

Mapping Cancer Research Across North Africa, 1996–2025

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Keywords.

Bibliometrics, Cancer research, North Africa, Research collaboration, Open access, OpenAlex.

ABSTRACT

Cancer research capacity across North Africa has grown, but its output, focus by cancer site, and collaboration patterns have not been characterized across the major countries of the region over the full period of modern indexing. All cancer-related records from Egypt, Morocco, Tunisia, Algeria, and Libya indexed in OpenAlex between 1996 and 2025 were retrieved (156,715 unique records) and profiled by publication year, cancer site inferred from the title, international co-authorship, and open-access status. Output rose across all five countries, led by Egypt. Breast cancer was the most studied site region-wide (8,305 records), followed by liver (6,379). Egypt showed a distinctive concentration on liver cancer (21% of its site-tagged records against a regional norm near 7%), consistent with its documented hepatocellular carcinoma burden. Research focus shifted over time toward breast and liver cancer and away from the lymphomas. International collaboration and open-access shares varied systematically by cancer site. North African cancer research has grown and professionalized, with an agenda that concentrates on a small set of sites and, in Egypt, tracks a known epidemiological burden. Research frequency reflects scientific attention rather than disease incidence.

Introduction

Cancer is now among the leading causes of death across North Africa, and the region carries a rising share of the continental burden. Global estimates place breast, liver, and colorectal cancers among the most common malignancies in the Maghreb and Egypt [1,2], with breast cancer presenting at a younger median age than in Western populations and often at a more advanced stage [3-5]. The burden among adolescents and young adults has grown measurably over the past three decades across all six North African states [6,7]. These features raise the question of how strongly the region's research effort is aligned with the diseases its populations actually face.

Research capacity across the continent has expanded, though unevenly and from a low base; Africa's share of world publication output rose from roughly 1.5% in 2005 to about 3.2% in 2016, and health-related output has been a central component of that growth [8,9]. Within North Africa, Egypt, Morocco, and Tunisia have built substantial oncology research communities, while output from Algeria and Libya has grown from a smaller base. Bibliometric analysis has become a standard instrument for describing this kind of research system, allowing questions of how much a country publishes, on what topics, with whom, and in which venues to be answered quantitatively [10-12].

Despite a growing number of country- and topic-specific bibliometric studies in the region, including analyses of cancer research in the Arab world and in fragile and conflict-affected settings [13-15], no study has characterized North African cancer research as a whole across output, the distribution of research effort by cancer site, international collaboration, and open access over the full period of stable indexing. Existing work tends to treat one country, one cancer, or one dimension at a time, leaving the regional picture fragmented.

This study provides that broader characterization for the five largest North African research producers, Egypt, Morocco, Tunisia, Algeria, and Libya, from 1996 to 2025. It describes how much each country publishes, which cancers its researchers study, how internationally connected that research is, how openly it is published, and how these patterns have shifted over three decades. Throughout, we treat the frequency with which a cancer site appears in the literature as a measure of research attention, shaped by researcher interest, sample availability, and funding, rather than as a measure of what a population suffers from. The one clear point of contact between research focus and disease burden in the region, Egyptian liver cancer, is identified as such.

Materials and methods

Data source and corpus. Records were retrieved from OpenAlex, an open scholarly index [16-18]. A record entered a country corpus when at least one author affiliation resolved to an institution in that country. Cancer-related records were identified by a fixed title, abstract, and keyword query for 1996 to 2025. Articles, reviews, letters, editorials, book

chapters, and preprints were included. After deduplication on the digital object identifier, the corpus held 156,715 unique records. Of these, 156,658 carried at least one author affiliation that resolved to an institution in one of the five study countries; the remaining 57 records (0.04%) had no institution country resolvable in the OpenAlex metadata and are retained in the corpus total but contribute to no country count. Counting was whole rather than fractional, so a record with affiliations in two study countries counts once for each. The five country totals therefore sum to 159,112, which exceeds the unique attributable total of 156,658 by 2,454; this difference is contributed by the 2,220 records with affiliations in more than one study country. Only these five countries defined corpus membership. Partner countries outside the region, such as Saudi Arabia and the United States, appear as co-author affiliations and are reported as collaboration partners, but they never brought a record into the corpus. OpenAlex was chosen because its records are redistributable in full, making the corpus reproducible without a subscription.

Variables. Each record carried its publication year, affiliation country set, source journal, and open-access status. A record was classified as internationally co-authored, for a given country, when its affiliation set contained any country outside that one. Cancer site was inferred by matching a fixed, custom keyword lexicon of anatomical site terms and their common variants (for example, “breast”; “liver,” “hepatocellular,” “HCC”; “colorectal,” “colon cancer,” “rectal”) against the record title. The lexicon was defined a priori by the authors rather than drawn from Medical Subject Headings (MeSH), because title text is not consistently indexed to MeSH in OpenAlex; the full term list is provided in the deposited materials. A record could match more than one site, and 38,547 records (24%) matched at least one.

Interpretation. The frequency with which a cancer site appears in the literature measures research attention, not incidence or mortality in the population. Site frequencies are reported as features of the research agenda, and a connection to disease burden is drawn only for Egyptian liver cancer, where the epidemiological link is independently documented.

Analysis. Descriptive statistics and figures were produced in Python. Code and derived data are deposited (see Data availability).

Results

Output and growth. Cancer research output rose in every country between 1996 and 2025 (Figure 1, Table 1). Egypt was by far the largest producer, contributing 108,176 of the 156,715 records (69%), followed by Morocco (23,102), Tunisia (17,741), Algeria (7,357), and Libya (2,736). Growth was sustained across the whole period and accelerated markedly after 2010: for the region as a whole, more records were published in 2021–2025 than in the preceding fifteen years combined. The smaller producers grew fastest in relative terms, with compound annual growth rates of 22.1% for Libya and 20.1% for Algeria, against 18.6% for Egypt, 14.6% for Morocco, and 12.8% for Tunisia (Table 2). This convergence in growth rate, alongside a persistent gap in absolute volume, is the dominant feature of the regional output trajectory.

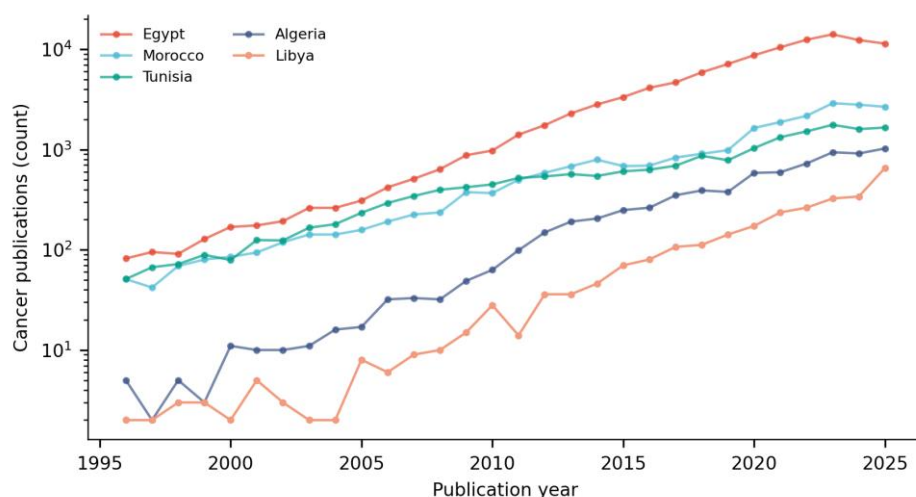


Figure 1 Annual cancer publication counts by country, 1996–2025 (log scale).

Table 1. Corpus characteristics by country.

Country	Records	2025 count	OA %	Intl %
Egypt	108,176	11,404	80	45
Morocco	23,102	2,669	76	39
Tunisia	17,741	1,657	65	43

Country	Records	2025 count	OA %	Intl %
Algeria	7,357	1,025	76	54
Libya	2,736	656	89	55

OA, open access; Intl, international co-authorship.

Table 2. Cancer publication output by five-year period and compound annual growth rate (CAGR), by country.

Country	1996–2000	2001–2005	2006–2010	2011–2015	2016–2020	2021–2025	CAGR
Egypt	565	1202	3423	11607	30578	60801	18.6%
Morocco	327	655	1396	3244	5060	12420	14.6%
Tunisia	358	829	1904	2780	4002	7868	12.8%
Algeria	26	64	209	893	1967	4198	20.1%
Libya	12	20	68	202	614	1820	22.1%

CAGR computed from the first to last year with non-zero output.

The research was overwhelmingly published as primary journal articles, which accounted for 93.5% to 94.6% of records in every country; reviews, preprints, editorials, and book chapters made up the small remainder, with no country deviating substantially from this pattern. The institutional base was concentrated: the fifteen most productive institutions in the region were dominated by the large Egyptian universities, led by Cairo University (20,415 records), Ain Shams University (13,073), and Mansoura University (11,289) (Table 3). Within Libya, the University of Tripoli (720 records) and the University of Benghazi (664) were the leading contributors.

Table 3. The fifteen most productive institutions in North African cancer research, 1996–2025.

Rank	Institution	Records
1	Cairo University	20415
2	Ain Shams University	13073
3	Mansoura University	11289
4	Alexandria University	9758
5	Al-Azhar University	9171
6	Zagazig University	8209
7	National Research Centre	7652
8	Assiut University	6383
9	Tanta University	5833
10	Menoufia University	5236
11	Benha University	4715
12	Mohammed V University	4694
13	King Saud University	4299
14	Suez Canal University	4156
15	Beni-Suef University	3837

Institution names as recorded in OpenAlex; counts reflect any authorship position. Secondary affiliations to non-regional institutions (e.g., King Saud University) may appear because of multinational co-authorship.

Research focus by site. A cancer site was identified in the title of 38,547 records (24% of the corpus). Breast cancer was the most studied site region-wide, appearing in 8,305 records, followed by liver (6,379), colorectal (2,957), leukemia (2,875), and lung (2,515). Breast cancer led the research agenda in every one of the five countries, at between 21 and 25% of site-tagged records, a striking uniformity given the countries' differences in size and output (Figure 2, Table 4).

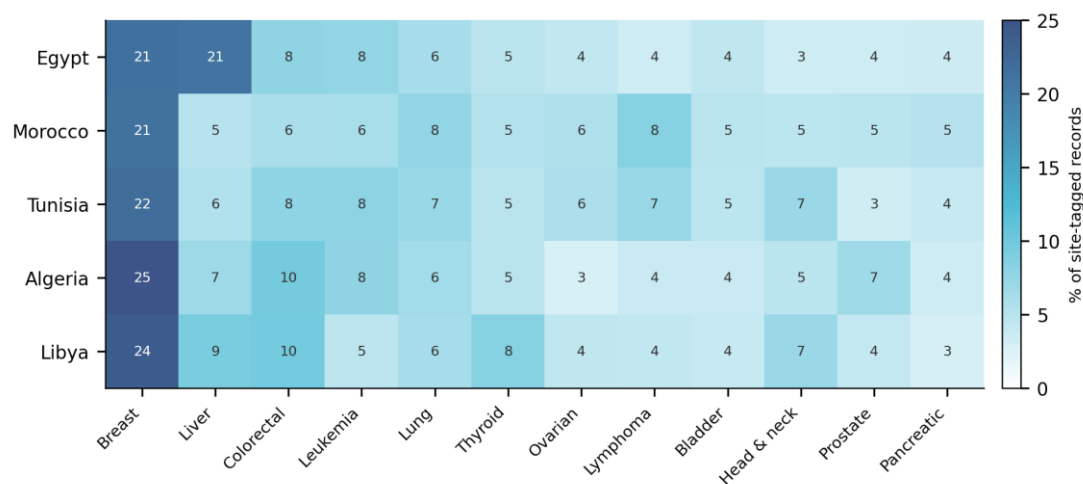


Figure 2 Share of site-tagged cancer records by site and country.

Table 4 Share of site-tagged records by cancer site and country (%).

Site	Egypt	Morocco	Tunisia	Algeria	Libya
Breast	21	21	22	25	24
Liver	21	5	6	7	9
Colorectal	8	6	8	10	10
Leukemia	8	6	8	8	5
Lung	6	8	7	6	6
Thyroid	5	4	5	5	8
Head & neck	4	5	7	5	7

Columns need not sum to 100 because a record may match more than one site.

The clearest cross-country difference was Egyptian liver cancer. Liver accounted for 21% of Egypt's site-tagged cancer research, against a regional norm near 7% in the other four countries, a roughly threefold concentration. This is the single point in the dataset where a national research focus aligns closely with a documented disease burden: Egypt has among the highest recorded rates of hepatocellular carcinoma worldwide, linked to historical hepatitis C virus prevalence [19-21]. No comparable single-site concentration appeared elsewhere; the profiles of Morocco, Tunisia, Algeria, and Libya were broadly similar to one another, dominated by breast cancer, with colorectal cancer forming a comparatively larger share in Algeria [22,23], alongside a long tail of less-studied sites. Libya's profile showed a modestly higher share for thyroid cancer and a slightly lower share for the leukemias, though its smaller site-tagged count ($n = 579$) warrants caution; documented cancer incidence in Libya is recorded chiefly for breast, liver, and colorectal cancers [24-27].

Change over time. The distribution of research effort across sites was not static (Figure 3). The share of site-tagged records devoted to breast cancer rose from roughly 15% in the late 1990s to about 22% by the early 2020s, and the liver-cancer share rose from about 11% to 17% over the same interval. In contrast, the share devoted to the lymphomas fell from about 8% to 4%, and the leukemia share declined more modestly. The regional research agenda therefore concentrated further on the dominant solid tumors across three decades, consistent with the global expansion of breast-cancer research and rising regional attention to hepatocellular carcinoma.

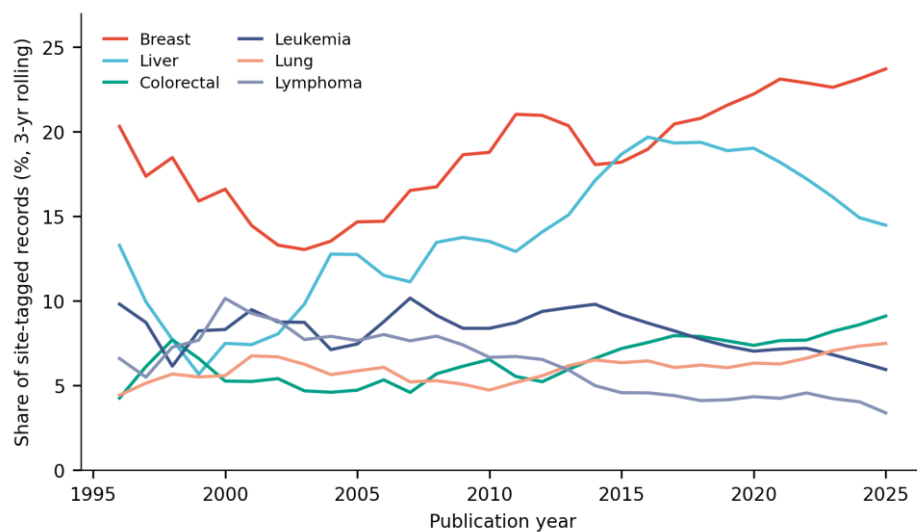


Figure 3 Research focus over time for the six most-studied sites (three-year rolling mean).

International collaboration. The rate of international co-authorship differed across countries, from 39% of Moroccan records to 55% of Libyan ones, with Algeria (54%) and Egypt (45%) intermediate (Table 1, Figure 4). Collaboration also varied systematically by cancer site: sites studied with more specialized or resource-intensive methods, such as brain and lung cancer, carried higher international co-authorship (around 47 to 50%) than the most common sites such as breast and liver (around 34 to 41%). This suggests that domestic communities more readily sustain work on high-incidence, clinically accessible cancers, while rarer or more technically demanding sites draw more on external partnership. Collaboration outside the region concentrated among a small set of partners, led by Saudi Arabia and the United States, followed by France, the United Kingdom, and Germany (Figure 5). Within the region, Egypt was the hub of intra-regional co-authorship, pairing most often with Libya, Morocco, and Algeria; ties not involving Egypt were markedly sparser, with Libya's links to Morocco and Algeria the weakest in the region (Figure 6).



Figure 4 International co-authorship rate by country, 1996–2025 (three-year rolling mean).

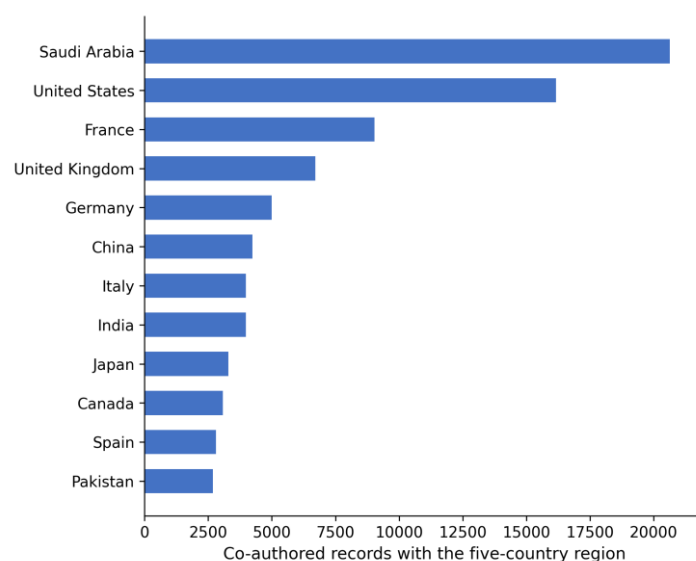


Figure 5. Leading external partner countries for North African cancer research by co-authored record count.

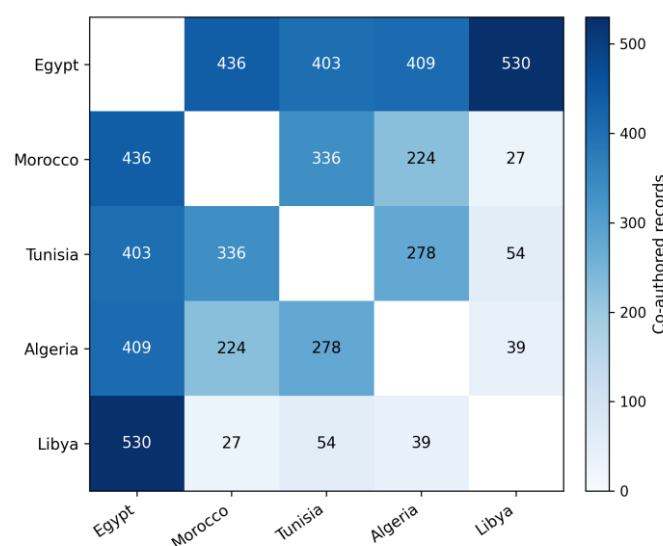


Figure 6. Intra-regional collaboration pairs among the five North African countries, by co-authored record count.

Open access. Open-access shares were high across the region, from 65% of Tunisian records to 89% of Libyan ones (Table 1), and rose over time in every country, consistent with the broader global shift toward open-access publishing. The composition of that access varied by country (Figure 7). Gold and diamond open access together formed the largest part of the open share in every country, Libya combined the lowest gold share with the highest hybrid share in the region, and closed access ranged from about 11% of Libyan records to 35% of Tunisian ones [28,29]. Open access also varied by cancer site. Figure 8 places each site in the two-dimensional space defined by its international co-authorship rate and its open-access share; the sites separate along both axes rather than moving together, indicating that collaboration and access are distinct, non-redundant dimensions of how the region's cancer research is produced and disseminated.

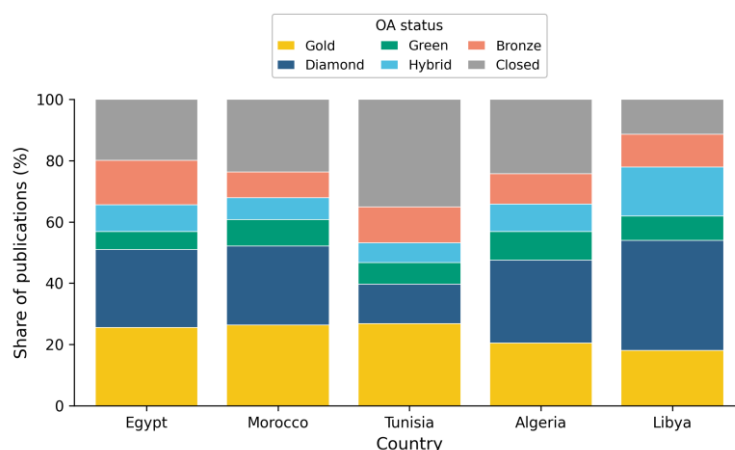


Figure 7 Open-access status composition of cancer publications by country.

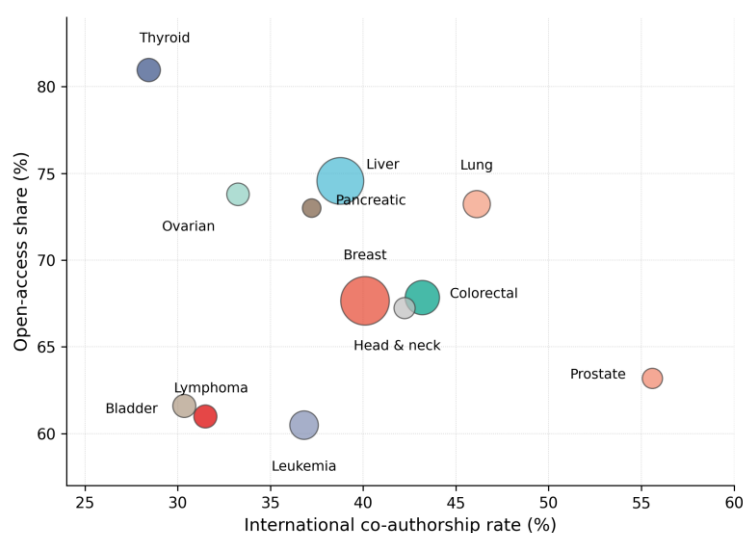


Figure 8 Cancer sites positioned by international co-authorship rate and open-access share; marker size proportional to record count.

Citation impact. Mean citation counts per record, adjusted for publication age, were broadly comparable across the five countries despite large differences in volume (Table 5). Egypt and Morocco recorded the highest mean impact (3.07 and 2.33 citations per year), Algeria and Tunisia were intermediate (2.80 and 2.12), and Libya was lowest (1.95), though the gap across countries was modest relative to the 40-fold difference in total output between Egypt and Libya. Libya's comparatively small research volume was therefore not accompanied by a proportionally lower per-paper citation impact.

Table 5. Citation impact by country.

Country	Records	Total citations	Mean citations/record	Mean citations/year*
Egypt	108,176	1,747,748	16.16	3.07
Morocco	23,102	376,364	16.29	2.33
Tunisia	17,741	276,942	15.61	2.12
Algeria	7,357	96,076	13.06	2.80
Libya	2,736	27,694	10.12	1.95

*Total citations divided by years since publication (using 2026 as reference), to correct for citation-age bias. Mean per-record citation impact is broadly comparable across the five countries despite a roughly 40-fold difference in publication volume; Libya's smaller output is not accompanied by a proportionally lower per-record citation impact.

Publication venues. Cancer research from the region appeared across a wide range of outlets, with no single journal dominating (Table 6). The most frequent venues region-wide were multidisciplinary and mega-journals, including Research Square, Scientific Reports, Cureus, and PLoS ONE, alongside nationally important titles such as The Egyptian Journal of Hospital Medicine. Egyptian national journals featured prominently overall, reflecting that country's share of output. The prominence of preprint servers and open mega-journals is consistent with the high and rising open-access shares described above. Across the region, original articles made up most of this output, with reviews a small but expanding share and letters and editorials remaining marginal (Figure 9).

Table 6: The twelve most frequent publication venues for North African cancer research, 1996–2025.

Rank	Journal / venue	Records
1	Research Square	2667
2	Scientific Reports	2665
3	PubMed	2553
4	The Egyptian Journal of Hospital Medicine	1807
5	Cureus	1462
6	Molecules	1328
7	Pan African Medical Journal	1175
8	The Egyptian Journal of Radiology and Nuclear Medicine	1124
9	Zenodo (CERN European Organization for Nuclear Research)	1102
10	Egyptian Journal of Chemistry	1083
11	The Medical Journal of Cairo University/The Medical Journal of Cairo University	970
12	PLoS ONE	956

Venue names as recorded in OpenAlex.

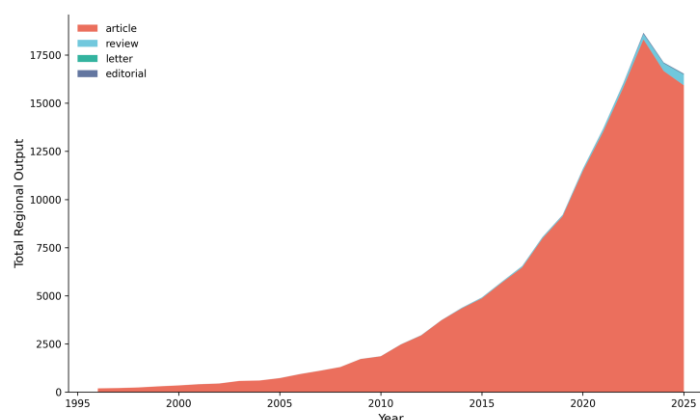


Figure 9. Regional cancer research output by document type, 1996–2025.

Discussion

This study characterized cancer research across the five largest North African producers over three decades along four dimensions: output, focus by cancer site, international collaboration, and open access. Three findings stand out. Output grew in every country. The research agenda concentrated on a small set of sites, led everywhere by breast cancer. And Egypt's pronounced focus on liver cancer marks the clearest instance in which a national research emphasis tracks a documented disease burden rather than general scientific interest.

The uniformity of breast-cancer dominance across five countries of differing size, wealth, and research maturity is itself notable. It likely reflects genuinely high and rising breast-cancer incidence in the region [1,2,3], the relative clinical accessibility of breast-cancer cases, and the global prominence of breast-cancer research that shapes local agendas. North African breast cancer is known to present at a younger median age and often at a more advanced stage than in Western populations, and its burden among younger women has risen over the study period [5,6]. A literature so concentrated on this single site is, in that light, at least broadly responsive to a real and growing clinical problem, even if the alignment is imperfect. The progressive concentration on breast and liver cancer alongside a relative decline in

lymphoma research also points to a shift in funding and infrastructure: breast cancer attracts disproportionate global funding and patient advocacy that spills into regional agendas [30], while the Egyptian liver focus is tied to dedicated national hepatitis C and hepatocellular carcinoma programs [31]. Where research effort is thin relative to burden, as it may be for the declining lymphoma share, the imbalance is a candidate target for deliberate national priority-setting rather than a neutral feature of the literature.

The Egyptian liver-cancer concentration is the sharpest signal in the data and the one place where research focus and epidemiology visibly converge. Egypt's historically high hepatitis C prevalence produced an exceptional hepatocellular carcinoma burden, and its research community has evidently oriented toward that problem [19-21]. This example is instructive precisely because it is exceptional: it shows that when a burden is large and distinctive enough it can reshape a national research agenda in a way visible in aggregate bibliometric data, and that the absence of such signals elsewhere reflects the weaker, more diffuse influence of burden on research choices under ordinary conditions rather than outright misalignment.

The variation in collaboration and open access by cancer site points to a research ecosystem that is not uniform in how it produces knowledge. High-incidence, clinically accessible cancers such as breast and liver are studied with comparatively more domestic authorship, while rarer or more technically demanding sites such as brain and lung cancer rely more on international partnership. This is consistent with a maturing but still resource-constrained system in which local communities sustain independent work on common cancers but draw on external collaboration for specialized questions [32].

For research policy, the value of a regional baseline like this one is that it makes the shape of the research effort explicit and therefore discussable. It identifies where effort concentrates, where it may be thin relative to burden, and where capacity depends on outside partners. Such a baseline is a starting point for more deliberate priority-setting and can be updated as the literature grows, allowing the alignment between research and burden to be tracked rather than assumed. Several limitations bear on interpretation. First, OpenAlex coverage of regional and Arabic-language journals is incomplete and understates true output [17,18], probably most for the smaller producers, so absolute counts are lower bounds. Second, cancer site was inferred from titles alone, which undercounts papers titled by molecular target or method rather than anatomical site, and the 24% site-tagging rate reflects this conservative approach. Third, and most important, research frequency is not disease incidence; the two are connected in this dataset only for Egyptian liver cancer, and site frequencies should not otherwise be read as epidemiology. Finally, the analysis is descriptive by design and does not attempt causal claims.

Conclusion

Across three decades, cancer research in North Africa grew, professionalized, and concentrated on a small set of sites, with Egypt's liver-cancer focus standing out as the point where the research agenda meets a documented disease burden. The regional literature now has enough structure to be characterized quantitatively, providing a baseline for research-policy analysis.

Acknowledgment

None.

Conflicts of interest

The authors declare no conflict of interest.

Funding

This research received no external funding.

Ethics statement

This study used only publicly available, aggregated bibliographic metadata and involved no human participants, human data, or animals; ethical approval was therefore not required.

Author contributions

A.M.A. conceived and designed the study, performed the analysis, and drafted the manuscript. S.M.E. contributed to data interpretation and critical revision. All authors read and approved the final manuscript.

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