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Original Article

Research Trends on Human Papilloma Virus In Iran: A Scientometric Analysis Based on ISI Web of Science (WoS) Data

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Abstract

Background and Aims: Human papillomaviruses are the most common sexually transmitted infections, with high-risk types linked to cervical cancer in women and other cancers in both sexes. Analyzing published data can guide future research priorities and address overlooked areas. Bibliometric analysis, which assesses research activities in a specific field, is a valuable tool for this purpose. To understand HPV research trends in Iran, a scientometric analysis was conducted on articles published by Iranian researchers in the HPV field from 2002 to 2023 and indexed in the Web of Science database. 74% of the articles were original, with the highest publication rate in 2021. Tehran University of Medical Sciences had the most publications. Cancer-related studies received the most attention, while genital warts research was less common. Gene cloning/protein expression, adjuvants/nano-delivery systems and therapeutic vaccines was found to be the most popular area of studies on HPV vaccine. The number of publications in Iran is significantly lower compared to developed countries. It is imperative to delve deeper into various aspects of HPV within the country. Enhancing the quality of original studies that delve into the basic aspects of HPV is crucial. Research on HPV vaccines should be structured as extensive, collaborative endeavors involving universities and vaccine manufacturers. Further investigations into genital warts are warranted.

Keywords: Human papillomavirus, Web of Science, Scientometric analysis, Iran.

Introduction

According to recent reports, 70-80% of people will get infected with a Human papillomavirus (HPV), the most common sexually transmitted infection, at some point in their lives (1, 2). HPV is the leading causative agent of cervical cancers in women. In the 1980s, the causative relation between specific HPV types; known as high-risk ones, with development of cervical cancers was described (3). Up to 13-15 high-risk HPV types have been identified so far (4, 5), and HPV is known to be a causative agent of several cancer types, including cervical, anogenital and head and neck cancers (1, 3). It is estimated that over 600,000 new cases of cancer are attributed to HPV infections each year (6). The improvement in cervical cancer screening and treatment, along with the development of effective vaccines against HPV, are among the most significant outcomes of recognizing the causal relationship between HPV and cervical cancer (2). Currently, there are three commercially available preventive vaccines against HPV - bivalent, quadrivalent, and nonavalent. The bivalent vaccine (HPV 16, 18 virus-like particles) induces protection against two most prevalent high-risk HPV types, while the quadrivalent vaccine (HPV 6, 11, 16, 18 virus-like particles) and nonavalent vaccine (HPV 6, 11, 16, 18, 31, 33, 45, 52, 58 virus-like particles) vaccines offer protection against both the most common genital-warts-causing HPVs and the cancer-causing HPV types. For optimal

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efficacy, it is recommended to receive the HPV vaccine before becoming sexually active (6), and vaccination programs utilizing these vaccines have been successfully implemented. The first HPV vaccine was approved by Food and Drug Administration (FDA) in 2006 for women and in 2009 for men (7). Numerous studies are conducted globally on various aspects of HPV, leading to a wealth of data on both the basic and clinical aspects of HPV infections being generated each year.

Bibliometric analysis, a quantitative technique for analyzing scientific publications (8), evaluates the research activities within a particular field (9). While meta-analyses and systematic reviews focus on addressing research questions, bibliometric analyses aim to summarize publication details (9). These details are typically sourced from databases like Web of Science (WoS) or Scopus, and then subjected to analysis. Scientometric analysis, a subset of bibliometrics, focuses on evaluating scientific literature.

In this particular research, scientometric analysis was utilized to examine a total of 445 articles authored by Iranian researchers in the HPV field over a span of 21 years (2002-2023), all of which were indexed in WoS. This marks the initial scientometric study on HPV-related publications in Iran.

Methods and Materials

This research involves analyzing scientific data obtained from the WoS. Only articles with at least one author from Iran that were listed in the WoS were considered. The following search strategy has been used to extract and retrieve information: “TI= ("Human papillomavirus*" OR HPV OR "Human papilloma virus*" OR HPV OR "Human papilomavirus* "OR "Human papilomavirus*") AND CU= Iran”. In some instances, articles were manually categorized to ensure accuracy. The data was then organized into excel spreadsheets and used to create visual representations.

Results

The papers authored by scholars from Iran and listed in WoS were not discovered before 2002. A total of 445 papers were published between 2002 and 2023. Out of these, 329 (74%) were original papers, 58 (13%) were reviews, 41 (9%) were conference papers, and 19 (4%) were meta-analyses. . The year with the highest number of publications was 2021, while the lowest was in 2004 (Fig 1). The leading institutions in terms of publications were Tehran University of Medical Sciences (139), Islamic Azad University (88), Shahid-Beheshti University of Medical Sciences (73) and Pasteur Institute of Iran (71) (Fig 2).

The most prolific authors/co-authors have been Somayeh Jalilvand (20 papers), Hossein Bannazadeh Baghi (19 papers), and Azam Bolhassani (17 papers). The most cited articles were authored by Maryam Esmaeili (311 citations), Javid Sadri Nahand (151 citations), and Manouchehr Teymouri (134 citations) (Fig 3). The top journals for publishing articles related to HPV among Iranian researchers were Asian Pacific Journal of Cancer Prevention (15 papers), Journal of Medical Virology (13 papers), and Infectious Agents and Cancer (12 papers). In terms of more frequent international collaboration, Iranian researchers collaborated on HPV-related articles with scientists from USA (16 articles), Germany (13 articles) and France (12 articles) (Fig 4). The main areas of focus were cancer-related research (95 papers), vaccine-related research (81 papers), typing/ genotyping research (64 papers), genital warts research (5 papers), and epidemiological aspects of HPV (4 papers) (fig 5) .

Out of 445 pieces of writing, 63 focused on various facets of the HPV vaccine. The initial piece was released back in 2008, however, the largest amount of articles related to the HPV vaccine were recorded in 2020 (12 articles) (Fig 6). The top contributors to HPV vaccine-related articles were Islamic Azad University, Pasteur Institute of Iran, and Tehran University of Medical Sciences, with 10, 9, and 8 articles published, respectively (Fig 7). The top contributors to articles concerning the HPV vaccine are Azam Bolhassani (with 10 publications), Hourieh Soleimanjahi (with 6 publications), and Amir Ghaemi (with 5 publications).

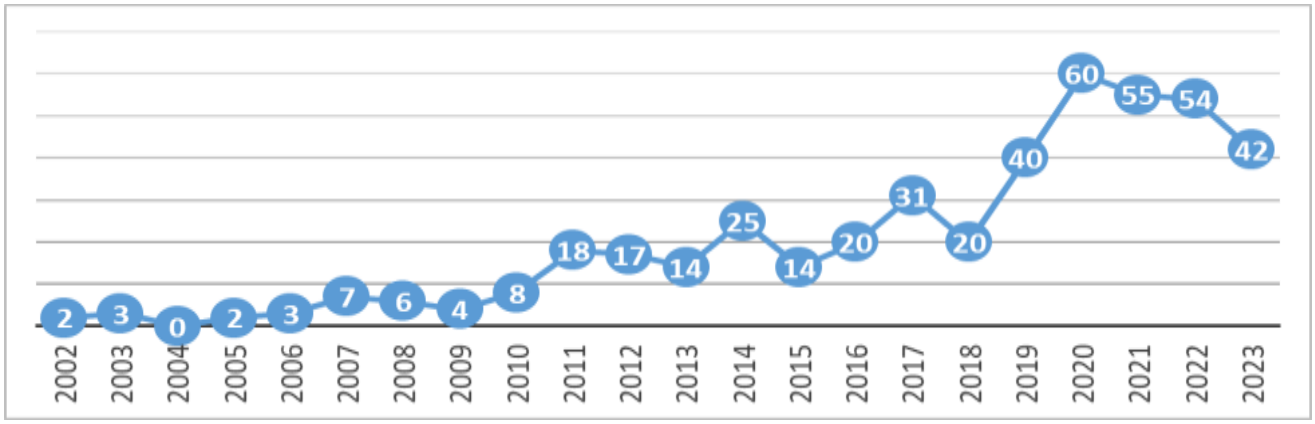


Fig 1. Number of HPV related articles in 2002-2023 which are published by Iranian researchers and indexed in WoS.

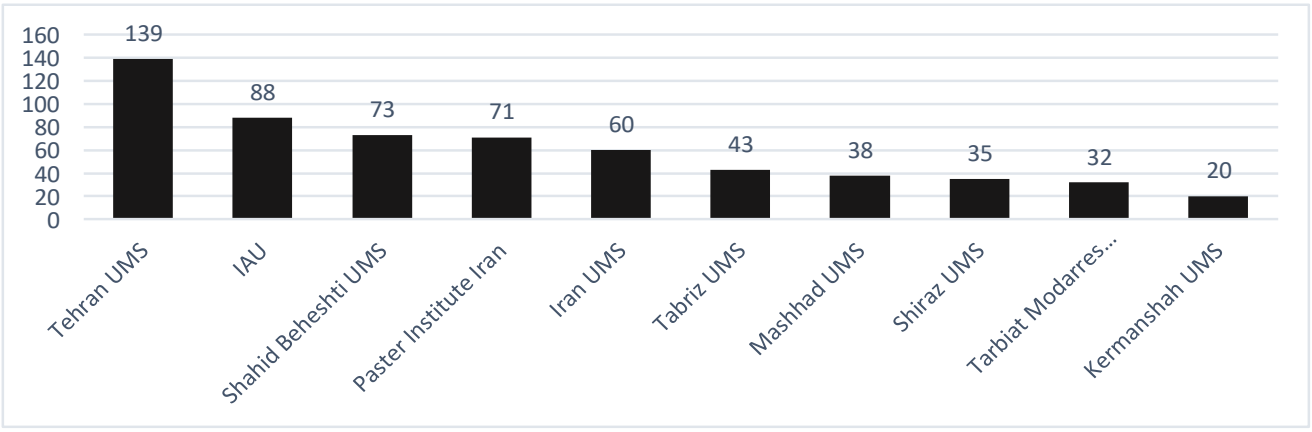


Fig 2. Number of HPV related articles in 2002-2023 which are published by top 10 different Iranian institutions and indexed in WoS.

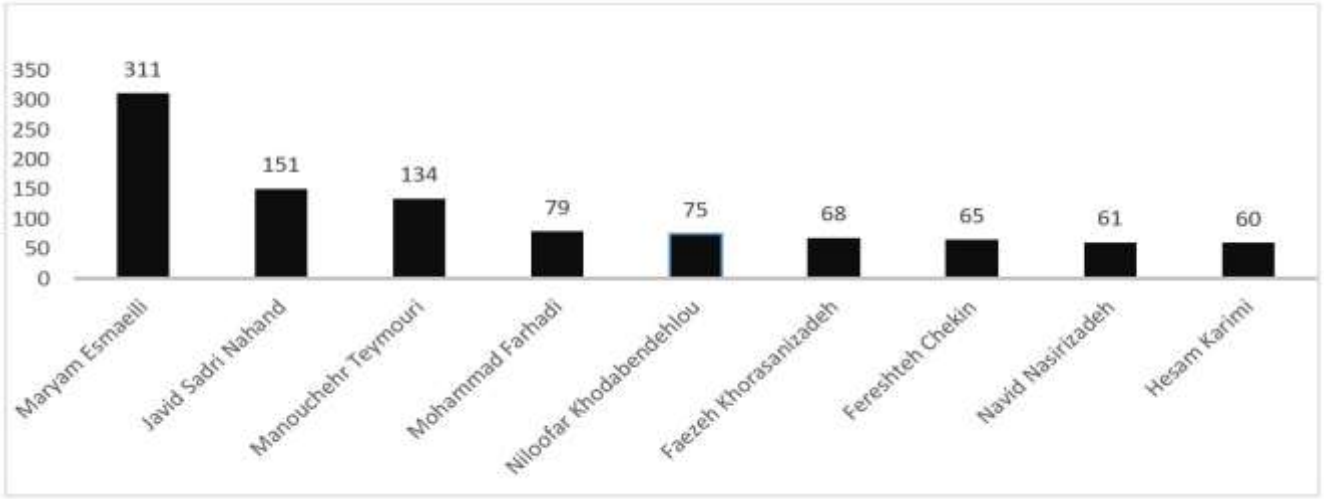


Fig 3. The most cited HPV related articles in 2002-2023 which are published by Iranian authors/co-authors and indexed in WoS.

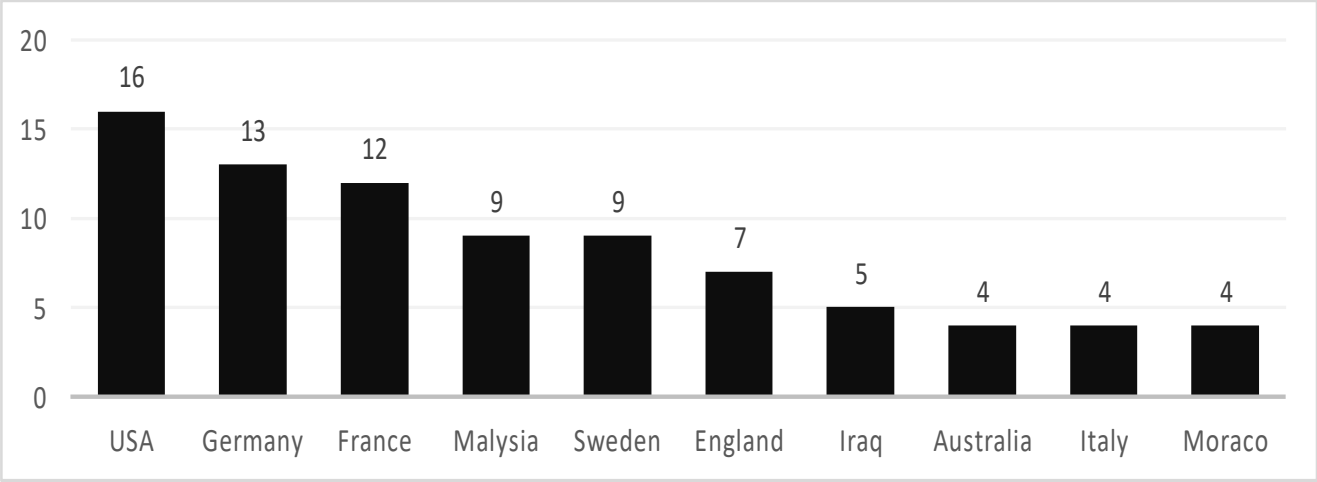


Fig 4. International collaboration and co-authorship of Iranian researchers with their counterparts in the field of HPV.

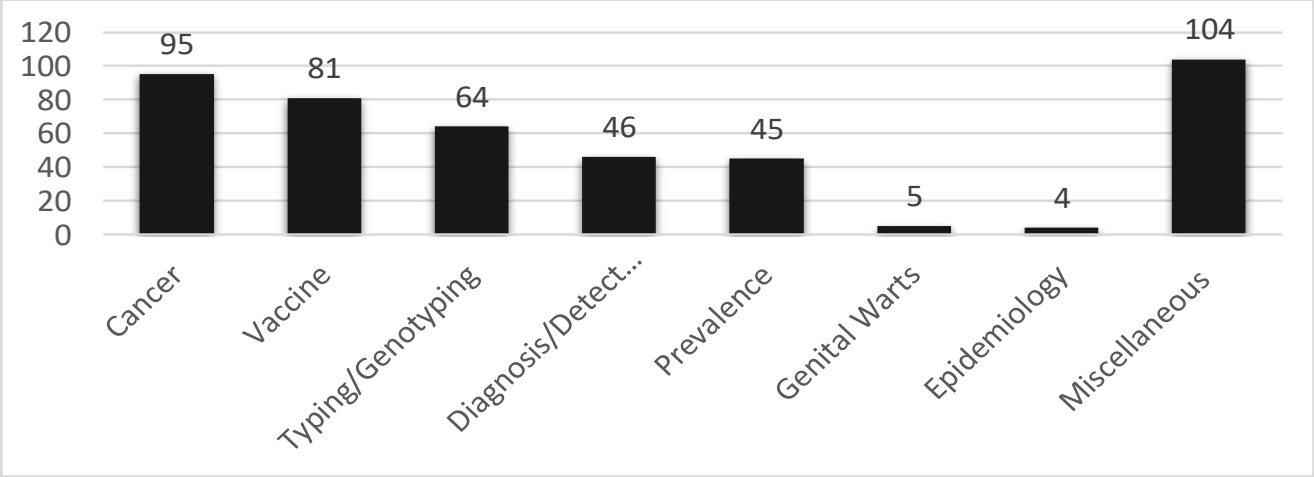


Fig 5. The number of articles with a focus on different aspects of HPV, which have published by Iranian.

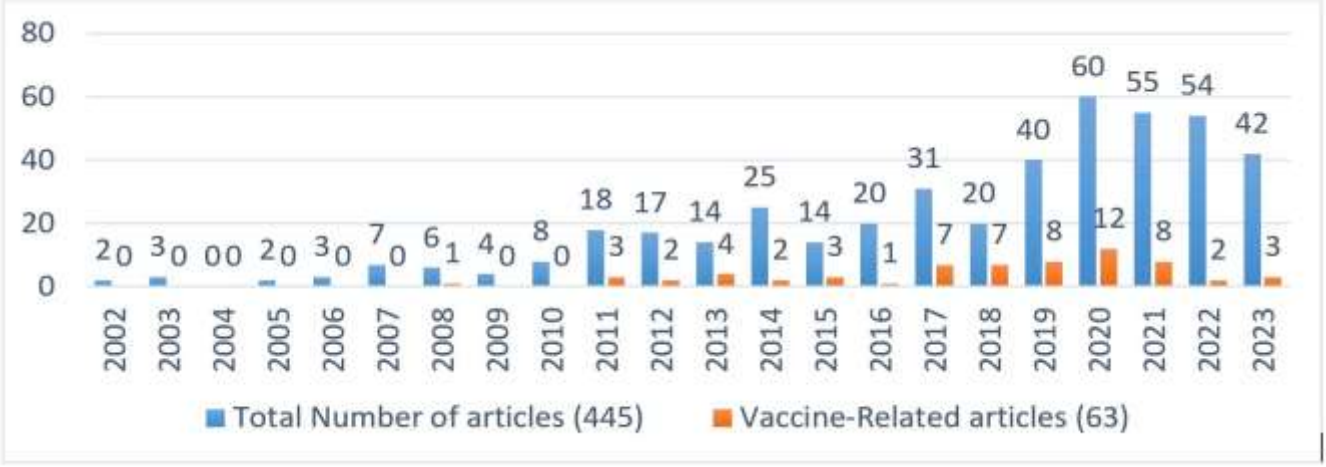


Fig 6. Number of total HPV related articles vs. HPV vaccine related articles that have published by Iranian researchers in 2002-2023 and indexed in WoS.

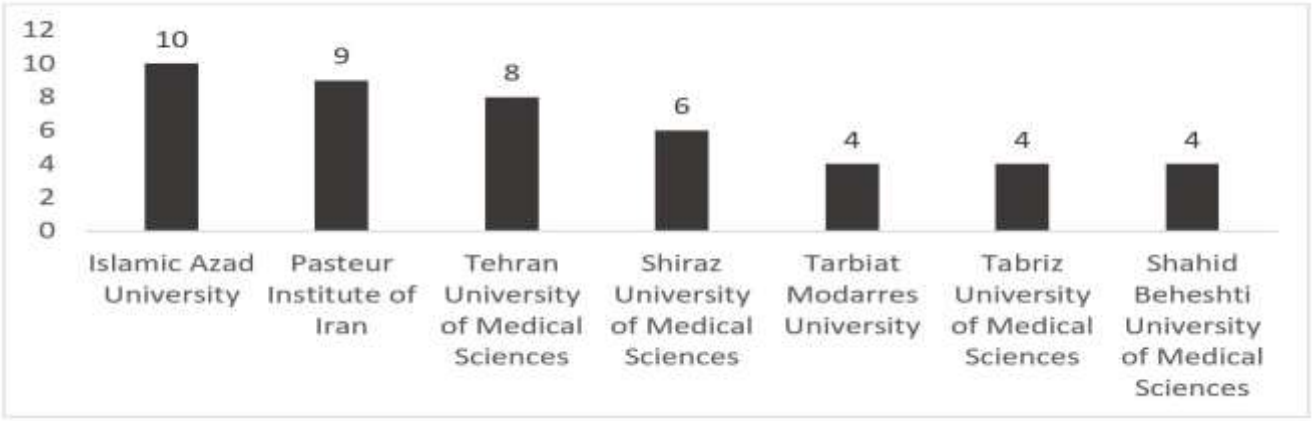


Fig 7. Number of HPV vaccine related articles in 2002-2023 which are published by different Iranian institutions and indexed in WoS (The affiliation of the first author is considered).

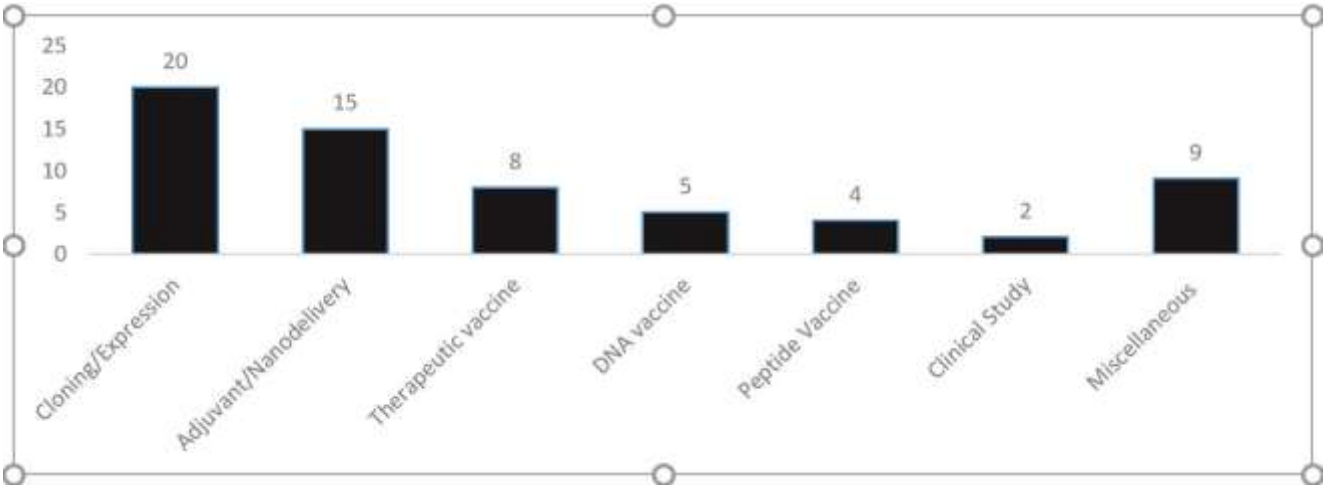


Fig 8. The number of articles with a focus on different aspects of HPV vaccine, which have published by Iranian researchers in 2002-2023 and indexed in WoS.

The most interested area of HPV-vaccine related researches are gene cloning/protein expression (20 articles), adjuvants/nano-delivary systems (15 articles), and therapeutic vaccines (8 articles) (Fig 8).

Discussion

An examination was conducted on the HPV-related papers authored by researchers from Iran and listed in the Web of Science database. The number of papers, averaging 21.2 per year, was significantly lower compared to developed countries. For example, American researchers produced an average of 740 HPV-related papers per year during the same period (2002-2023), while German researchers produced an average of 104.5 papers per year. As a matter of concern, different aspects of HPV should be more investigated in Iran. There was a significant surge in the number of publications on HPV between 2018 and 2020, followed by a sudden decline. This decline could possibly be attributed to the impact of the Covid-19 pandemic. During the aforementioned period, a large portion of research efforts were directed towards studying SARS-CoV-2, leading to a noticeable drop in the number of indexed HPV publications from 2020 to 2023. The most frequently cited HPV articles tend to be either reviews or original studies focusing on clinical aspects. This suggests that there is room for improvement in the quality of original research on fundamental aspects of HPV. The majority of published articles pertain to HPV-related cancers, HPV vaccines, and HPV typing/ geno-

typing, in that order. The information gathered from studies on HPV-related cancer and HPV typing/genotyping can be valuable in shaping clinical and diagnostic approaches. However, the inconsistency in HPV vaccine research and the lack of focus on VLP production/adjuvant preparation/formulation can be seen as a drawback, leading to a lack of progress in HPV vaccine development in Iran. Research on HPV vaccines should be planned as long-term endeavors, with careful consideration.

Additionally, the majority of HPV vaccine studies have been conducted by universities, often without a commercial mindset. Building a strong partnership between universities and vaccine production companies could help address commercialization challenges in the future. It is worth noting that the number of articles on genital warts is significantly low (0.9% of a total of 445 HPV articles). Given the growing significance and prevalence of genital warts in Iran, it is essential to conduct further studies on the subject. While the Islamic Azad University (IAU) has achieved the second position in terms of the number of research papers on HPV, it is important to note that researchers from all 253 branches of IAU across the country are publishing their work under the same affiliation. Therefore, it would not be fair to compare them with a single university or research institute. Despite facing political challenges such as sanctions, Iranian researchers have established strong international collaborations with scientists from the countries such as United States, Germany, and France. This trend is also evident in other areas of scientific research.

Conclusions

This marks the initial scientometric examination of HPV studies in Iran. HPV infections are viewed as a worldwide issue. Because of the absence of regular immunization in Iran, there should be a focus on further studies regarding the identification, typing, occurrence, spread, epidemiology, prevention, and management of HPV infections. The key findings of the analysis can be condensed as follows: a) the significance of having a sustained strategy and persistence in HPV studies, b) the need for conducting more studies on genital warts, and c) the importance of strong teamwork between academic faculty and the vaccine sector.

Acknowledgment

None

Conflict of Interest

No conflict of interest is declared.

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Ethics Approval and Consent to Participate

Not applicable.

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