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CLINICAL RESEARCH IN MEDICAL ONCOLOGY IN MOROCCO

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ABSTRACT

Background: Clinical research in oncology is a strategic lever to improve knowledge, therapeutic practices, and health policies in response to the incrising cancer burden in Morocco. Despite significant legislative and structural progress, this sector continues to face regional disparities and logistical constraints.
Objective: To provide an overview of clinical research in oncology in Morocco through a systematic review of national scientific production between 2013 and 2023, trends, study types, research themes, and the geographical and institutional distribution of publications are analyzed.
Methods: A systematic review was conducted according to PRISMA guidelines via PubMed. The included publications had to address biomedical oncology research with Moroccan institutional affiliations. The extracted data were analyzed descriptively and comparatively.
Results: Out of the 10,000 articles initially identified, 459 were retained. Medical oncology dominated (56.21%), followed by radiotherapy (28.10%) and surgical oncology (15.69%). Case reports (47.28%) and retrospective studies (23.31%) were predominant. Rabat accounts for more than 50% of the national scientific output, led by the National Institute of Oncology. After a peak between 2014 and 2016, a decline was noted between 2017 and 2019, followed by recovery post-2020. The Pan African Medical Journal was the most frequently used journal.
Conclusion: Moroccan oncology research shows growing potential but remains marked by institutional concentration, limited use of advanced analytical studies, and significant geographical disparities. Structural measures—such as strengthening regional capacity and promoting multicenter clinical trials—are necessary to establish equitable and internationally competitive research.

KEYWORDS

Clinical research, oncology, Morocco, systematic review, bibliometrics, PRISMA.

MAIN ARTICLE

I.Introduction

Clinical research is essential for assessing the effectiveness of medical treatments and improving disease management. In oncology, it enables the testing of new drugs and therapies while providing critical data on risk factors and patient quality of life.
In Morocco, this field is expanding, but resources and infrastructure remain insufficient to meet the growing needs of the population.

II. Evolution of Clinical Research in Morocco

Historical background and context

Clinical research in Morocco began in the 1980s with the creation of the National Health Research Ethics Committee (CNERS). Since the 2000s, it has expanded with state support and private initiatives. Institutions such as the National Agency for Medicines and Health Products Regulation (ANRMP), the National Institute of Oncology (NIO) in Rabat, and the Mohammed VI Cancer Center in Casablanca have played central roles [1–2].
In 2016, the adoption of Laws 28-13 represented a milestone, regulating biomedical research and strengthening ethical safeguards for participants [3].

Recent trends

The number of clinical studies rose from 54 in 2010 to 317 in 2019, driven by growing interest from international pharmaceutical companies, attracted by Morocco's diverse population and competitive costs [4].

III. Key Actors and Institutions

1. **The Ministry of Health** – Oversees clinical research, issues guidelines, and ensures ethical compliance, and works closely with the CNERS [5].
2. **National Center for Scientific and Technical Research (CNRST)** – Established in 1978, it finances and coordinates research projects and builds international partnerships [6].
3. **National Institute of Hygiene (INH)** – Regulates laboratories, enforces safety standards, and contributes to researcher training [7].
4. **Private actors and NGOs** – Pharmaceutical companies finance ~70% of clinical trials, whereas organizations such as AMFROM and the Lalla Salma Foundation actively support oncology research [8].

IV. Focus on Oncology

The situation of sedical oncology in Morocco [9–10]

Medical oncology in Morocco represents a particularly strategic field of research, given the growing prevalence of cancers in the country. According to data from the World Health Organization (WHO), cancer is one of the leading causes of mortality in Morocco, with steadily increasing rates. The country has therefore implemented several cancer screening and treatment programs, yet these efforts are often limited by unequal access to care, particularly in rural areas.

Oncology in Morocco is characterized by a focus on the treatment of some of the most common cancers, such as breast cancer, colorectal cancer, and lung cancer. Clinical research in this field is essential for the development of new therapies tailored to the genetic and environmental specificities of the Moroccan population.

Clinical Trials and Translational Research in Oncology [11–12]

Morocco's participation in international clinical trials is a key factor in its integration into global oncology research. However, participation remains limited compared with that in other regions, due to several logistical and regulatory challenges. One of the first initiatives to encourage such participation was the establishment of a regulatory framework for clinical research, including the creation of the National Ethics Committee for clinical trials.

Clinical trials in Morocco are focused mainly on treatments for breast and lung cancers, but the country is also beginning to explore oncogenomic research, aiming to better understand

genetic variations in cancers among Moroccans. Limited access to advanced technologies and insufficient training of oncology researchers continue to represent significant barriers to the development of translational research.

Recent Initiatives and International Collaborations [13–14]

In recent years, several initiatives have been launched to strengthen clinical oncology research in Morocco. These include partnerships with international institutions such as the International Agency for Research on Cancer (IARC) and the International Cancer Research Center (CIRC), which have enabled Moroccan researchers to benefit from specialized training and to develop collaborative research projects.

Morocco has also hosted several international oncology conferences, thereby promoting scientific exchanges between Morocco and international researchers. Such collaborations are essential to advancing research, while also offering local researchers the opportunity to participate in multicenter studies and secure funding for their projects.

V. Materials and methods

Study Design

This research is part of a systematic review conducted in accordance with the methodological principles of the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), witch is internationally recognized for ensuring transparency and reproducibility of systematic reviews [15,16]. The literature search was performed using advanced queries on the biomedical database PubMed [17].

Research Question

The central research question guiding this systematic review was formulated as follows:
What is the current state of clinical oncology research in Morocco?

Search Strategy and Keyword Selection

The search strategy was designed to maximize comprehensiveness by combining keywords in both French and English, including the following:

"Oncologie médicale" OR "Medical oncology"
"Maroc" OR "Morocco"
"CHU" OR "University Hospital Center"
"Radiothérapie" OR "Radiotherapy"
"Département d'oncologie chirurgicale" OR "Department of surgical oncology"

These descriptors were cross-referenced via Boolean operators (AND, OR) in all possible combinations. The selection process followed the predefined eligibility criteria outlined below.

Study Selection Criteria

Inclusion criteria:

Articles published in French or English
Publications addressing biomedical research in oncology
Publication period: 2013–2023
Fields covered: medical oncology, radiotherapy, surgical oncology

Exclusion criteria:

Studies not meeting the standards of biomedical research
Papers with authors having no affiliation with Moroccan oncology institutions

Data collection method

PubMed was selected for its extensive coverage of biomedical literature. Manual selection of publications was performed on the basis of titles and abstracts, followed by systematic extraction of relevant data.

The retained articles were recorded in an Excel file that included the following variables:

- Title

- Authors
- Year of publication
- City (affiliation)
- Specialty
- Study type
- Scientific journal

Data Analysis Method

Descriptive and statistical analysis:
The extracted data were entered and processed via Microsoft Excel, which enabled the construction of graphs and tables illustrating trends in oncology research in Morocco.

Comparative analysis:
The results were compared with international systematic reviews on oncology research conducted in other middle-income countries, in order to position Morocco within the global landscape of biomedical research.

VI. The results

Selection flow

An advanced search of the PubMed database initially identified 10,000 potential articles. Following a rigorous screening of titles and abstracts, 459 publications were retained in accordance with the inclusion criteria. Among the 9,541 excluded articles, the majority did not address the research question.

The retained publications were as follows: 258 articles in medical oncology, 129 in radiotherapy, and 72 in surgical oncology. The selection process is represented according to the PRISMA flow diagram [18] (Figure 1).

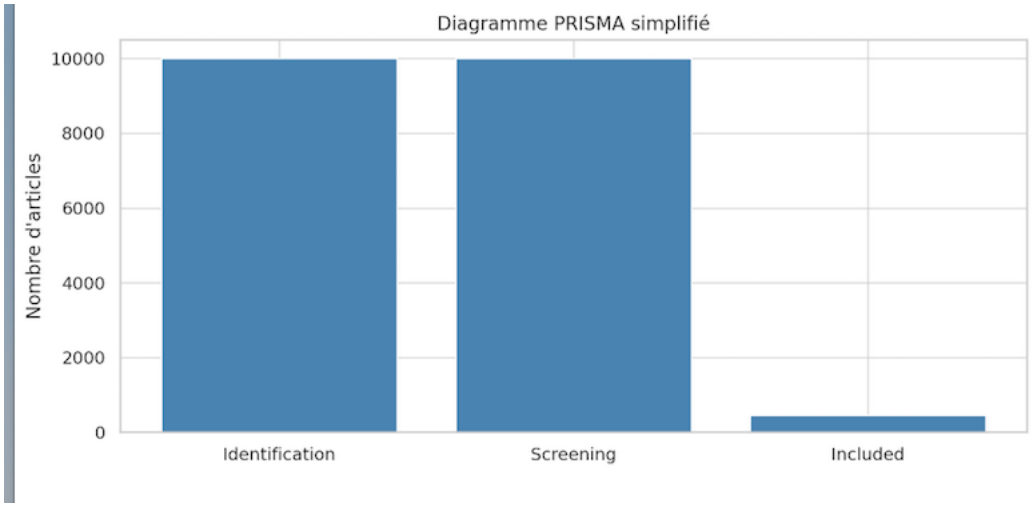

Figure 1 : *Simplified PRISMA diagram illustrating the article selection process.*

Temporal trends (2013–2023)

The chronological analysis of publications reveals an irregular trend over the studied decade. A peak was observed between 2014 and 2016 (55, 52, and 59 articles, respectively). This phase was followed by a marked decline between 2017 and 2019, reaching a minimum of 21 articles in 2019. A recovery was noted in 2020 (54 publications), maintained in 2021 (46), and further strengthened in 2022 (68). The number reported for 2023 remains partial (13 articles), pending updates from the database [19]. These fluctuations may be explained by exogenous factors such as the COVID-19 pandemic, institutional constraints, or research funding [20].

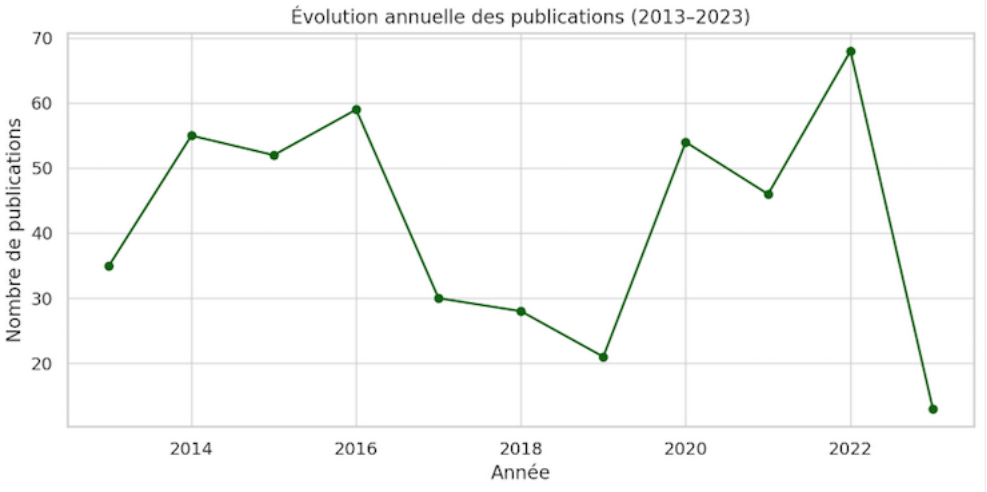

Figure 2 : *Annual evolution of publications from 2013 -- 2023*

By specialty

Medical oncology dominates scientific production in oncology in Morocco, accounting for 56.21% of publications, compared with 28.10% for radiotherapy and 15.69% for surgical oncology. This predominance may reflect the accessibility of drug-based treatments, as well as the training and research priorities of Moroccan university hospital institutions.

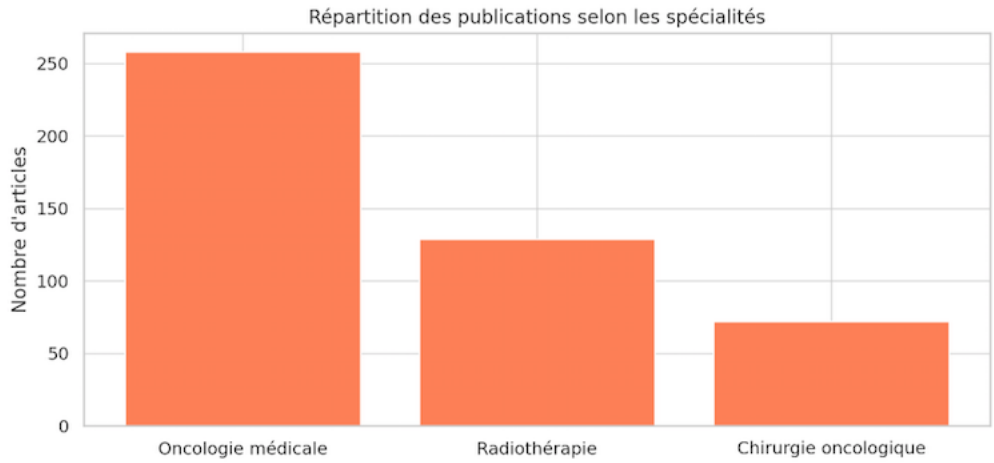

Figure 3 : Distribution of publications by oncology speciality

By study type

The majority of published articles are clinical case reports (47.28%, i.e., 217 articles), followed by retrospective studies (23.31%, n = 107) and literature reviews (20.70%, n = 95). Other study types are only marginally represented: prospective studies (4.36%), cross-sectional studies (1.31%), meta-analyses (1.09%), case-control studies (0.87%), surveys (0.56%), and cohort studies (0.44%). This distribution highlights the predominance of descriptive studies over analytical or experimental studies.

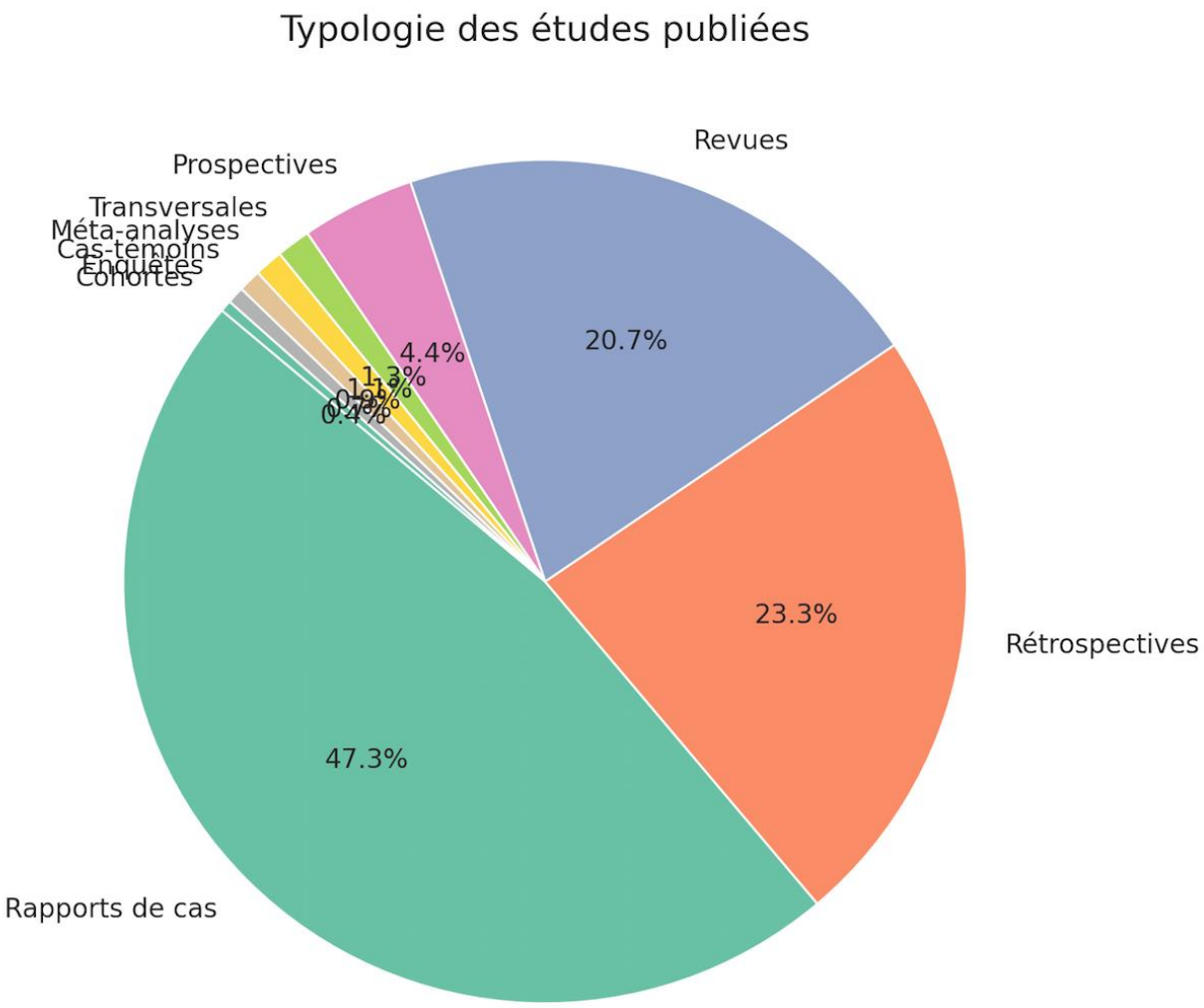

Figure 4: *Pie chart showing the distribution of study types*

Geographical distribution

Rabat accounts for more than half of the national oncology publications (50.11%, i.e., 230 articles), followed by Fez (13.73%), Casablanca and Oujda (12.64% each). The cities of Marrakesh, Agadir, Meknes, and Tangier show more modest scientific activity. This unequal geographical distribution likely reflects disparities in infrastructure, qualified personnel, and access to funding.

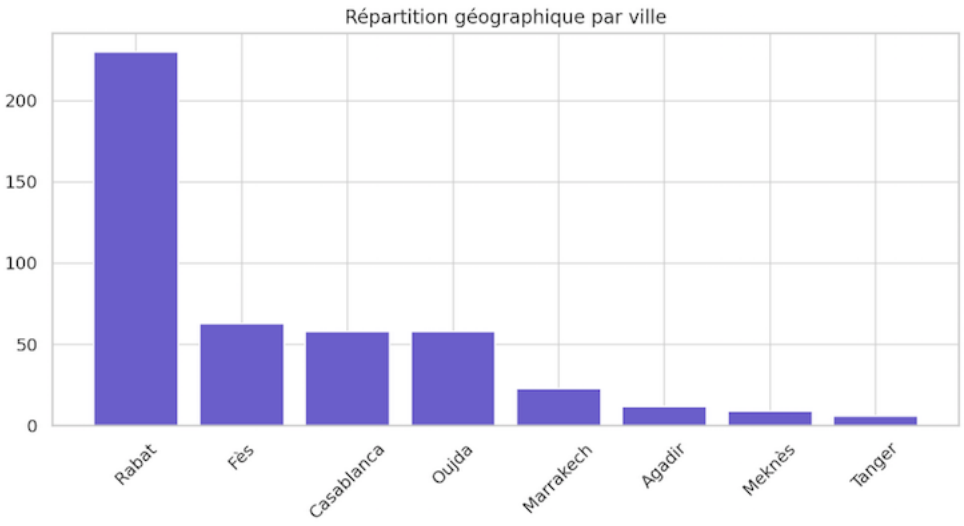

Figure 5: *Distribution of publications across cities*

By institution

The National Institute of Oncology (INO) in Rabat is the most prolific center, with 194 publications. It is followed by Hassan II University Hospital in Fez (63), Mohammed VI University Hospital in Oujda (50), the Military Hospital of Rabat (36), Ibn Rochd University Hospital in Casablanca (28), and the University Hospital of Marrakesh (23). This ranking reflects the unequal distribution of clinical oncology research across the country.

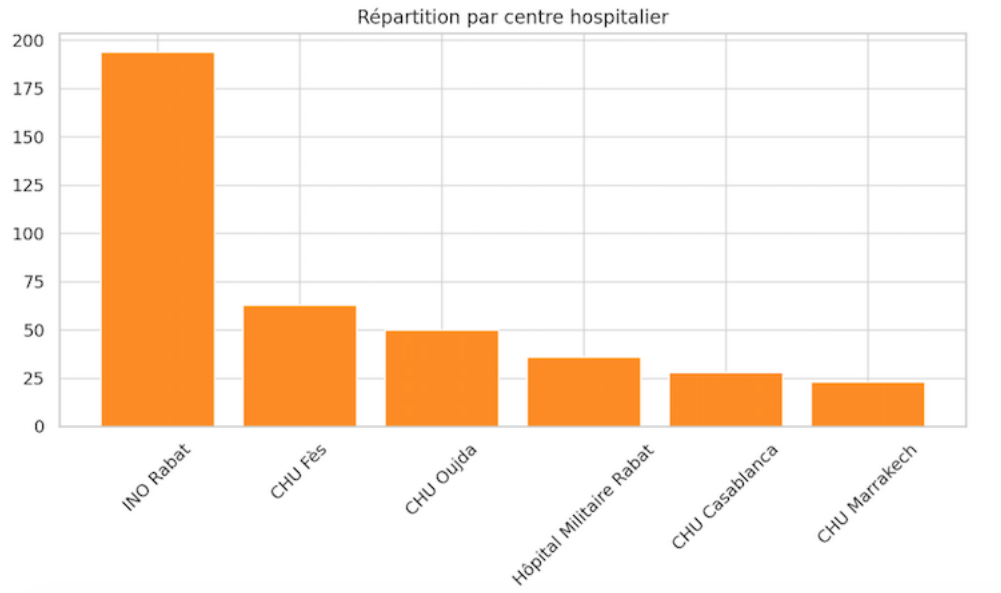

Figure 6 : Breakdown of publications according to hospital center.

Publication Journals [21]

The Pan African Medical Journal is the most widely used outlet for disseminating scientific findings, representing 31.07% of all publications (n = 142). Its broad circulation across the African continent and its accessibility may explain this preference.

Focus on medical oncology [20]

Among the medical oncology publications, Rabat led with 26.83% of the articles, followed by Fez (8.93%), Oujda (5.01%), Casablanca (6.71%), Marrakesh (4.58%), and Agadir (1.09%). These figures highlight regional disparities in knowledge production and resource allocation.

Focus on surgical oncology [20]

In the field of surgical oncology, Rabat accounts for 8.71% of national publications, followed by Oujda (5.66%). Casablanca and Fez had significantly lower rates (0.87% and 0.44%, respectively). This illustrates the limited structuring of surgical oncology research in certain regions.

VII. Discussion

Scientific research in oncology constitutes an essential pillar for the continuous improvement of knowledge, diagnostics, and therapeutic strategies in the fight against cancer. Scientific publications, through their rigorous nature and peer validation, represent indispensable and reliable sources for updating medical practices and ensuring the rapid dissemination of innovations. They play a major role not only in the expansion of fundamental and clinical knowledge but also in fostering close collaboration between researchers and practitioners, thereby promoting a dynamic exchange of expertise capable of addressing the complex challenges inherent to cancer pathologies [22–25].

In this context, a bibliometric analysis of scientific production in oncology in Morocco over the period 2013–2023 reveals a significant yet heterogeneous evolution. After sustained growth between 2014 and 2016, research experienced a slowdown from 2017 - 2019, before

regaining marked momentum from 2020 onward. This fluctuation can be explained by various factors, including financial constraints, recently implemented institutional reforms, and the significant impact of the COVID-19 pandemic, which affected clinical and scientific activities worldwide. [22,26]. These findings highlight not only the existence of strong development potential but also the need to stabilize and sustain research efforts to strengthen Morocco's contribution in this field.

The study highlights a predominance of publications in medical oncology (56.21%), compared with radiotherapy (28.10%) and oncological surgery (15.69%). This distribution reflects a preferential focus on drug-based and less invasive approaches, which are likely linked to the concentration of training and research resources in major university cities such as Rabat and Fez [23]. Furthermore, the predominance of case reports (47.28%) and retrospective studies (23.31%) reflects the strong representation of descriptive works—a trend observed in many resource-limited countries, where logistical, financial, and regulatory barriers hinder the conduct of more complex prospective or randomized studies, which are nonetheless essential for generating robust and generalizable scientific output [24,29]. This observation underlines the urgent need to develop the infrastructures and skills required for multicenter studies and clinical trials to align local oncological practices with international standards.

Another major finding concerns the strong geographical centralization of publications, with nearly 50% of research produced in Rabat, mainly at the National Institute of Oncology (INO). This concentration of resources and research capacity reflects a significant territorial gap in access to infrastructures and scientific resources on a national scale [25]. To address this imbalance, it is crucial to establish incentive policies that foster the development of research in other university hospital centers, thereby expanding and diversifying scientific production capacity across the country.

In terms of dissemination, most Moroccan oncology publications appear in regionally focused journals, such as the Pan African Medical Journal, which are accessible and relatively lowcost. However, only a small proportion of articles are published in high-impact journals or indexed in major international databases. This finding highlights the need to strengthen training in scientific writing, the mastery of editorial standards, and

methodological quality to increase the visibility and global influence of Moroccan research [30].

Moreover, the recent legislative framework, notably Law 06-22 enacted in 2022, marks a significant advance in structuring and financing scientific research in Morocco. The creation of the National Agency for Research and Development (ANRD) aims to promote innovation by strengthening human and material capacities, fostering international collaboration, and financially supporting high-impact research projects [31]. These initiatives are complemented by partnerships with foreign institutions, particularly in Europe, and by national programs supported by the National Center for Scientific and Technical Research (CNRST), which contributed to increasing Moroccan clinical research [32].

Despite these advances, several major challenges persist. The lack of adequate public funding, insufficient modern infrastructure, and scarcity of qualified researchers remain significant obstacles. In addition, the absence of a coherent and stable national strategy in oncological research complicates the implementation of long-term strategic orientations. It is therefore essential to establish a national strategic framework that integrates continuous researcher training, the development of multicenter research networks, the establishment of standardized clinical registries, and the systematic valorization of scientific results [27,28,33].

Consolidating these elements will not only increase the quantity and quality of scientific publications in oncology in Morocco but also optimize their impact on patient care by fostering evidence-based medicine adapted to local specificities. By strengthening research, the country will be better equipped to respond to growing healthcare needs and actively contribute to the global fight against cancer.

VIII. Current challenges

Insufficient Funding [34]: Morocco allocates only 0.75% of its GDP to scientific research, which is well below the target of 2% set for 2030.
Lack of Infrastructure [35]: Some regions lack modern equipment and clinical research units, thereby limiting access to clinical trials.

Human Resource Deficit [36]: The country faces a shortage of researchers and clinicians specifically trained in clinical research.

Coordination and Regulation [37]: Complex protocols and administrative procedures often slow down the conduct of studies.

IX. Future perspectives and recommendations

The future prospects for clinical oncology research in Morocco are promising, yet several challenges remain to be addressed. Recommendations for improving the situation include the establishment of more robust funding structures to support local research, ongoing professional training for healthcare workers, and enhanced access to advanced technologies, such as genomic sequencing, to better personalize treatments.

It is also crucial to strengthen patient participation in clinical trials by overcoming socioeconomic and cultural barriers that limit access to clinical research in certain regions of the country. Finally, the integration of precision medicine and targeted therapies represents a major challenge and opportunity for the future of medical oncology in Morocco.

X. Conclusion

Clinical oncology research in Morocco has made considerable progress over the past decade through governmental commitment, local researchers, and international collaboration. Persistent challenges—funding, infrastructure, and human resources—must be addressed to position Morocco as a regional leader in oncology research. With targeted investments and stronger stakeholder engagement, Morocco could significantly enhance cancer care, align with global standards and improve patient outcomes.

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