

Twenty-Five Years of Hajj–Umrah Research (2001–2025): A Global Bibliometric and Science-Mapping Overview

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ABSTRACT

Hajj–Umrah research spans public health, infectious disease, heat and climate, crowd safety, chronic disease, digital health, rehabilitation, and women’s health, yet its overall evolution has not been systematically mapped. This study aimed to quantify output and collaboration, describe thematic evolution, and identify 2020–2025 hot topics that can inform practice, policy, and curricula. We analysed a document set exported from Scopus using TITLE(Hajj OR Umrah) for 2001–2025 (articles, reviews, proceedings), de-duplicated, and processed with Bibliometrix (R) and VOSviewer (keyword co-occurrence, thematic mapping, three-period evolution). A simple trend metric compared keyword frequencies in 2020–2025 vs 2001–2019. The corpus comprises 1,000 documents, with steady growth across five-year windows (38, 81, 185, 331, 365 documents). The latest window contributes the largest volume but shows a slight negative compound annual growth rate for 2021–2025, consistent with post-COVID normalization and partial 2025 indexing; sensitivity restricted to 2020–2024 yields 367 documents with positive growth of about 4.4%. Thematically, the field has recently pivoted toward COVID-19–related work and AI-enabled analytic approaches, including advanced machine-learning and diagnostic studies, while maintaining strong attention to infectious, heat, and crowd-related risks. In contrast, themes relating to rehabilitation and the International Classification of Functioning, functional readiness and frailty, and women’s health remain small and comparatively under-represented. These patterns highlight priority agendas for climate-ready operations and heat-risk mitigation, rigorously validated and interoperable analytic or digital tools, and functional-readiness pathways that explicitly integrate frailty, ICF concepts, and women’s-health perspectives into Hajj–Umrah health services and management.

Key words: Artificial intelligence, Bibliometrics, Hajj, Rehabilitation, Umrah.



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INTRODUCTION

Hajj and Umrah are among the largest recurrent mass gatherings in the world and are associated with distinctive health and operational challenges (Aldossari et al., 2019). These include communicable diseases, heat and dehydration, crowding and stampedes, emergency care, chronic disease management during travel, and increasingly the use of digital health and artificial intelligence to support decision-making (Samarkandi et al., 2025; Yezli et al., 2021). In recent years, there has also been a growing use of digital health and artificial intelligence to support clinical and operational decision-making during Hajj (Alquayt et al., 2025; AlWatban et al., 2024). Over the last two decades, research on Hajj–Umrah has expanded across many disciplines, but the overall structure and direction of this field remain unclear (Aldossari et al., 2019; Sweileh, 2022).

Previous reviews have typically focused on single themes such as infectious disease, crowd safety, or specific outbreaks (Aldossari et al., 2019; Sweileh, 2022; Yezli et al., 2021). Health services planners, clinicians, and educators need a panoramic view that shows how Hajj–Umrah research has evolved over time, which topics dominate the field, and which important areas remain under-represented. This study addresses that gap through a 25-year bibliometric and science-mapping analysis of Scopus-indexed Hajj–Umrah literature.

MATERIALS AND METHODS

We conducted a bibliometric study using the Scopus database. Records were retrieved with the high-precision query TITLE (Hajj OR Umrah) for the years 2001–2025 and limited to articles, reviews, and proceedings papers. For each document we extracted bibliographic metadata including year of publication, source, authors and affiliations, abstract, and keywords.

Performance indicators (annual output, five-year windows, and approximate compound annual growth rate) were calculated to describe volume and growth. Science-mapping analyses were conducted using Bibliometrix in R and VOSviewer. We generated keyword co-occurrence networks, thematic maps, and thematic evolution across three periods (2001–2009, 2010–2019, 2020–2025). A simple trend-detection score contrasted keyword frequencies in 2020–2025 against earlier years to identify “hot” topics. A sensitivity analysis restricted to 2020–2024 was performed to explore the potential impact of incomplete indexing for 2025.

RESULT AND DISCUSSION

A total of 1,000 documents met the inclusion criteria. Publication volume increased steadily over time (Table 1). The five successive five-year windows yielded 38, 81, 185, 331, and 365 documents respectively, with the largest contribution in 2021–2025.

Table 1. Five-year publication volume in Hajj–Umrah research indexed in Scopus, 2001–2025

Five-year window	Documents (n)	Cumulative (%)
2001–2005	38	3.8
2006–2010	81	11.9
2011–2015	185	30.4

2016–2020	331	63.5
2021–2025	365	100

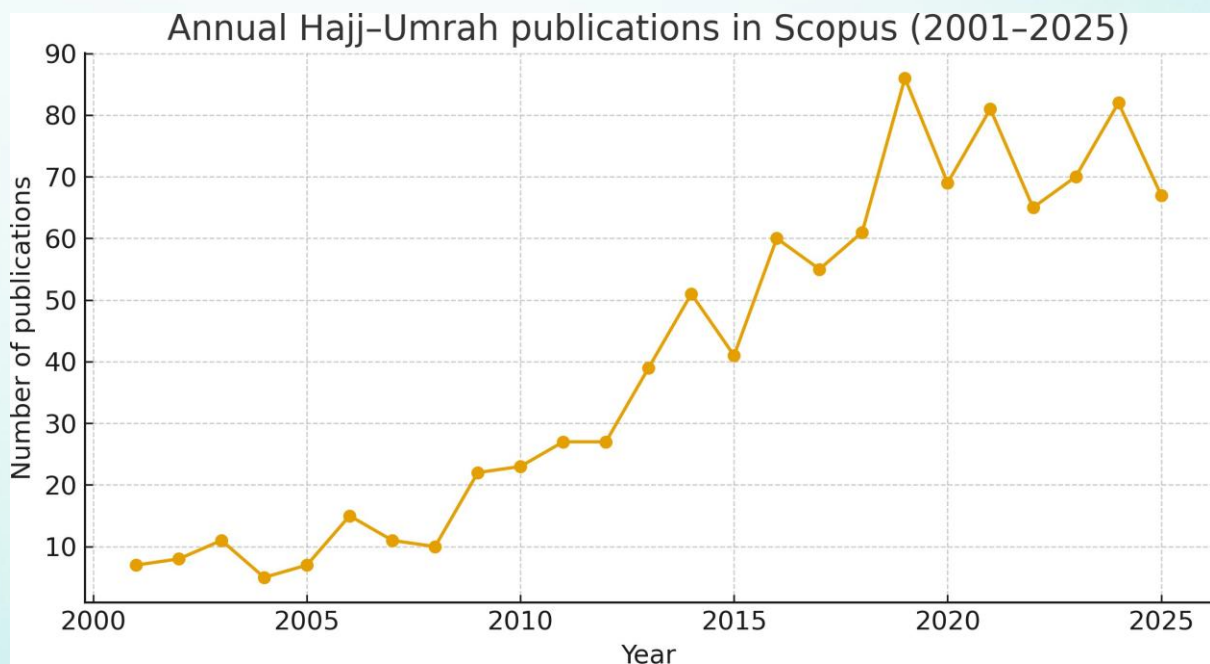


Figure 1. Annual Hajj–Umrah publications in Scopus (2001–2025)

The annual curve (Figure 1) shows a slow rise in the early 2000s, accelerated growth after the mid- 2000s, and a pronounced peak around the COVID-19 period, followed by a slight plateau. The most recent window displays a small negative compound annual growth rate for 2021–2025, which is compatible with post-COVID normalization after an exceptional surge of pandemic-related publications and with partial indexing of 2025. When restricted to 2020–2024, the dataset contains 367 documents and demonstrates a positive growth rate of about 4.4%, suggesting that the underlying trend remains upward once indexing lag is removed.

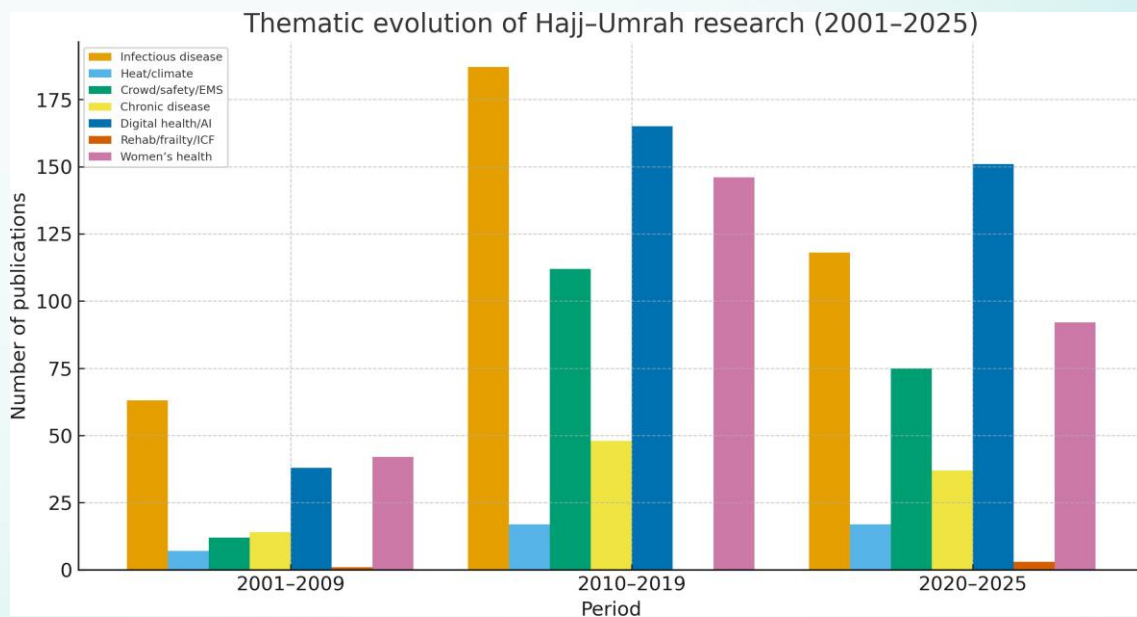


Figure 2. Thematic evolution of Hajj–Umrah research (2001–2025)

Thematic analyses revealed three broad waves of Hajj–Umrah research (Figure 2). In 2001–2009, the field was dominated by infectious-disease themes, with frequent keywords related to respiratory infections, meningitis, influenza, and vaccination, together with early work on mass-gathering medicine and crowd risks. Between 2010 and 2019, these infectious-disease topics remained central but were reshaped by the emergence of MERS-related work and a stronger emphasis on environmental and heat- related factors, as well as crowd safety and emergency medical services, indicating a consolidation of mass- gathering medicine as a distinct line of inquiry. In 2020–2025, infectious-disease terms continue to occupy a major portion of the map, now anchored around COVID-19, while AI- and analytics-related themes become more visible, often linked to prediction, pattern recognition, and classification tasks. Heat and climate, together with crowd and safety operations, persist as recurrent motifs rather than disappearing. By contrast, themes that would correspond to rehabilitation and ICF, functional readiness and frailty, and women’s health remain small and peripheral across all three periods, suggesting that functional and gender- sensitive aspects of care have not yet been mainstreamed into the Hajj–Umrah research agenda.

Trend analysis of keywords between 2020–2025 and earlier years confirms a recent pivot in the field, but with a more method-focused pattern than purely service labels. Keywords with the highest trend scores are either absent or rare before 2020 and rise sharply in the recent period. They form three conceptually coherent clusters. The first cluster is centred on the COVID-19 pandemic and respiratory diagnostics, with “covid-19” (grouping synonyms such as coronavirus disease 2019 and SARS-CoV-2) and

sampling-related terms such as “nasopharyngeal swab” and “oropharyngeal”, reflecting intensive work on detection and control of SARS-CoV-2 among pilgrims. A second cluster captures artificial-intelligence and analytics methods, including “machine-learning”, “deep learning”, “convolutional neural network”, “convolution”, and “sentiment analysis”, indicating growing use of advanced modelling and text-mining approaches in Hajj–Umrah research. A third element is the appearance of “demographics” as a trending keyword, highlighting increased attention to profiling pilgrims’ characteristics and risk distributions. Notably, telemedicine and other digital-health service terms are prominent in the overall keyword structure and thematic maps, but they do not dominate the top trend-score list, suggesting that the sharpest lexical changes in 2020–2025 are driven by pandemic-related diagnostics and AI/analytics tooling, rather than by the labels of digital service models themselves.

Despite this diversification, several domains remain relatively under-represented. Across all periods, rehabilitation and International Classification of Functioning (ICF) perspectives, functional readiness and frailty, and women’s health appear much less frequently than infectious-disease or environmental topics. This is notable given the aging pilgrim population and the high prevalence of chronic disease and disability among Hajj–Umrah participants. From a health-services perspective, the field has begun to embrace digital health and data-driven operations, but has not yet fully integrated functional assessment, rehabilitation planning, and sex-specific or gender-sensitive care into mainstream research agendas.

Overall, the results suggest that Hajj–Umrah research is maturing into a multi-dimensional field. The combination of rising volume, clear thematic waves, and strong digital/AI trends provides an opportunity to align future work with priority service needs: climate-ready operations and heat-risk mitigation, validated and interoperable digital tools with transparent reporting of bias and validation, and functional-readiness pathways—grounded in frailty and ICF concepts—that explicitly incorporate women’s-health considerations.

CONCLUSION

Over the last 25 years, Hajj–Umrah research has expanded in volume and diversified in scope, with a recent shift towards COVID-19–related work and the use of artificial intelligence and advanced analytics, while maintaining sustained attention to infectious disease, heat, climate, and crowd-related risks. Nevertheless, themes linked to rehabilitation and the International Classification of Functioning, functional readiness and frailty, and women’s health remain small and peripheral within the overall keyword and thematic structure. Future work should prioritise climate-ready operations and heat-risk mitigation; rigorously validated and interoperable analytic and digital tools with transparent reporting of bias and external validation; and functional-readiness pathways that explicitly integrate frailty and ICF concepts, together with women’s-health considerations, into the planning and delivery of Hajj–Umrah health services and management.

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