	C54	6544	3.2	4.3	1695	0.83	1.1	19287	0.26
Gallbladder	C23–24	2838	1.4	1.8	2187	1.1	1.4	3088	0.77
Hodgkin lymphoma	C81	2855	1.4	1.5	961	0.47	0.55	9015	0.37
Hypopharynx	C12–13	441	0.22	0.26	247	0.12	0.15	733	0.56
Kaposi sarcoma	C46	**204 (L)**	**0.1 (L)**	**0.11 (L)**	121	0.06	0.07	412	0.59
Kidney	C64–65	2849	1.4	1.6	1429	0.7	0.87	7514	0.50
Larynx	C32	660	0.32	0.42	550	0.27	0.35	1590	0.83
Leukemia	C91–95	7584	3.7	4.2	6297	3.1	3.5	19362	0.83
Lip, oral cavity	C00–06	2041	1	1.3	942	0.46	0.59	4870	0.46
Liver	C22	9445	4.6	6.1	9310	4.6	6	7947	**0.99 (H)**
Lung	C33–34	6234	3.1	4	5716	2.8	3.6	6822	0.92
Melanoma of skin	C43	791	0.39	0.49	380	0.19	0.24	2032	0.48
Mesothelioma	C45	210	0.1	0.13	177	0.09	0.11	**245 (L)**	0.84
Multiple myeloma	C88+C90	1621	0.8	1	1377	0.68	0.9	3487	0.85
Nasopharynx	C11	1538	0.76	0.86	625	0.31	0.37	4770	0.41
Non–Hodgkin lymphoma	C82–86, C96	10362	5.1	6.2	6260	3.1	3.9	25192	0.60
Oesophagus	C15	2569	1.3	1.6	2440	1.2	1.6	2460	0.95
Oropharynx	C09–10	213	0.1	0.13	**113 (L)**	**0.06 (L)**	**0.07 (L)**	557	0.53
Ovary	C56	9006	4.4	5.3	6344	3.1	4	21063	0.70
Pancreas	C25	3316	1.6	2.1	3139	1.5	2	2569	0.95
Salivary glands	C07–08	632	0.31	0.36	242	0.12	0.15	1320	0.38
Stomach	C16	5118	2.5	3.1	4454	2.2	2.7	7174	0.87
Thyroid	C73	11338	5.6	6.2	1391	0.68	0.86	36263	**0.12 (L)**
Vagina	C52	393	0.19	0.25	184	0.09	0.12	881	0.47
Vulva	C51	958	0.47	0.6	446	0.22	0.29	2335	0.47
All cancers	**C00–97**	**227494**	**111.7**	**134.5**	**122903**	**60.3**	**75.4**	**530735**	**0.54**

Table 2: 2018 Cancer types in females in the Arab world countries in the alphabet (Abbreviations: ICD: international classification of diseases; *Per 100 000; Incid: Incidence; Mort.: Mortality; CIR & CMR: Crude Incidence and Mortality Rate; ASIR & ASMR: Age Standardised Incidence & Mortality Rate; 5Y Prev.: 5–year prevalence; MIR: Mortality to Incidence Ratio) [7].

CIR of 72.2/100,000). The top ten were breast, leukemia, colorectal, CNS, lung, non–Hodgkin lymphomas, ovary, thyroid, bladder, and stomach. The GCO, by this estimate, was 0.78 of the registered cases in that particular country in 2018.

Gender ratio showed exciting findings in the total population, cancer incidents, deaths and 5Y Prev. While the average female to male ratio in the people of the Arabic countries is 45.7:54.3 (compared to the balance of 49.6:50.4 worldwide), it is almost equally distributed (around 50% +/– 0.6) in most Arabic countries (in particular, Levant and North Africa countries). Interestingly, the ratio is in–favor of males in the Gulf region countries (36.7:63.3 in Bahrain, 42.6:57.4 in Kuwait, 33.8:66.2 in Oman, 25.1:74.9 in Qatar, 42.7:57.3 in Saudi Arabia and 27.9:72.1 in UAE). Usually, the gender ratio at birth is slightly biased towards the male sex and is often considered around 105[9]. The main reason for this gender

Top 10 cancers	Of Incidence in AFC	Of Incidence in WFC	Of Mortality in AFC	Of Mortality in WFC
1	Breast	Breast	Breast	Breast
2	Colorectum	Colorectum	Liver	Lung
3	Thyroid	Lung	Colorectum	Colorectum
4	Cervix uteri	Cervix uteri	Cervix uteri	Cervix uteri
5	Non–Hodgkin lymphoma	Thyroid	Ovary	Stomach
6	Liver	Corpus uteri	Leukemia	Liver
7	Ovary	Stomach	Non–Hodgkin lymphoma	Pancreas
8	Leukemia	Ovary	Lung	Ovary
9	Corpus uteri	Liver	Brain, CNS	Esophagus
10	Lung	Non–Hodgkin lymphoma	Stomach	Leukemia

Table 3: Top ten cancers in incidence and mortality in Arab and World females.

Communities	Incid. No.	CIR*	ASIR*	Mort. No.	CMR*	ASMR*	5Y Prev.	Proportion*	MIR**
AFC	**227494**	**111.7**	**134.5**	**122903**	**60.3**	**75.4**	**530735**	**260.5**	**0.54**
WFC	8622539	228	182.6	4169387	110.2	83.1	22826472	603.5	**0.49**
World countries based on human development–index level									
Very HDI	3714184	528.6 **(H)**	269.2 **(H)**	1427398	131.4	87.8	11888609	1692.1 **(H)**	0.38 **(L)**
High HDI	1119604	250.3	178.4	521373	203.2 **(H)**	81	2859597	582.9	0.47
Medium HDI	876373	108.2	112.8 **(L)**	506200	64.9	68.6 (L)	1904812	233.8	0.58
Low HDI	401977	78.6 **(L)**	128.4	267887	52.4 **(L)**	91.1 (H)	699472	136.8 **(L)**	0.67 **(H)**
World countries based on income level									
HIC	3355170	549.4 **(H)**	278 **(H)**	1249228	133.1	88.6	10874151	1780.5 **(H)**	0.37 **(L)**
UMIC	3311162	254.5	181.5	1731651	204.5 **(H)**	79.5	7826991	601.7	0.52
LMIC	1572790	106.4	113 **(L)**	942120	63.7	68.6 **(L)**	3425883	231.7	0.60
LIC	325901	86.4 **(L)**	133	222227	58.9 **(L)**	95.1 **(H)**	544695	144.4 **(L)**	0.68 **(H)**

Table 4: CIR, ASIR, CMR, ASMR and proportion, MIR of AFC compared to WFC, and females in very high human development index (HDI), high HDI, medium HDI, low HDI, high–income countries (HIC), upper–middle–income countries (UMIC), lower–middle–income countries (LMIC) and low–income countries (LIC). */100000; **Mort. No. / Incid. No.

ratio in the Gulf region countries is the large male migrant stock[10]. Our work's other gender ratios revealed that females in the Arabic countries have a little higher ratio for the incidence (54%), less ratio for the deaths (48%) and more ratio for the 5Y Prev. (58.4%). This might reflect the better outcomes of females' cancers compared to males' cancers.

A closer view of the numbers of AFCs showed a wide range of variation among the Arabic countries, reaching three folds ASIR between Yemen and Lebanon and three folds in ASMR between Saudi Arabia and Somalia. While this difference in ASIR could be inaccurate and is affected by the lower estimate of cancer registry in Yemen compared to that in Lebanon, the disparity between the ASMR in Saudi Arabia and Somalia could also be related to the inaccuracy, most likely to the better treatment outcomes and health measures in Saudi Arabia compared to that in Somalia, as the latter is LIC compared to the former that is HIC. Health disparities may worsen in the absence of targeted intervention because poverty, associated with higher cancer risk, increases in some countries[2]. To address this disparity, one has to keep in mind that most primary prevention measures are incredibly cost–effective, especially tobacco control and vaccination. This step will substantially reduce the burden of cancer. Many of the standard cytotoxic drugs and radiotherapy sessions, even with Cobalt teletherapy and palliative care, are also cost effective[11].

While we all see breast cancer as the leading cause of incidence and mortality among AFCs and WFCs, however, leukemia, on the other side, which ranked tenth deadly WFCs, was ranked fifth in the deadly AFCs. Leukemia, in general, has become a highly curable disease in recent decades in developed communities. Still, despite that, it

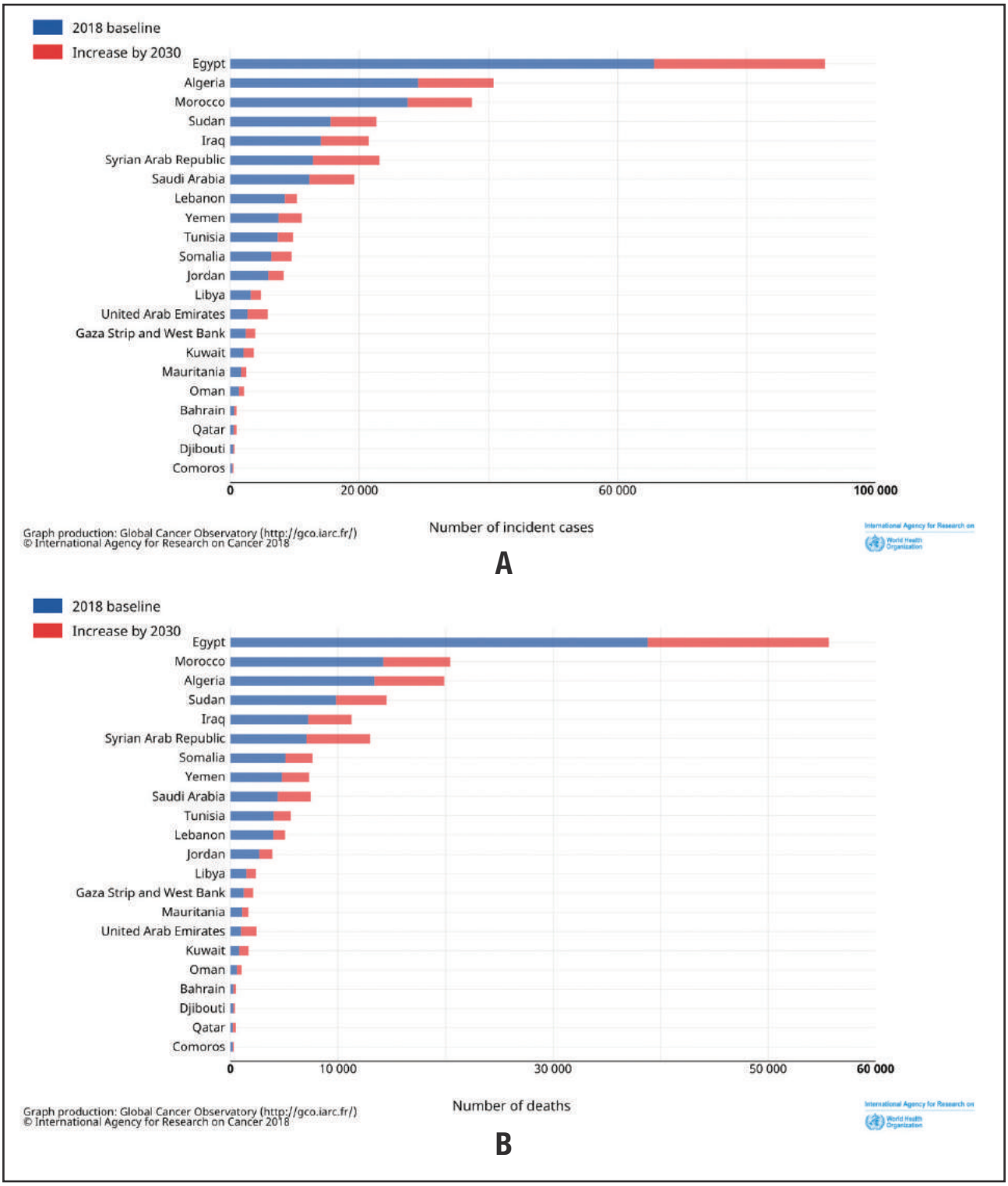

Figure 1: Estimated number of AFCs' incident cases (A) and deaths (B) from 2018 to 2030 [7].

ranked eighth of the incident AFCs. This may give a hint to the clinicians that the modernization of care might improve this disease outcome. On the other hand, lung cancer ranks third globally and tenth in AFCs, which can be attributed to the relatively lesser use of tobacco among females in Arabic countries. It is well established that around one–third of deaths from cancer are due to the five leading behavioural and dietary risks: tobacco use, and alcohol use, low fruit and vegetable intake, high body mass index, and lack of physical activity[1]. The Arabic countries' females are relatively good regarding tobacco and alcohol use, moderately good for fruit and vegetable intake, and less regarding high body mass index and physical activity[5,12], mostly due to societal and cultural norms. Despite these

general similarities, there are apparent disparities in some habits, like tobacco use. According to the WHO Cancer Country Profiles, smoking prevalence among females in Qatar, Oman, and UAE varies from 0.2% to 0.7%, whereas it rises to 8.2% in Tunisia and 34% in Lebanon[13].

Despite that cancer of the cervix uteri is among the top five females cancer on the global scale and that it is ranked fourth in AFCs and WFCs incidence and mortality by the 2018 GCO, the authors are not convinced of this estimate in AFCs, as the risk factors of this cancer are not that obvious in the females of the Arabic countries in comparison with other communities. To support this assumption, we notice that the latest published national cancer registries in 2016 from Saudi Arabia and Jordan reported 111 and 39 incident cases, respectively[14], while the GCO estimated that in 2018 there would be 316 and 104 in Saudi Arabia and Jordan, respectively[15]. It is unlikely that cervical cancer cases will be almost doubled or tripled in two years. This postulation agrees with Elsayed Salim *et al.,* who reported in 2009 that cervical cancer is generally low in the Arab world (apart from some countries) and does not appear to be increasing[5].

Although MIR is a controversial tool in the literature, we used it in this work as we think it is a practical measure for broadly assessing the effectiveness of cancer control programs[16,17]. AFCs MIR was 0.54 (range: 0.36 – 0.80) in this work. These MIRs are inversely parallel to countries' gross domestic products (GDPs), with the lowest MIR in Saudi Arabia, the highest GDP in Arab countries. Compared to high–income Arabic countries, management of female cancer in LICs and war weakened countries face significant challenges, mainly about lack of human resources, medical equipment and access to novel drugs leading to the highest rates of cancer–specific mortalities. Based on this, MIRs are high (unfavorable) of >0.6 in Comoros, Djibouti, Mauritania, Somalia, Sudan and Yemen. Strategies that reduce healthcare and drugs' costs, improve access to health services, and strengthen the infrastructure of healthcare systems are needed to meet the challenge and improve the current gaps[18]. Improvement of human resources, educational programs and networking between the professional, stakeholders, and authorities in the Arabic countries can be among the first essential steps to be taken. The establishment experience of the first board–certification program in radiation oncology in a war–torn Arabic country, Iraq, can be a successful model in this regard[19]. Besides the international organizations like the World Health Organization (WHO), the regional organizations like the Arab Medical Association Against Cancer (AMAAC)[20] and the Gulf Federation For Cancer Control (GFFCC)[21], all are expecting to further help in filling this gap in the limited resources Arabic countries.

The late political changes in many Arabic countries in the last two decades that lead to apparent instability in many life circumstances could have had a negative impact that affected the unfavorable AFCs' MIR in these countries by either increasing the cancer incidence or the cancer–related mortality in these Arabic countries. Rajaie Batniji *et al.* suggested an association between more effective government and average reductions in mortality. The movements for changing governance in the region threaten access to services in the short term, forcing migration and increasing the vulnerability of some populations[22]. In response to the priority health challenges in the Arab world, Ala Alwan wrote that non–communicable diseases, including cancer, are a crucial challenge, and its burden continues to escalate. In some countries, up to 40% of those dying from non–communicable diseases are aged younger than 60 years. The response of countries to the United Nations (UN) roadmap is inadequate[23].

Besides governmental and public cancer care facilities, non–governmental civil facilities can significantly improve cancer outcomes by decreasing cancer incidence and decreasing cancer–related deaths. Moreover, civil society members provide education to the public and support health–care providers by providing training, equipment, and supplies. Civil society organizations in HIC and collaborations with governments and businesses can help support and catalyze national cancer control efforts in low–income and middle–income countries[24]. Prominent examples in this regard are the establishment of the King Hussein Cancer Foundation and Center in Jordan[25], and the Children's Cancer Hospital Foundation in Egypt[26]. Radical progress in closing the global cancer divide for women requires evidence–based policymaking and a broad multisectoral collaboration that capitalizes on recent progress in the associated domains of women's health and innovative public health approaches to cancer care and control. Such multisectoral cooperation can serve to build health systems for cancer[27].

It is lovely to repeat the question and reply of Abbas El–Zein *et al.*: What future we plan for AFCs? We must respect the fact that different populations of the Arabic countries might want other ends; however, the fundamentals of state–citizen relationships, responsive and accountable institutions, and cooperation for the sake of survival are arguably standard. It is the message that the Arabic countries can contribute to the global debate on sustainable development goals. It is as urgent a message as ever[28]. In general, the Arab world has made significant progress in reducing the number of deaths from diseases and injuries and prolonging life when we compare the health indicators in the last decades to that in the mid of the previous century. Despite improvements, the burden

of non–communicable diseases and injuries, including cancer, has increased. The changes in the disease burden will challenge already stretched human and financial resources because many Arab countries are now dealing with both non–communicable and infectious diseases. A roadmap for health in the Arab world is urgently needed[4].

This work's strength is coming from its objective to look for the similarities and disparities of cancer in Arab world females, all in one document. The study is not limited to female sex–limited cancers. It examined the epidemiological metrics of AFCs and the relation to an economic and human–development index. It is the first study of this kind in the Arab world. The limitations of this work are based on estimated numbers from the 2018 GCO. Despite that GCO is a well–established database, the incidence and mortality measures are not confirmed numbers. Accordingly, there could be a range of inaccuracies in our results. The recommendations from this work are including but not limited to the development and improvement of the national and regional cancer registries in the Arabic countries, systematic and comprehensive research to address further the evidence–based gender disparities of cancer in the Arabic countries, where we can fully understand the whole picture and manage the required future directions, to successfully shift every individual MIR of the AFCs to the favorable ones. Cancer is a major global social and political priority. Women's cancers are a tractable socioeconomic policy target in themselves and a vital Trojan horse to drive improved cancer control and care[27].

Conclusions:

Higher incidence rates in females' cancers in the Arab world compared to males, but with less mortality. Despite the similarities among the Arab communities, there are apparent disparities in cancer metrics within the Arab world females. Remarkable differences in cancer ranking and rates among Arab countries themselves and other world groups and countries require a systematic approach to address.

Abbreviations:

5Y Prev.: 5–year prevalence; AFCs: Arab Females' Cancers; AMAAC: Arab Medical Association Against Cancer; ASIR: Age–Standardized Incidence Rate; ASMR: Age–Standardized Mortality Rate; CIR: Crude Incidence Rate; CNS: Central Nervous System; F: Female; GCO: Global Cancer Observatory; GDP: Gross Domestic Product; GFFCC: Gulf Federation For Cancer Control; H: Highest; HDI: Human Development–Index; HIC: High–Income Country; ICD: International Classification of Diseases; Incid: Incidence; L: Lowest; LIC: Low–Income Country; LMIC: Lower–Middle Income Country; M: Male; MIC: Middle–Income Country; MIR: Mortality to Incidence Ratio; Mort: Mortality; UAE: United Arab Emirates; UN: United Nations; UMIC: Upper–Middle Income Country; WFCs: World Females' Cancers; WHO: World Health Organization.

Funding:

None.

Ethics approval and consent to participate:

Not applicable.

Competing interests:

The authors disclose no conflict of interest.

References:

1. World Health Organization. Cancer. World Health Organization https://www.who.int/news–room/fact–sheets/detail/cancer (2020).
2. Torre, L. A., Islami, F., Siegel, R. L., Ward, E. M. & Jemal, A. Global Cancer in Women: Burden and Trends. Cancer Epidemiol. Biomarkers & Prev. 26, 444 (2017).
3. Ginsburg, O. & Horton, R. A Lancet Commission on women and cancer. Lancet 396, 11–13 (2020).
4. Mokdad, A. H. et al. The state of health in the Arab world, 1990–2010: An analysis of the burden of diseases, injuries, and risk factors. Lancet 383, 309–320 (2014).
5. Salim, E. I. et al. Cancer epidemiology and control in the Arab world – past, present and future. Asian Pacific Journal of Cancer Prevention vol. 10 3–16 (2009).
6. Ginsburg, O. et al. The global burden of women's cancers: a grand challenge in global health. The Lancet vol. 389 847–860 (2017).
7. Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, B. F. Global Cancer Observatory: Cancer Today. International Agency for Research on Cancer (2018).
8. Iraqi Cancer Registry. 2018 Annual Report – Iraqi Cancer Registry. https://moh.gov.iq/upload/upfile/ar/1090.pdf (2018).
9. World Health Organization. Sex Ratio. http://origin.searo.who.int/entity/health_situation_trends/data/chi/sex–ratio/en/ (2020).
10. Ritchie, H. Gender Ratio. OurWorldInData.org https://ourworldindata.org/gender–ratio (2019).
11. Islami, F., Torre, L. A., Drope, J. M., Ward, E. M. & Jemal, A. Global Cancer in Women: Cancer Control Priorities. Cancer Epidemiol. Biomarkers & Prev. 26, 458 (2017).

12. Rahim, H. F. A. et al. Non–communicable diseases in the Arab world. Lancet 383, 356–367 (2014).

13. World Health Organization. WHO report on the global tobacco epidemic, 2017: monitoring tobacco use and prevention policies. https://apps.who.int/iris/bitstream/handle/10665/255874/9789241512824–eng.pdf;jsessionid=BC7BF2764F536FDCB64B8385573ED848?sequence=1 (2017).

14. Saudi Cancer Registry. 2016 Saudi Arabia Cancer Incidence Report. https://nhic.gov.sa/eServices/Documents/2016.pdf (2019).

15. Jordan Cancer Registry. Cancer Incidence in Jordan – 2016. https://www.moh.gov.jo/Echobusv3.0/SystemAssets/05bd5575–f7e2–4943–8e66–2dd1510196cc.pdf (2017).

16. Choi, E. et al. Cancer mortality–to–incidence ratio as an indicator of cancer management outcomes in Organization for Economic Cooperation and Development countries. Epidemiol Heal. 39, e2017006–0 (2017).

17. Ellis, L., Belot, A., Rachet, B. & Coleman, M. P. The Mortality–to–Incidence Ratio Is Not a Valid Proxy for Cancer Survival. J. Glob. Oncol. 1–9 (2019) doi:10.1200/JGO.19.00038.

18. Cesario, S. K. Global Inequalities in the Care of Women With Cancer. Nurs. Womens. Health 16, 372–385 (2012).

19. Mula–Hussain, L. et al. Board–certified specialty training program in radiation oncology in a war–torn country: Challenges, solutions and outcomes. Clin. Transl. Radiat. Oncol. 19, 46–51 (2019).

20. Arab Medical Association Against Cancer. AMAAC Official Website. https://amaac.org/ (2020).

21. Gulf Federation For Cancer Control. GFFCC Official Website. http://gffcc.org/home/ (2020).

22. Batniji, R. et al. Governance and health in the Arab world. Lancet (London, England) 383, 343–55 (2014).

23. Alwan, A. Responding to priority health challenges in the Arab world. Lancet (London, England) 383, 284–6 (2014).

24. Brawley, O. W. & Cowal, S. G. Civil society's role in efforts to control women's cancers. Lancet 389, 775–776 (2017).

25. King Hussein Cancer Foundation and Center – Homepage. https://khcc.jo/.

26. Children's Cancer Hospital Egypt (CCHE 57357) – Children's Cancer Hospital Egypt (CCHE 57357). https://www.57357.org/en/home–page/ .

27. Ginsburg, O. et al. Changing global policy to deliver safe, equitable, and affordable care for women's cancers. Lancet 389, 871–880 (2017).

28. El–Zein, A. et al. Health and ecological sustainability in the Arab world: a matter of survival. Lancet 383, 458–476 (2014).