JLSC

ISSN 2162-3309 | JLSC is published by the Iowa State University Digital Press | http://jlsc-pub.org

Volume 14, 1 (2026)

Challenges of Open Access Adoption in Low-Resource Settings: Lessons From Tunisia

Ridha Mhamdi

Mhamdi, R. (2026). Challenges of Open Access Adoption in Low-Resource Settings: Lessons From Tunisia. *Journal of Librarianship and Scholarly Communication*, 14(1), eP21182. https://doi.org/10.31274/jlsc.21182

This article underwent fully anonymous peer review in accordance with JLSC's peer review policy.

ISSN 2162-3309 10.31274/jlsc.21182

RESEARCH ARTICLE

Challenges of Open Access Adoption in Low-Resource Settings: Lessons From Tunisia

Ridha Mhamdi

Laboratory of Legumes and Sustainable Agrosystems, Centre of Biotechnology of Borj-Cedria, Tunisia

ABSTRACT

Introduction: Open Access (OA) publishing is a transformative movement that removes subscription barriers to facilitate unrestricted dissemination of scholarly research. This study aims to identify gaps in OA adoption in Tunisia, assess whether Gold OA publications enhance the visibility and impact of research, and determine how OA publishing aligns with the Sustainable Development Goals (SDGs).
Methods: Using Scopus data, we performed a bibliometric analysis of Tunisian research (2020-2024), including publication trends, citation metrics, SDG alignment, and funding sources of OA publications.
Results: Despite high regional productivity, over 60% of publications by Tunisian researchers remain paywalled, limiting their visibility. Hybrid Gold OA demonstrated the highest citation impact, while the advantage of Gold OA was constrained by publication in lower-prestige journals. Although Medicine, Computer Science, and Engineering were the dominant fields in OA output, only 40% of OA publications were aligned with the SDGs. International collaboration, notably with Saudi Arabia, was a key driver of OA adoption. However, high article processing charges (APCs) and a heavy reliance on institutional funding present significant financial barriers.
Conclusion: Tunisia's OA expansion is hindered by financial sustainability challenges and a misalignment with SDG-focused research. To enhance global research visibility and contribution to sustainable development, we recommend strategic policy shifts: redirecting funds from subscriptions to OA models, pursuing transformative agreements, supporting Diamond OA, and incentivizing high-impact, sustainability-focused research.

Keywords: article processing charges, bibliometric analysis, open access adoption, research impact, sustainable development goals, international collaboration, financial barriers

Received: 10/28/2025 Accepted: 02/17/2026

IMPLICATIONS FOR PRACTICE

- Policy makers, librarians, and institutions should develop targeted strategies to reduce the paywall barrier for the 60% of Tunisian research that remains inaccessible, to improve its global visibility and societal impact.
- The existing centralized infrastructure (Centre National Universitaire de Documentation Scientifique et Technique (CNUDST)) must be formally empowered to lead the OA transition. Librarians within this consortium should expand their mandate from content acquisition to holistic scholarly communication management.
- The CNUDST should champion the development of a national Diamond OA infrastructure. This includes establishing a national repository network and supporting institutional publishing platforms to create non-APC OA avenues. Concurrently, librarians must lead targeted, nationwide awareness campaigns to educate researchers on OA options, copyright retention, and identifying predatory practices, ensuring the ethical and effective growth of OA in Tunisia.
- Funding bodies and universities should critically re-evaluate their support for article processing charges (APCs), prioritizing cost-effective Hybrid Gold OA that demonstrates higher impact, while addressing the perceived prestige gap of pure Gold OA in fields like Medicine.
- Research grants and national priorities should incentivize OA publishing that explicitly addresses the Sustainable Development Goals (SDGs) to better align the nation's high productivity with pressing global and local sustainability challenges.

INTRODUCTION

Open access (OA) publishing is a transformative movement in academia that seeks to eliminate subscription barriers and facilitate unrestricted access to scholarly research and literature. This initiative has gained prominence due to its potential to democratize knowledge, enhance visibility for researchers, and encourage collaboration across disciplines (Shelley & Scott, 2023). By providing free access to research outputs, OA supports the broader principles of open science, allowing not only researchers but also the general public to benefit from academic findings (Shelley & Scott, 2023).

The movement encompasses several models, including Gold, Green, Diamond, and Hybrid OA, each characterized by distinct publication practices and funding structures. Gold OA involves publishing articles in fully OA journals where all content is available without subscription fees. Authors typically pay an Article Processing Charge (APC) to cover publication

costs. This model allows immediate access to the research upon publication, enabling rapid dissemination and increased visibility for authors (Elsevier, 2025; Zul, 2024). Green OA refers to the self-archiving of research outputs in institutional or subject-based repositories, allowing authors to share their work publicly. In this model, authors submit their articles to traditional subscription-based journals but later deposit a version of their work in an OA repository (McKenna, 2024). This version may not always be the final published version, and there can be embargo periods set by publishers before the work becomes accessible (Zul, 2024). Green OA serves as a viable option for researchers when gold OA is not available, although it may not always provide the same level of visibility or accessibility as Gold OA (Eve, 2014). Diamond OA (also known as Platinum OA) encompasses journals that provide free access to both readers and authors, with no APCs charged for publication. These journals are often supported by funding from institutions, government agencies, or scholarly societies, allowing them to operate without the need for subscription fees or article charges (McKenna, 2024). This model promotes inclusivity and accessibility, ensuring that diverse voices can contribute to academic discourse. Hybrid OA journals offer a dual model where authors can choose between traditional subscription-funded publishing or Gold OA by paying an APC for OA. This approach allows for a mix of openly accessible and subscription-only articles within the same journal (McKenna, 2024). While hybrid journals increase options for authors, they also continue to support the subscription model, which can perpetuate barriers to access for some readers (Hernandez-Maskivker et al., 2023). Initiatives like Read & Publish agreements have significantly increased OA uptake in regions with adequate funding and institutional support, such as the UK, Australia, and New Zealand (Hoogendoorn & Redvers-Mutton, 2024). In Asia, the OA movement has seen significant developments in countries like India (Das, 2008), Japan (Seo, 2018), and China (Roy et al., 2012), while facing challenges in others, such as Pakistan (Sheikh & Richardson, 2023).

The objective of this work is to examine the adoption of OA publishing in Tunisia, a North-African country with low-resource settings.

LITERATURE REVIEW

Paywalls and restrictive licensing have historically excluded a vast array of research outputs from public view, hindering global knowledge dissemination (Zul, 2024). The OA movement is, therefore, not just about making research freely available, but also about ensuring that such availability truly serves a global audience (Shelley & Scott, 2023). This accessibility is crucial for early-career researchers who need a platform to establish themselves in their respective fields (Quaia et al., 2024). By providing free access to research findings, OA promotes academic collaboration and work opportunities, particularly for institutions in low- and middle-income countries where financial barriers to academic resources can impede research and

innovation (Kopitar et al., 2024). OA publications generally receive greater visibility and often lead to increased citation rates. Studies indicate that OA articles receive, on average, 2.4 times more citations than their subscription-based counterparts (Cornell University, 2025). This enhanced visibility allows authors to reach wider audiences and encourages interdisciplinary collaboration (Kopitar et al., 2024).

Despite its benefits, the OA movement faces significant challenges, including economic sustainability and concerns over scholarly integrity. Critics highlight issues such as the financial burden of APCs, which may restrict access for authors without institutional support, and the potential dilution of academic rigor associated with some OA models (Hernandez-Maskivker et al., 2023; McKenna, 2023). Additionally, there are ongoing debates regarding copyright control and the implications of open licensing, which could affect authors' rights and revenue streams (Alexander, 2020; Mallalieu, 2019).

In the United States, federal agencies are required to ensure that the public can access the results of federally funded research (Mounier & Rooryck, 2024). The US approach primarily focuses on Green OA, where authors deposit their manuscripts in repositories, making them freely accessible after an embargo period (Mounier & Rooryck, 2024). Horizon Europe, the EU's key funding program for research and innovation, supports OA by mandating that all research outputs be openly accessible. This aligns with the broader European initiative, Plan S, which aimed to make full and immediate OA a reality by 2021. Plan S has faced challenges, particularly in its implementation across diverse national contexts, and has been critiqued for potentially favouring large publishers through transformative agreements that may not align with the principles of equity and accessibility (Godínez-Larios & Aguado-López, 2024). In contrast, Latin America has pioneered the Diamond OA model, which is characterized by its non-commercial, community-driven approach, exemplified by platforms like SciELO and Redalyc. This model is supported by public universities and scientific societies, emphasizing regional science output and democratization of knowledge (Babini, 2019).

Tunisia, like other African countries, has implemented OA policies across various universities and research institutions (Adegbilero-Iwari et al., 2023). These policies encourage researchers to publish their work in OA journals or repositories. Tunisia's inclusion in the Directory of Open Access Repositories (DOAR) and the Registry of Open Access Repositories (ROAR) reflects its commitment to OA. However, the number of repositories remains relatively low, and challenges persist regarding access restrictions and policy implementation (Hachani, 2017). The UVT e-doc repository of the *Université Virtuelle de Tunis* (http://pf-mh.uvt.rnu.tn/), registered in 2011 and powered by EPrints, appears largely dormant, with limited content and no recent activity. The national repository PIST (https://www.pist.tn/)—developed by the *Centre National Universitaire de Documentation Scientifique et Technique* (CNUDST)—remains

actively maintained. PIST hosts the *Archive Ouverte Universitaire Tunisienne* (AOUT) and has received ongoing technical upgrades, including the implementation of FAIR Signposting Level 1 in July 2024 and a planned migration to the InvenioRDM platform. However, access to PIST from outside Tunisia was reportedly restricted due to ongoing security measures, limiting its international accessibility.

The country's efforts are part of a broader regional trend in the Maghreb, where OA is increasingly seen as a vital component of academic and scientific progress. Tunisia's initiatives are characterized by a focus on integrating information and communication technologies (ICT) to improve governance and public administration, as well as promoting OA in scientific research. However, challenges such as limited resources, policy inconsistencies, and infrastructural constraints continue to impede progress (Mensah, 2024).

Tunisia's economic challenges, including high unemployment and limited funding, restrict the resources available for developing the necessary infrastructure for OA. These economic issues also affect the ability of institutions to support OA initiatives financially (Lopez-Acevedo et al., 2023). Understanding the extent to which Tunisian researchers utilize OA channels—particularly Gold OA—can provide critical insights into the effectiveness of existing policies and funding mechanisms. Furthermore, in a resource-limited setting, the strategic justification for allocating scarce funds to APCs is under scrutiny. Beyond measuring adoption rates and citation impact, it is essential to evaluate whether OA publishing channels are amplifying research that addresses pressing national and global priorities, such as the United Nations Sustainable Development Goals (SDGs). This study, therefore, also assesses the alignment of OA publications with the SDGs to understand the broader societal return on investment in OA. By addressing these aspects, this study will provide valuable recommendations to policymakers, librarians, institutions, and funding agencies to strengthen Tunisia's participation in the global OA movement.

This study will specifically address the following questions:

- What are the most common OA channels used?
- Do OA make publications more impactful?
- Which subject areas benefit the most from OA?
- To what extent are gold OA publications aligned with the SDGs?
- Does international collaboration promote Gold OA publishing?
- Who are the main funders cited in Gold OA publications?

METHODS

Data collection

Scopus and Web of Science are among the most widely used bibliographic databases for academic research and bibliometric analysis (Ghorbani & Sabour, 2021; Mhamdi, 2023, 2024). Their coverage differs across disciplines, which can impact research outcomes, particularly in citation and bibliometric studies. To ensure a comprehensive approach, we conducted a preliminary search in both databases to assess their coverage and identify the most appropriate dataset for our study. The Boolean query (Tunisia OR Tunisie) was used in the affiliation country field. This approach ensured that only publications with at least one author affiliated with a Tunisian institution were included in the results. The search retrieved 151,673 documents from Scopus and 134,866 from the Web of Science. Given its broader coverage, Scopus was selected as the primary data source, as Web of Science applies fundamentally different classification logics and category labels that make direct comparison incompatible. Also, Scopus data could be directly exported to the SciVal module for further analysis.

The search was conducted on 5 February 2025, and subsequently refined to include only publications from the period 2020–24, restricting results to the document types article, review, and conference paper. The search was limited to English, as it is the predominant language of scientific publishing indexed in Scopus. The refined Boolean query was as follows:

AFFILCOUNTRY (Tunisia OR Tunisie) AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2024)) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English"))

This refined search retrieved 46,194 documents, including 36,757 articles, 1,741 conference papers, and 1,696 reviews. Additional filters were subsequently applied to classify publications based on their OA status.

Scopus categorizes OA publications into four main types: Gold, Hybrid Gold, Green, and Bronze OA:

- Gold OA includes articles published in fully OA journals, typically requiring APCs paid by authors or institutions.
- Hybrid Gold OA applies to subscription-based journals where authors can choose to make their articles openly accessible by paying an APC.

- Green OA consists of articles deposited in institutional or subject-specific repositories, either as preprints or postprints, often subject to an embargo period.
- Bronze OA refers to articles freely accessible on the publisher's website but without an explicit open access license, meaning their availability may be temporary.

Scopus does not explicitly classify Diamond OA, which refers to journals providing full open access without APCs. Instead, such journals are typically grouped under Gold OA, despite their distinct funding model.

Data analysis

Using the Scopus OA filters (All OA, Gold, Hybrid, Green, and Bronze), we created a sub-dataset for each category. Non-OA documents (closed access) were also retrieved by excluding all OA documents and used for comparison. The annual proportion of each OA category was calculated relative to the total number of documents published that year and expressed as a percentage.

Since Gold and Hybrid OA require publication fees, making them financially challenging for Tunisian institutions, our study focused on these two modes of publication. To determine which subject areas benefit the most from Gold and Hybrid OA models, we applied the subject area filter. The proportion of OA publications was normalized against the total number of publications in each category.

To assess whether OA publications were associated with higher-impact journals or received more citations than closed-access publications, we exported the OA sub-datasets from Scopus to SciVal (https://www.scival.com). SciVal is an analytics platform that provides bibliometric insights based on Scopus data, enabling in-depth evaluation of research performance (Mhamdi & Gtari, 2024). We calculated and compared the proportion of OA publications in top 10% journals (i.e., the number of publications appearing in the top 10% of journals ranked by CiteScore) and the top 10% citation percentile (i.e., the number of publications ranked among the top 10% most cited worldwide). Furthermore, we used the Field-Weighted Citation Impact (FWCI), a metric that normalizes citation counts by accounting for differences across disciplines, publication years, and document types, allowing for a fair comparison of research impact. The average citations per publication were also analyzed to compare the citation performance of OA versus closed-access publications.

To assess the societal relevance and strategic alignment of the research supported by OA funding (APCs), we analyzed the proportion of Gold and Hybrid OA publications aligned with the United Nations SDGs using Scopus' SDG mapping. Furthermore, we investigated the role

of international collaboration in facilitating access to OA by calculating the proportion of OA documents involving international co-authors. These metrics were used for comparative analysis with the global Tunisian output and the share of closed-access publications behind paywalls.

Finally, the funding sponsor filter was used to identify the most significant contributors to Gold and Hybrid OA publications. Funder names were standardized and categorized by source (National, European Commission, or the respective country of origin). It is important to note that a publication may acknowledge no funding source or multiple funders. When no funding source is cited, the publication is classified under an "undefined" funding source.

Limitations

This study has several limitations that should be acknowledged. First, the classification of OA types in Scopus—particularly the absence of an explicit category for Diamond OA—may lead to an incomplete representation of OA models. Additionally, the study assumes that publications without cited funders are institutionally funded, which may not always be accurate and could distort the actual funding landscape. Moreover, citing a funder in a publication does not necessarily mean they covered the OA fees, as many funding bodies do not allocate specific budgets for APCs, complicating the interpretation of funding sources. Lastly, the 2024 data may be incomplete, as Scopus continuously updates its records, potentially affecting the observed trends in OA publishing. These limitations highlight the need for caution when generalizing the findings.

RESULTS AND DISCUSSION

Trends in OA publishing

Globally, Tunisia ranks 55th in scientific output (Scimago Country Rankings), demonstrating strong academic productivity relative to its size. With a population of 12.2 million and a GDP of $48.53 billion, ranks fourth in Africa for scientific publications, trailing South Africa, Egypt, and Nigeria (Table 1). In 2022, Tunisia ranked 12th globally in terms of scientific production relative to GDP, indicating a high level of research productivity compared to its economic size (EURAXESS, 2025). Despite this achievement, the technological impact of Tunisian research remains limited, with only 1.3% of its publications cited in patents (Mhamdi, 2025). Reflecting this gap, Tunisia holds the 81st position globally in the Global Innovation Index 2024, with a score of 25.4, placing it 4th in Africa. These findings underline the urgent need to enhance the visibility and application of research outputs to bridge the divide between academic productivity and technological innovation. Against this backdrop, this study presents a comprehensive analysis of OA publishing in Tunisia.

	GDP 2023* ($ Billion)	Habitants* (Million)	Number of** Documents	Citations** per Document	*h*-index**
South Africa	380.7	63.2	448391	19.01	652
Egypt	396	114.5	389675	14.93	409
Nigeria	363.85	227.9	175445	11.19	303
Tunisia	48.53	12.2	134434	12.79	271
Morocco	144.42	37.7	122005	11.18	261

* Source: World Bank (https://data.worldbank.org/).
** Source: Scimago country rankings (https://www.scimagojr.com/countryrank.php).

Table 1. Top 5 African countries in terms of scholarly publications

Between 2020 and 2024, Tunisia published 46,426 documents (articles, reviews, and conference papers), with 18,111 of these being OA. The proportion of OA publications rose from 35.8% in 2020 to over 40% in 2021-23 but declined to 33.7% in 2024 (Fig. 1).

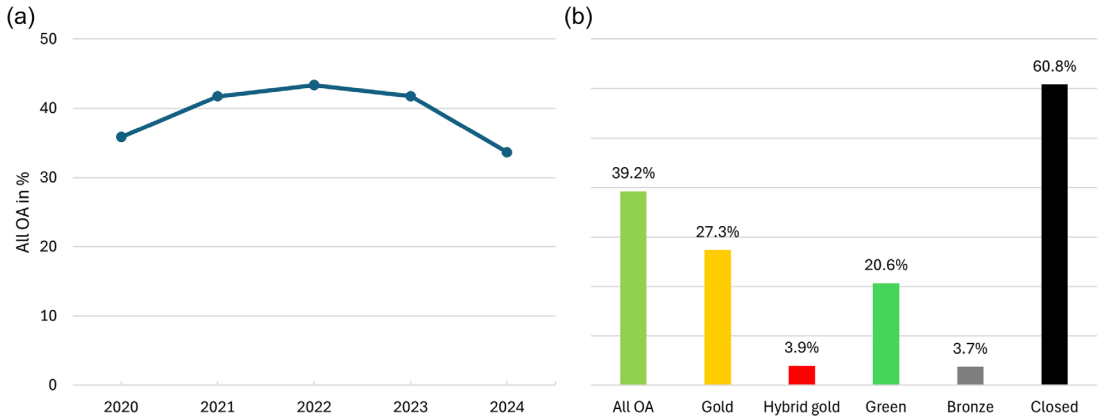

Figure 1. Evolution of the share of all Open Access (OA) publications (a) and the average share of different OA categories from 2020 to 2024. Note: A document can be classified as Green OA (self-archived in a repository) while also being categorized as Gold or Hybrid Gold OA if it is published in an OA journal or under an OA license.

The trend in OA publishing over the past five years has not shown the expected consistent growth. On average, 39.2% of Tunisian publications have been openly accessible. The high percentage of closed-access publications (60%) indicates that a substantial portion of Tunisian research remains restricted by paywalls, limiting its broader accessibility. In 2024, a noticeable decline in OA publications is observed, which may be partly attributed to the incompleteness of Scopus data for that year. However, this decline is also associated with funding challenges, as the financial burden of APCs may have limited institutions' capacity to support OA publishing. This aligns with global concerns regarding the sustainability of OA publishing, especially

in low- and middle-income contexts where financial constraints prevent the widespread adoption of Gold OA (Hernandez-Maskivker et al., 2023).

Among the OA publications, the Gold route—where authors publish in fully OA journals, typically involving APCs—is the most common (27.3%). It should be noted, however, that Scopus classifies Diamond OA journals—which charge no fees to either authors or readers—under the broader Gold category rather than as a distinct category. Given that Scopus is known to significantly underrepresent Diamond OA journals compared to their actual presence in the global publishing landscape (Simard et al., 2025), the proportion of APC-free OA in our dataset is likely to be a minor but unquantified fraction of this Gold figure.

The Green OA route, which involves self-archiving in repositories, follows at 20.6%. Hybrid Gold OA (3.9%) refers to articles made openly accessible in subscription-based journals for a fee, while Bronze OA (3.7%) includes articles made freely available by publishers without a formal OA license. These figures underline a strong reliance on Gold OA, with Green OA also playing a significant role (Fig. 1).

The financial burden discourages many researchers from opting for Gold OA, despite its benefits (Bruns et al., 2020). This creates a disparity in the accessibility and dissemination of research outputs between high-income and low-income regions (Greussing et al., 2022). Due to the high costs associated with Gold OA, many researchers in low- and middle-income countries prefer alternative models, such as Green OA, which involves self-archiving published articles in repositories without incurring APCs. This model is considered more economically viable and effective for providing OA to scholarly literature (Fredericks, 2015). In Tunisia, however, only a fifth of publications are available through Green OA, underscoring the need to strengthen this model by establishing national repositories and addressing access restrictions. The existing repositories in Tunisia do not fully adhere to the OA philosophy. Instead of providing unrestricted access, they often require users to register and log in, which contradicts the primary goal of OA to make scientific literature freely accessible to anyone with an internet connection (Hachani, 2017). The issue of restricted access is not unique to Tunisia. Similar problems are observed globally, where institutional repositories often restrict access to certain types of documents or require registration, thereby limiting the free flow of information (Schöpfel & Prost, 2015).

Open access publishing demonstrated a clear advantage over closed access, with OA publications exhibiting higher citation impact across all metrics (Table 2).

This confirms that OA models can enhance scholarly impact, particularly when authors publish in prestigious OA journals (Trishchenko & Makeenko, 2024; Yi et al., 2024). Among the OA routes, Hybrid Gold stands out as the most impactful, significantly surpassing both closed

	Top 10% journal* (%)	Top 10% citation** (%)	Citations/Paper	FWCI***
Gold	13.7	11.1	8.8	1.07
Hybrid Gold	25.8	15.8	24.3	2.8
Green	17.8	13.6	18.4	1.72
Bronze	23.5	13	26.5	2.15
All OA	17	12.1	13.1	1.42
Closed (Paywall)	14	8.7	6.5	0.89
Overall	**15.3**	**10**	**8.9**	**1.1**

* Publications appearing in the top 10% of journals ranked by CiteScore.
** Publications ranked among the top 10% most cited worldwide.
*** Field-Weighted Citation Impact, values above "1" indicate higher citation impact than similar publications in the Scopus database.

Table 2. Publication and citation metrics of the different OA categories

access and the overall average in the percentage of top 10% cited publications, citations per paper, and FWCI (a field-normalized measure of citation impact, where values above one indicate higher impact than the global Scopus average). This elevated impact is likely attributable to a selection effect rather than the OA status itself: top-tier journals, which consistently generate the highest citation rates, typically offer a hybrid publishing option. Authors choose to pay APCs to publish in these prestigious venues, resulting in the concentration of highly citable papers within the Hybrid Gold category. Hybrid Gold also has the highest share of documents in the top 10% journals (25.8%), meaning that a quarter of these publications appear in highly impactful journals (Table 2).

In contrast, although Gold OA accounts for the largest share of Tunisia's OA publications (27%), it has not demonstrated a clear citation advantage over closed-access publications (Table 2). Additionally, Gold OA has the lowest proportion of documents published in highly impactful journals (13.7% in top 10% journals). This suggests that many of the Gold OA journals frequented by Tunisian researchers may lack the academic prestige or visibility required to significantly boost citation impact.

A closer look at Gold OA publications by discipline shows that Medicine is the most productive area, with 3,242 documents. However, it also has the lowest proportion of publications in Q1 journals (21%), compared to other prolific disciplines where the proportion ranges from 52% in Agricultural and Biological Sciences, 56% in Material Science, 59% in Engineering, 59% in Biochemistry, Genetics and Molecular Biology, 60% in Computer Science, 61% in Mathematics, 62% in Chemical Engineering, 64% in Environment, 70% in Chemistry, 71% in Social Sciences, 79% in Energy, to 94% in Multidisciplinary. This disparity indicates a challenge in achieving high-impact dissemination of medical research through Gold OA channels in Tunisia.

Since Gold and Hybrid Gold OA publishing are the most challenging for Tunisian institutions due to the associated article processing fees, we focus the remainder of this study on these two modes. Their prevalence across subject areas is shown in Figure 2.

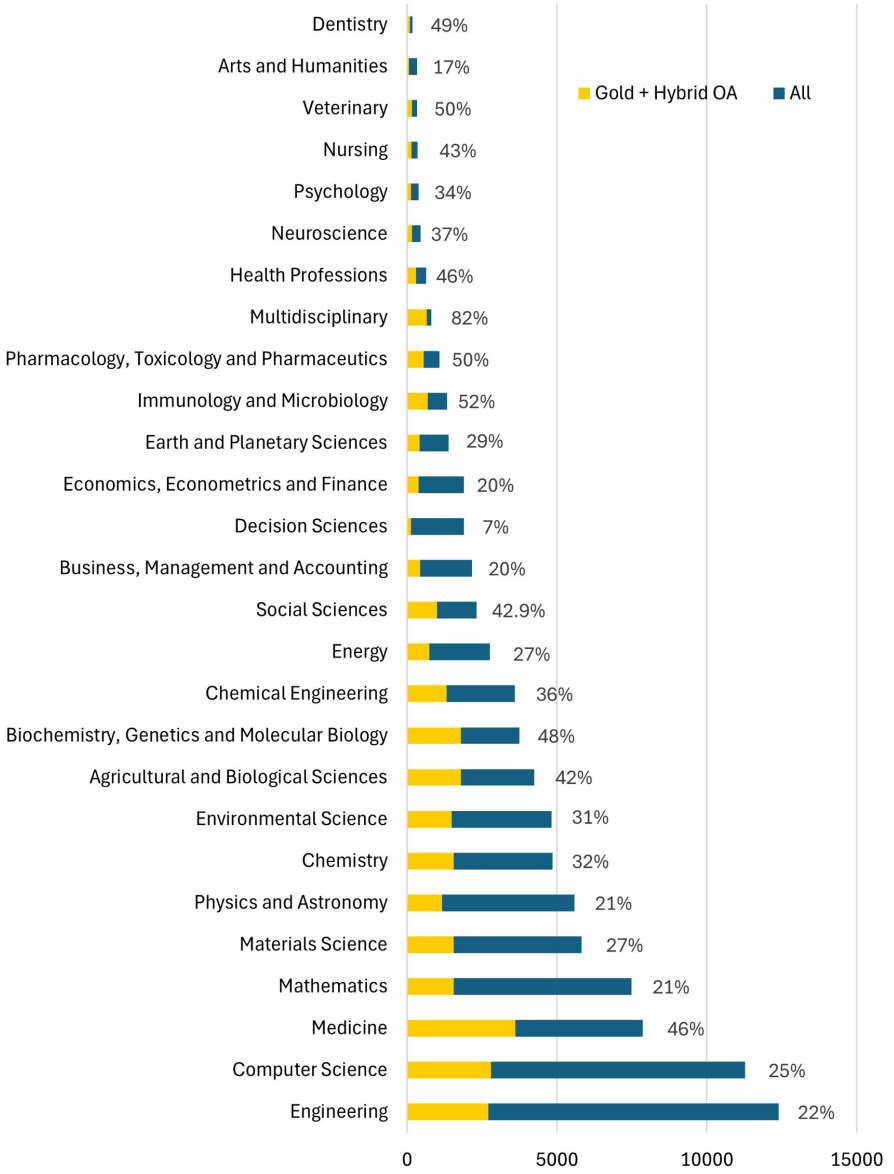

Figure 2. Gold and Hybrid Gold OA publications by subject area. The X-axis indicates the number of publications from 2020 to 2024. Note: The percentages indicate the share of Gold and Hybrid Gold OA publications in each subject area.

The subject areas that benefit the most from OA in terms of the number of publications are Medicine (3,607 OA publications), Computer Science (2,804 OA publications), and Engineering (2,718 OA publications). Among these, Medicine has the highest percentage of OA publications at 46%. However, the subject areas with the highest levels of OA publishing in terms of percentage are Immunology and Microbiology (52%), Pharmacology, Toxicology, and Pharmaceutics (50%), and Veterinary Science (50%). Despite having fewer total publications, these fields demonstrate the highest proportions of their publications available in OA. Additionally, Multidisciplinary studies have the highest percentage of open access at 82%, though the total number of publications in this category is relatively low (656 OA publications). In contrast, certain disciplines exhibit notably low percentages of OA publications. Decision Sciences has the lowest at 7%, followed by Arts and Humanities at 17%, and Business, Management, and Accounting at 20%. These fields show a significantly smaller proportion of their publications available in OA, reflecting more limited adoption of OA publishing practices in these areas.

OA and alignment with the SDGs

Given the significant financial investment required for Gold and Hybrid OA, we evaluated the alignment of these publications with the SDGs to gauge their contribution to sustainability challenges. OA publishing is a powerful tool for advancing the SDGs by making scientific knowledge widely accessible, supporting informed decision-making, and promoting innovation and collaboration across disciplines and regions (Awasthi et al., 2024; Jain et al., 2020). Our analysis reveals that a higher proportion of publications aligned with the SDGs were found in Gold and Hybrid Gold OA categories (40%) compared to closed-access publications (31%) (Fig. 3).

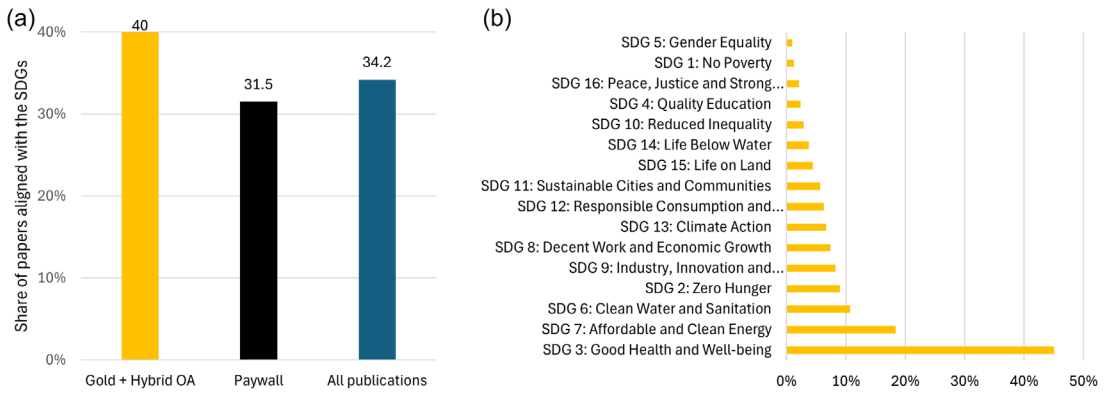

Figure 3. Alignment of documents with the United Nations Sustainable Development Goals (SDGs) (a) and share of OA publications (Gold + Hybrid Gold) for each SDG. Note: A document may be categorized under more than one SDG.

OA publications (Gold and Hybrid Gold) predominantly align with SDG 3: Good Health and Well-being, which accounts for 45% of publications, significantly surpassing other SDGs. SDG 7: Affordable and Clean Energy follows at 18%, while SDG 6: Clean Water and Sanitation ranks third with 11%. Other notable SDGs represented include SDG 2: Zero Hunger (9%) and SDG 9: Industry, Innovation and Infrastructure (8%), reflecting a strong emphasis on health, sustainable energy, and infrastructure.

The finding that only 40% of Gold and Hybrid Gold OA publications in Tunisia are aligned with the SDGs suggests a significant gap in research focus on global sustainability challenges. While this proportion is higher than that of closed-access publications (31.5%), the majority of OA research (60%) still does not address SDG-related themes. This indicates that, although OA enhances accessibility, it does not inherently drive research toward sustainability goals. Additionally, with only 43% of SDG-oriented research being openly accessible, there remains a critical need to bridge the gap between impactful research and public availability, ensuring broader dissemination of knowledge that supports global development objectives.

Government research incentives—such as the MOBIDOC Green program (which has supported over 900 collaborative research projects since 2012 and currently funds 75 environmental research initiatives) and the ARESSE project (a €11.5 million EU-funded program supporting environmental research and green innovation)—demonstrate national commitment to SDG-related research. However, they currently focus primarily on researcher mobility and applied collaboration rather than directly addressing publication costs.

To strengthen SDG alignment, Tunisia should therefore expand existing incentive structures by: (1) explicitly integrating SDG priorities into national research agendas; (2) creating dedicated funding streams for SDG-related publication fees (building on existing transformative agreements); and (3) promoting interdisciplinary collaboration through programs like MOBIDOC Green that already connect researchers with municipalities and industry partners.

Additionally, raising awareness among researchers about the importance of aligning their work with the SDGs and strengthening institutional support for OA publishing could further enhance the impact of Tunisian research on global sustainability efforts.

OA and international collaboration

The overall level of international collaboration during the last five years across all publications, including both OA and closed access, is 60%. However, this rate varies by access model, with

Gold and Hybrid Gold OA publications showing the highest international collaboration at 69%, reflecting stronger global research networks. In contrast, closed-access publications, which remain behind paywalls, have a lower collaboration rate of 54% (Fig. 4).

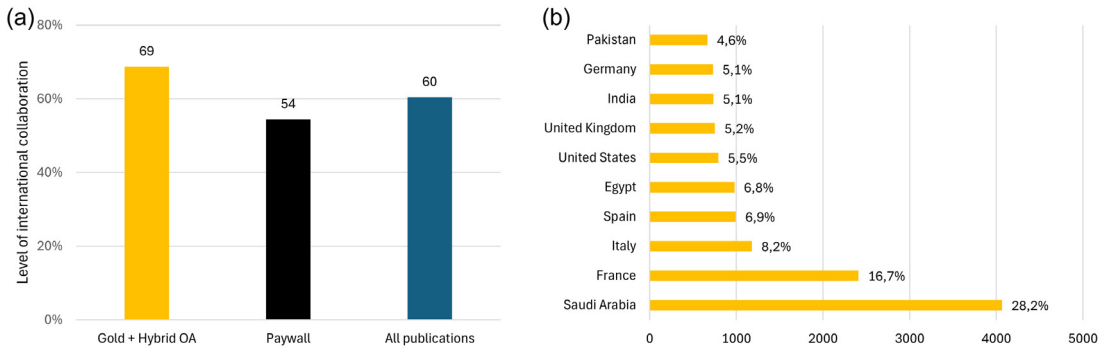

Figure 4. Level of international collaboration (a) and top 10 collaborators for Gold and Hybrid Gold OA publications (b). Note: The X-axis represents the number of Gold and Hybrid Gold OA publications co-authored with each country, while the percentages indicate the share of these OA publications within the total collaboration with each country.

International collaboration has emerged as a key factor in driving OA publishing in Tunisia. Publications with international co-authors exhibited a higher rate of OA availability (45%) compared to those with solely domestic authors (30%). This pattern reflects the global nature of OA publishing, where international networks facilitate the distribution and sharing of research outputs, breaking down the geographical and economic barriers that often limit the reach of closed-access publications (Gabrielle Breugelmans et al., 2018).

International collaboration has been shown to significantly increase the number of publications in OA journals. For instance, a study on Jordanian publications revealed a dramatic rise in OA publications from 7.3% in 2008 to 18.7% in 2017, coinciding with an increase in international collaborations from 38% to 53.3% over the same period (AlRyalat & Malkawi, 2018). International organizations like UNESCO and WIPO recognize the role of OA in promoting sustainable development and have adjusted their policies to support OA initiatives (Jain, 2021). Many international funding bodies, such as Horizon 2020, require OA publishing for project results to ensure broad dissemination and maximize research impact. This requirement aligns with global efforts to promote transparency, knowledge sharing, and innovation. International collaboration further enhances OA publishing by bringing together researchers from institutions with diverse funding policies, some of which actively support OA through institutional mandates or national policies. Collaborative projects also increase access to resources and infrastructure that facilitate OA publishing, making

research outputs more visible and accessible to a wider audience, including policymakers, industry, and the public (Cary & Rockwell, 2020).

Saudi Arabia stands out as Tunisia's top collaborator in Gold and Hybrid Gold OA publications, with 4,064 co-authored documents, accounting for more than 28% of Tunisia's total output in these OA categories (Fig. 4).

Tunisia has a strong research collaboration with Saudi Arabia, its leading international partner in OA publishing. Between 2020 and 2024, the two countries co-authored more than 10K publications, with over 4K (40%) available in OA. A significant factor contributing to this collaboration is the presence of many Tunisian researchers working as contractual faculty members in Saudi universities through governmental academic exchange programs. These appointments provide Tunisian researchers with access to well-funded research environments, advanced facilities, and collaborative networks that foster high-quality scientific output. As a result, a substantial portion of joint publications originates from these affiliations, benefiting from Saudi Arabia's strong support for OA publishing.

France follows as the second-highest collaborator, with 2,408 co-authored publications. However, the share of OA collaboration with France is the lowest among the top collaborators, at just 27%, whereas for other countries, it ranges between 40% and 54%. This suggests that while France remains a key research partner for Tunisia, collaboration with other countries — such as Saudi Arabia, Italy, Spain, Egypt, the United States, the United Kingdom, India, Germany, and Pakistan—is more likely to occur through OA channels.

OA and funding

The transition from traditional subscription-based models to OA has required the development of diverse funding mechanisms to ensure the sustainability and accessibility of scholarly communication. However, the variability in funding sources and the lack of equitable funding programs have led to challenges for researchers, particularly due to the high costs associated with Gold OA models (Borrego & Anglada, 2024). For example, in Spain, projects funded by the Spanish State Plan allocated 3–8% of their budgets to APCs, indicating the financial burden these charges impose on research projects (Alonso-Álvarez et al., 2024). Similarly, the Swiss National Science Foundation (SNSF) allocated 3.9 million francs for OA journal articles in 2022, demonstrating a strong institutional commitment to OA (Philipp et al., 2024). Nevertheless, the commercialization of OA through APCs poses a significant financial burden, particularly for researchers in resource-limited settings, highlighting the need for enhanced support from research institutions and international organizations.

In order to explore the funding channels of Tunisia's Gold and Hybrid Gold OA publications, we extracted the funding sponsors cited in these publications and homogenized and categorized the most significant sources (Fig. 5).

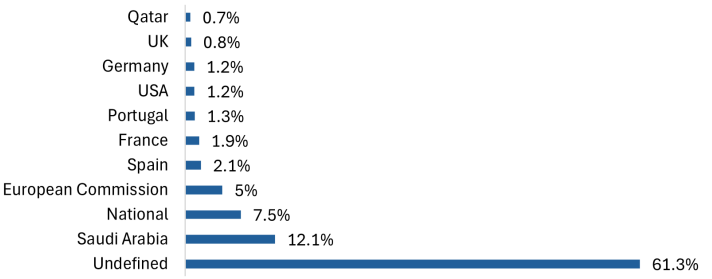

Figure 5. Top 10 funding sponsors cited in Gold and Hybrid Gold OA publications. Note: The percentages represent the share of publications that cite each corresponding funder.

While Scopus provides a structured overview of acknowledged funders, the data is not exhaustive, as funding information depends on authors' disclosures. The presence of an "undefined" category, where no specific funder is cited, suggests that either institutional support was provided but not explicitly acknowledged or that the research was conducted without external funding. In the Tunisian context, researchers tend to cite national funding sources, such as project-based grants, while institutional funding is rarely mentioned. Our results show that 61.3% of publications do not cite funders, likely reflecting institutional funding. If we consider the "undefined" category as institutional funding, the national contribution would total 68.8% (61.3% undefined + 7.5% identified national funders). This assumption helps estimate the share of national funding in OA publications, though it remains an approximation rather than a definitive classification.

Saudi Arabia is the leading international contributor, supporting 12% of OA publications, followed by the European Commission (5%). Smaller contributions come from Spain, France, Portugal, and other countries. This data suggests a strong reliance on institutional funding for OA publishing in Tunisia, while also benefiting from a mix of international and national contributions. However, the relatively small proportion of publications receiving external funding (around 30%) stresses the need for increased efforts to secure international funding opportunities that prioritize OA. Expanding access to such funding would help sustain and enhance Tunisia's OA publishing efforts.

CHALLENGES AND RECOMMENDATIONS

While Tunisia has made progress in adopting OA publishing practices, several challenges persist. More than 60% of Tunisian research remains behind pay-to-read paywalls, limiting its

accessibility and reducing its potential impact on the global scientific community. While awareness-building is necessary, the financial burden of APCs remains the dominant barrier, as systemic budget constraints limit the feasibility of Gold OA for most researchers and institutions.

Additionally, the gap in SDG alignment and the relatively limited impact of Gold OA suggest the need for more strategic planning in the promotion of OA publishing.

It is important for policymakers in Tunisia to recognize this gap and consider incentivizing or prioritizing SDG-focused research through funding and OA publication strategies. Policies should encourage OA channels that prioritize high-quality and impactful research, particularly in fields such as Medicine.

Access to electronic bibliographic resources in Tunisia is centralized through the CNUDST, which negotiates agreements with publishers on behalf of all universities and research centres. This centralized approach ensures uniform access to essential academic resources across the country and streamlines the negotiation process, making it an effective strategy to support OA. Tunisia has recently initiated Read & Publish agreements with two publishers. However, these agreements currently cover fewer than 100 OA documents in 2024, a figure that remains highly restrictive.

This existing infrastructure (CNUDST), which already brings together library and disciplinary representatives from various institutions to negotiate and validate nationwide subscriptions, is uniquely positioned to lead the OA transition. Librarians, particularly those within the CNUDST and its Committee for the Acquisition of Electronic Resources, must be empowered to expand their mandate from content acquisition to scholarly communication management.

The OA transition strategy should maintain essential access while building toward sovereignty. During the transition period, CNUDST should retain targeted subscriptions to core journals, expand agreements with fully OA publishers, and strengthen document delivery services. This ensures that researchers do not lose access to critical content. Simultaneously and in parallel, it should champion the development of a Tunisian Diamond OA publishing platform in collaboration with Tunisian institutions to provide a cost-free publishing route while maintaining rigorous editorial standards. Latin America offers a successful model in this regard, with platforms like SciELO and Redalyc.

This parallel investment would:

- Build Tunisian-owned publishing capacity independent of commercial publishers.
- Support multilingual output (Arabic, French, English) serving local and regional scholarly communities.
- Eliminate APCs for Tunisian researchers over time.
- Create a permanent, freely accessible archive of Tunisian research.

Open access policies should prioritize the development of institutional repositories to promote Green OA, enabling researchers to self-archive their work. The CNUDST must enhance its infrastructure to provide a robust alternative to paywalled publishing. Researchers should be incentivized to deposit preprints and accepted manuscripts in these repositories, thereby increasing the accessibility of Tunisian research without relying exclusively on APC-funded models. Additionally, security measures should not undermine access to these repositories from outside the country, and policies should be established to mandate unrestricted access to them.

Raising awareness and providing training on OA publishing practices is essential. Researchers, librarians, and administrators should be educated on the benefits of OA, available funding mechanisms, and compliance with OA mandates. Training programs and workshops should be widely implemented to ensure all stakeholders are informed and prepared to take advantage of OA opportunities. Crucially, Tunisia should engage with emerging global Diamond OA coordination efforts, such as the European Diamond Capacity Center (EDCH) and DIAMAS project, which are developing standards, training, and technical support for community-led publishing. By learning from both Latin American successes and Northern failures, Tunisia can build an OA future that is truly equitable, sustainable, and sovereign.

CONCLUSION

This study provides valuable insights into the status and impact of OA publishing in Tunisia, highlighting both the opportunities and challenges facing the country in its efforts to enhance global access to research. While OA publishing offers substantial benefits in terms of visibility, citation impact, and collaboration, Tunisia faces significant barriers, particularly related to the financial sustainability of OA models and the alignment with SDG-focused research. Developing clear and comprehensive policies to support OA initiatives is crucial to ensuring long-term accessibility and equity in research dissemination. By strengthening funding mechanisms, expanding OA agreements, and optimizing the allocation of financial resources to maximize societal value, Tunisia can establish a more sustainable OA publishing framework.

These initiatives, combined with well-defined policies, will help eliminate financial barriers for researchers, enabling them to publish their work more freely and contribute to high-quality and impactful research. Future research should directly investigate the attitudes and perceptions of Tunisian researchers towards these trade-offs between cost, prestige, and societal impact to inform such policies.

BIODATA AND DECLARATIONS

Brief biodata: Ridha Mhamdi is a Professor and Senior Investigator at the Laboratory of Legumes and Sustainable Agrosystems at the Centre of Biotechnology of Borj-Cédria (CBBC), Tunisia. He formerly served as the Director General of the CBBC.

https://orcid.org/0000-0002-2999-7604,
https://www.scopus.com/authid/detail.uri?authorId=6508149442

Author contribution: The author is the sole contributor to this work and is responsible for all content, including conception, design, writing, and editing.

Declaration of competing interest: The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

Funding: The author declares that no funds, grants, or other support were received during the preparation of this manuscript.

Acknowledgments: The author wishes to thank the CNUDST (Centre National Universitaire de Documentation Scientifique et Technique, Tunisia) for facilitating access to Scopus and SciVal, as well as for providing data on Open Access agreements.

Declaration of generative AI in scientific writing: During the preparation of this work, the author used DeepSeek to enhance the readability and language of the manuscript. After utilizing this tool, the author thoroughly reviewed and edited the content as needed and assumes full responsibility for the final published article.

Data availability: Datasets analyzed during the current study are retrieved from the Scopus database.

Ethical Approval: Not applicable.

Consent to Participate: Not applicable.

Consent to Publish: Not applicable.

REFERENCES

Adegbilero-Iwari, I., Adetoro, N., & Salawu, I. K. (2023). The open access movement and its march in Africa. *African Journal of Library, Archives and Information Science*, *33*(2), 115–129. https://doi.org/10.4314/ajlais.v33i2.1

Alexander, P. H. (2020). Open access and author rights: questioning Harvard's open access policy. *Insights: The UKSG Journal*, *33*, 1–8, https://doi.org/10.1629/UKSG.525

Alonso-Álvarez, P., Sastrón-Toledo, P., & Mañana-Rodríguez, J. (2024). The cost of open access: Comparing public projects' budgets and article processing charges expenditure. *OSF*. http://doi.org/10.31235/osf.io/98j5p

AlRyalat, S. A., & Malkawi, L. (2018). International collaboration and openness in Jordanian research output: A 10-year publications feedback. *Publishing Research Quarterly*, *34*(2), 265–274. https://doi.org/10.1007/s12109-018-9572-5

Awasthi, S., Das, S., & Tripathi, M. (2024). Gold open access publishing in ASEAN countries: A comparative study. *Journal of Scientometric Research*, *13*, S98–S123. https://doi.org/10.5530/jscires.20041199

Babini, D. (2019). La comunicación científica en América Latina es abierta, colaborativa y no comercial. Desafíos para las revistas. *Palabra Clave (La Plata)*, *8*(2), e065–e065. https://doi.org/10.24215/18539912e065

Borrego, Á., & Anglada, L. (2024). The costs of open access publication: A case study at Catalan universities. *LIBER Quarterly: The Journal of the Association of European Research Libraries*, *34*(1), 1–20, https://doi.org/10.53377/lq.19069

Bruns, A., Rimmert, C., & Taubert, N. (2020). Who pays? Comparing cost sharing models for a gold open access publication environment. *Journal of Library Administration*, *60*(8), 853–874. https://doi.org/10.1080/01930826.2020.1820275

Cary, M., & Rockwell, T. (2020). International collaboration in open access publications: How income shapes international collaboration. *Publications*, *8*(1), 13. https://doi.org/10.3390/publications8010013

Cornell University. (2025). LibGuides: Open access publishing: Policies & perspectives. Retrieved February 5, 2025, from available https://guides.library.cornell.edu/openaccess/policies

Das, A. K. (2008). Open access to knowledge and information: scholarly literature and digital library initiatives – the South Asian scenario. *VINE*, *38*(3), 370–370. https://doi.org/10.1108/03055720810904871

Elsevier. (2025). An introduction to open access. Retrieved February 5, 2025, from https://www.elsevier.com/researcher/author/open-access/oa-basics

EURAXESS. (2025). Research in Tunisia | EURAXESS. Retrieved February 24, 2025, from https://www.euraxess.tn/tunisia/research-tunisia

Eve, M. P. (2014). *Introduction, or why open access? In Open access and the humanities: Contexts, controversies and the future* (pp. 1–42). Cambridge University Press. https://doi.org/10.1017/CBO9781316161012.003

Fredericks, S. (2015). Questioning the efficacy of 'gold' open access to published articles. *Nurse Researcher*, *22*(6), 8–10. https://doi.org/10.7748/nr.22.6.8.e1370

Gabrielle Breugelmans, J., Roberge, G., Tippett, C., Durning, M., Struck, D. B., & Makanga, M. M. (2018). Scientific impact increases when researchers publish in open access and international collaboration: A bibliometric analysis on poverty-related disease papers. *PLoS ONE, 13*(9). https://doi.org/10.1371/journal.pone.0203156

Ghorbani, M., & Sabour, M. R. (2021). Global trends and characteristics of vermicompost research over the past 24 years. *Environmental Science and Pollution Research*, *28*(1), 94–102. https://doi.org/10.1007/s11356-020-11119-x

Godínez-Larios, S., & Aguado-López, E. (2024). Las políticas globales y las realidades locales y regionales del acceso abierto: el Plan S y Latinoamérica. *Discursos del Sur, revista de teoría crítica en Ciencias Sociales*, *13*, 9–37. https://doi.org/10.15381/dds.n13.28086

Greussing, E., Kuballa, S., Taddicken, M., Schulze, M., Mielke, C., & Haux, R. (2022). Open Access publishing around the globe. A two-tier study on the perspectives of international medical informatics researchers on a barrier-free communication of science. *Observatorio*, *16*(1), 60–89. https://doi.org/10.15847/obsOBS16120221877

Hachani, S. (2017). Algeria, Morocco and Tunisia's presence in The Directory of Open Access Repositories (DOAR) and The Registry of Open Access Repositories (ROAR): A comparative study of their ratio of open access material. *Open Information Science*, *1*(1), 56–70. https://doi.org/10.1515/opis-2017-0005

Hernandez-Maskivker, G., Capdevila-Torres, M., Ivanov, S., & Garrod, B. (2023). Open-access publishing in tourism and hospitality research. *Tourism: An International Interdisciplinary Journal*, *71*(2), 228–251. https://doi.org/10.37741/t.71.2.1

Hoogendoorn, C., & Redvers-Mutton, G. (2024). Scaling up open access publishing through transformative agreements: Results from 2019 to 2022. *Learned Publishing*, *37*(2), 125–129. https://doi.org/10.1002/leap.1601

Jain, P. (2021). Open access as a platform for sustainable development: prospects and challenges in Africa. In Jain, P., Mnjama, N., & Oladokun, O. (Eds.), *Open Access Implications for Sustainable Social, Political, and Economic Development* (1–23). IGI Global. https://doi.org/10.4018/978-1-7998-5018-2.ch001

Jain, P., Mnjama, N., & Oladokun, O. (2020). *Open Access Implications for Sustainable Social, Political, and Economic Development*, 360. IGI Global. https://doi.org/10.4018/978-1-7998-5018-2

Kopitar, L., Plohl, N., Verboten, M. T., Štiglic, G., Watson, R., & Korošak, D. (2024). Two scholarly publishing cultures? Open access drives a divergence in European academic publishing practices. *arXiv, 9*. https://doi.org/10.48550/arXiv.2411.06282

Lopez-Acevedo, G., Ranzani, M., Sinha, N. and Elsheikhi, A. (2023), Informality and Inclusive Growth in the Middle East and North Africa, *The World Bank*, doi: https://doi.org/10.1596/978-1-4648-1988-9.

Mallalieu, R. (2019). The elusive gold mine? The finer details of Creative Commons licences ? The why they really matter. *Insights: The UKSG Journal*, 32. https://doi.org/10.1629/uksg.448

McKenna, J. (2023). *Key moments in the history of open access*. MDPI Blog. Retrieved February 5, 2025, from https://mdpiblog.wordpress.sciforum.net/2023/07/07/history-of-open-access

McKenna, J. (2024). *Open access policies and mandates around the world*. MDPI Blog. Retrieved February 5, 2025, from https://mdpiblog.wordpress.sciforum.net/2024/12/24/open-access-policies/.

Mensah, K. (2024). Challenges and opportunities of implementing open access policies. *African Journal of Information and Knowledge Management*, *3*(1), 40–52. https://doi.org/10.47604/ajikm.2429

Mhamdi, R. (2023). Evaluating the evolution and impact of wood vinegar research: A bibliometric study. *Journal of Analytical and Applied Pyrolysis*, *175*. https://doi.org/10.1016/j.jaap.2023.106190

Mhamdi, R. (2024). Mapping the technological impact of chitosan research through patent citations. *Materials Today Communications*, *41*. https://doi.org/10.1016/j.mtcomm.2024.110334

Mhamdi, R. (2025). Patent-paper citations: A window into the technological impact of Tunisian research. *African Journal of Science, Technology, Innovation and Development*, *17*(2), 177–187. https://doi.org/10.1080/20421338.2024.2433846

Mhamdi, R., & Gtari, M. (2024). Tracking the trajectory of Frankia research through bibliometrics: Trends and future directions. *Canadian Journal of Microbiology*, *70*(12), 551–564. https://doi.org/10.1139/cjm-2024-0030

Mounier, P., & Rooryck, J. (2024). *Towards a federated global community of diamond open access*. https://biblioteca-repositorio.clacso.edu.ar/handle/CLACSO/251505

Philipp, T., Lanzerstorfer, M., & Gorin, S. (2024). OA monitoring 2022: Strong increase and continued demand for article funding [Data story]. *Swiss National Science Foundation*. https://doi.org/10.46446/datastory.open-access-publications-monitoring-2022

Quaia, E., Zanon, C., Vieira, A., Loewe, C., & Marti-Bonmatí, L. (2024). Publishing in open access journals. *Insights into Imaging*, *15*(1), 212. https://doi.org/10.1186/s13244-024-01794-6

Roy, B. K., Biswas, S. C., & Mukhopadhyay, P. (2012). Open access repositories in Asia: From SAARC to asian tigers. *Library Philosophy and Practice*, *2012*(1).

Schöpfel, J., & Prost, H. (2015). Degrees of openness: Grey literature in institutional repositories. *Grey Journal*, *11*(2), 103–112.

Seo, T.-S. (2018). Open access full-text databases in Asian countries. *Science Editing*, *5*(1), 26–31. https://doi.org/10.6087/kcse.114

Sheikh, A., & Richardson, J. (2023). Open access movement in the scholarly world: Pathways for libraries in developing countries. *Journal of Information Science*, *52*(2), 577–595. https://doi.org/10.1177/01655515231202758.

Shelley, A., & Scott, R. E. (2023). Open Access. *Notes*, *80*(2), 241–248. https://doi.org/10.1353/not.2023.a912336

Simard, M.-A., Basson, I., Hare, M., Larivière, V., & Mongeon, P. (2025). Examining the geographic and linguistic coverage of gold and diamond open access journals in OpenAlex, Scopus, and Web of Science. *Quantitative Science Studies*, *6*, 732–752. https://doi.org/10.1162/qss.a.1

Trishchenko, N. D., & Makeenko, M. I. (2024). The impact of open access on citation counts and alternative metrics of articles in leading international scientific journals on media and communication. *Journal of Siberian Federal University - Humanities and Social Sciences*, *17*(8), 1602–1611.

Yi, H., Cao, Y., Leng, Q., Wang, Y., Zhang, G., & Mao, Y. (2024). The impact of open access on citations, Pageviews, and downloads: A scientometric analysis in Postgraduate Medical Journal. *Postgraduate Medical Journal*, *100*(1187), 679–685. https://doi.org/10.1093/postmj/qgae047

Zul, M. (2024). Promoting Open Access | PublishingState.com. Retrieved February 5, 2025, from https://publishingstate.com/promoting-open-access/2024/