

Bibliometric Study of Pharmacy Practice Research in a High-Income Middle-Eastern Country: 15 Years Insight

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Abstract: Pharmacy practice research is essential in progression in science to improve the patient's quality of life and meet the nation's research priority areas. This study aimed to analyze the quantity and quality of pharmacy practice-based research and use bibliometric indicators to describe research activity in the pharmacy practice during the last 15 years in Qatar. The study was conducted to analyze the quantity and quality of pharmacy practice-based research in 2005-2020 using bibliometric retrospective analysis. A systematic search was conducted on Web of Science, Scopus, and PubMed, using broad search terms, 'pharmacy' and 'pharmacist.' We collected original articles, case reports, review articles, short communications, letters to the editor, and brief reports. All articles included are in English. Data were analyzed descriptively based on various journal metrics. Our findings are that 355 out of 921 articles (38.5%) retrieved were usable. Overall, there were 152 journals with an average publication per year of 23.6. The number of authors per publication ranged from 1 up to 18. 135 of 355 (38.0%) publications have international collaborators, which the UK with the highest cooperation with Qatar. Overall, the average impact factor, journal H-index, and citations were 2.64, 53.19, and 5.86, respectively. The percentages indexed in Scopus and Web of Science were 88.8% and 81.37%, respectively. Over the years, it was found that there was a positive progression in the quantity of research and local and international collaborations. The quality of published journal articles was generally good and met the priorities.

Keywords: bibliometric analysis, pharmacy practice, journal metrics, information science.

中東高收入國家藥學實踐研究的文獻計量研究：十五 年洞察

摘要：藥學實踐研究對於提高患者生活質量和滿足國家研究重點領域的科學進步至關重要。本研究旨在分析基於藥學實踐的研究的數量和質量，並使用文獻計量指標來描述卡塔爾過去15年藥學實踐中的研究活動。本研究採用文獻計量回顧性分析法分析2005-2020年藥學實踐研究的數量和質量。在科學網、斯科普斯和考研上進行了系統搜索，使用了廣泛的搜索詞“藥房”和“藥劑師”。我們收集了原創文章、病例報告、評論文章、簡短的交流、致編輯的信和簡要報告。包含的所有文章都是英文的。根據各種期刊指標對數據進行了描述性分析。我們的發現是檢索到的921篇文章中有355篇 (38.5%) 是可用的。總體而言，有152種期刊，平均每年發表23.6篇。每份出版物的作者數量從1到18不等。355份出版物中有135份 (38.0%) 有國際合作者，其中英國與卡塔爾的合作最多。總體而言，平均影響因子、期刊H指數和被引次數分別為2.64、53.19和5.86。斯科普斯和科學網收錄的百分比分別為88.8%和81.37%。多年來，

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研究發現在研究數量以及本地和國際合作方面取得了積極進展。已發表期刊文章的質量總體良好，符合優先事項。

关键词：文獻計量分析、藥學實踐、期刊指標、信息科學。

1. Introduction

Pharmacy practice research looks at the impact of pharmacy practice on health care systems, medicines use, and patient care. Its scope has expanded over the past 50 years to encompass the clinical, behavioral, economic, and humanistic implications of the pharmacy practice and practice change and implementation of innovations and new services in routine practice [1]. For the context of this study, pharmacy practice research will encompass all research involved in developing the professional role of pharmacists or helping provide optimal patient care.

In Qatar, pharmacy practice has been notably progressing [2]. However, some studies showed some gaps to be filled to maximize the research capacity of pharmacy institutions [3-5]. Another study indicated that it is essential to carry out a pharmacy practice research training program to improve pharmacists' knowledge and capacity in research [6]. This research may indicate some areas for pharmacy practice research to enable pharmacists in practice and academia to conduct good quality pharmacy research. Researchers need to focus on research areas that substantially meet the country's national priorities and improve patient outcomes [7]. In Qatar, there are several guidelines to describe national research priorities. For example, The Qatar National Research Strategy (QNRS) identifies four research priorities: water security, energy security, cybersecurity, and healthcare. The sub-priorities in healthcare, according to QNRF, are cancer, diabetes, and personalized medicine [8].

Similarly, Qatar University (QU) prioritizes resource sustainability, information communication and technology (ICT), social change, and population health and wellness, focusing on chronic non-communicable diseases, especially cancer, cardiovascular diseases, hypertension, and diabetes [9]. Moreover, the National Health Strategy (NHS) focuses on the population covered by research: children, pregnant women, employees, people with multiple chronic diseases, and the elderly. They also prioritize the prevention of communicable disease, and they recommend a focus to be paid on maintaining good mental health for all populations in the country [10]. Targeting these research areas is essential, as those areas of research will help meet the country's

national vision and improve the overall life and health of the population.

Up to our knowledge, there were no studies that assessed whether the current pharmacy practice research covered the areas and patient groups mentioned above. One study has looked at community pharmacy research in Middle Eastern Countries, including Qatar [11]. However, Qatar was not the main focus of the study; research articles included were limited to community pharmacy-based only. Only one database was used for the search. The time frame was only from 2003 until 2012. There is a compilation of all research published by academicians from the College of Pharmacy, Qatar University. However, this compilation does not have any analysis conducted or pharmacy research conducted by researchers outside the College of Pharmacy, such as hospital and community pharmacists [12]. Therefore, we believe that a study clearly describes pharmacy practice research's growth, quality, and focus is highly required.

Bibliometric analysis can describe patterns of publications in a particular field using quantitative and qualitative indicators. This type of analysis has been used in many studies to describe pharmacy practice research in different countries and specific branches in pharmacy research like community pharmacy, hospital pharmacy pharmacovigilance, and others [13-17]. Therefore, we conducted this study by assessing and describing the research activities in pharmacy practice areas in Qatar reflected by research articles published between 2005 and 2020. Specifically, this study aimed:

- 1) To analyze the quantity and quality of pharmacy practice-based research during the last 15 years in Qatar;
- 2) To set and shape the future research direction for academicians and practitioners in the country;
- 3) To map out the research areas with Qatar University and Qatar National Research Strategy priority areas.

2. Materials and Methods

2.1. Study Design

This study is a bibliometric retrospective analysis to evaluate the quantity and quality of publications on pharmacy practice in Qatar from 2005 to 2020. The

scope of this study covers the published research only. This scope may be a limitation as grey literature will not be included. However, for bibliometric analysis, many quality indicators rely mainly on the research journal or the number of citations. This type of data can only be found for published work [18]. This design is appropriate for this study's aim and objectives as it allows objective quantification of the impact of publications on the scientific community. In contrast, if it were to be a peer review or any other expert-based judgments, it would be more subjective, leading to variation of outcomes between individuals and, therefore, unreproducible results [19-20]. Moreover, looking at both quantity and quality allows describing the patterns of research in pharmacy practice in Qatar along with displaying what areas are current research neglecting or gaps in current research, thus encouraging researchers in Qatar to tackle the topics that have not been focused on by other researchers[20].

2.2. Search Strategy and Databases Used

A systematic search was conducted on Web of Science (WoS), Scopus, and PubMed, using broad search terms, 'pharmacy' and 'pharmacist' to avoid missing out on research combined with 'Qatar' for affiliations. This search covered the period from January 2005 to October 2020.

2.3. Inclusion and Exclusion Criteria

A broad range of article types by Qatari authors or authors in Qatar is included in this study, like original articles, case reports, review articles, short communications, letters to the editor, and brief reports. All articles included are English, published from January 2005 until October 2020. Unpublished articles or articles that are not published in online journals, online newsletters, drug bulletins, and conference presentations are excluded from this study. Therefore, they do not have any bibliometric indicators and cannot be analyzed by bibliometric analysis. Similarly, no papers published in the local language or any other language than English were included. Furthermore, no manual search of papers in libraries was conducted.

2.4. Data Collection and Validation

One author (RH) extracted data from all publications; this information was entered into MS-10 Excel. All

information was screened and checked by two other authors (HA and MIMI) for validity.

2.5. Data Analysis and Visualization

Data extracted and entered into Excel were summarized by descriptive statistics into tables and figures for visualization, using means (sd) for quantitative data and frequencies (%) for qualitative data. Data extracted included: title of the paper, title of the journal, number of authors, number of collaborating institutions, journal impact factor, journal H-index, journal eigenfactor, and journal quartile. Furthermore, the articles were classified based on disease and significant research areas based on the study's main objectives to identify the research gaps.

2.6. Ethical Approval

Ethical approval by an ethics committee was unnecessary as no human subjects or human materials were utilized in this study.

3. Results

921 articles were retrieved, using the methodology stated. After excluding articles not of interest for this study based on exclusion criteria, only 355 articles, shown in Appendix 1, complied with the inclusion criteria, with the earliest publication dating back to 2005. Thus, yielding an average of 23.6 publications per year. Fig. 1 shows the number of publications per year, showing low productivity from 2005 to 2014, followed by a gradual increase in the following years and the highest productivity in 2020.

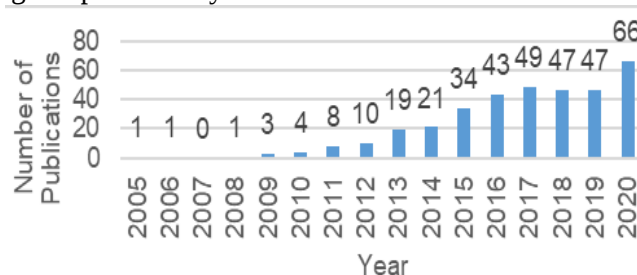


Fig. 1 Distribution of research by year of publication

Table 1 displays context and quality indicators of publications on pharmacy practice research in Qatar, showing an increase in institution collaborations over the years and a higher average number of citations in older publications. The 15 years are split into three periods: 2005-2010, 2011-2015, and 2016-2020.

Table 1 Context and quality indicators of publications by year

Period	Year	Number of publications	Average number of authors	Average institutions collaborations	Average impact factor	Average H-index	Most frequent quartile	Average cite score	Average eigenfactor	Indexing Scopus	Indexing WoS	Average number of citations
1	2005	1	7	0	1.195	48	Q3	1.6	0.002	100%	100%	16
	2006	1	6	0	2.406	109	Q1	4.3	0.011	100%	100%	28
	2008	1	6	1	0	58	Q1	2.5	0.02	100%	100%	142
	2009	3	2.66	0.67	1.19	34	Q3	2.05	0.002	66.67%	33.30%	8
	2010	4	4	1.4	1.77	42.8	Q2	2.82	0.003	80%	80%	25.2
	2011	8	3.37	0.5	1.78	28.42	Q2	2.73	0.003	87.50%	25%	26
2	2012	10	3.4	0.7	3.02	46.22	Q1	3.3	0.008	80%	50%	12.4
	2013	19	3.57	0.84	2.23	60.76	Q2	3.06	0.265	68.42%	52.63%	10.78
	2014	21	4.85	1.33	2.75	35.95	Q3	3.11	0.01	85.71%	52.38%	7
	2015	35	5.11	1.55	3.2	56.42	Q1	3.9	0.01	97.05%	94.11%	10.38
	2016	43	4.81	1.32	2.43	50.09	Q1	3.47	0.01	93.02%	75%	5.04
	2017	49	4.32	1.24	2.62	51.73	Q2	3.01	0.01	91.83%	85.10%	4.51
3	2018	47	4.89	1.57	2.28	52.63	Q2	2.73	0.18	91.49%	95.74%	3.38
	2019	47	4.89	1.25	2.38	54.6	Q2	3.3	0.08	85%	89.30%	1.85
	2020	66	6.06	1.68	1.65	52.70	Q2	2.97	0.00	92.42%	84.84%	0.38
Total		355	4.87	1.35	2.64	53.19	Q2	3.46	0.04	88.8	81.37	5.86

Fig. 2 shows the percentage of indexed publications in Web of Science and Scopus to have a more general idea of the publications. Furthermore, in Table 2, the number of authors per publication is displayed from 1 up to 18. Only 14 articles, equivalent to 3.94% of total articles, have only one author. Likewise, in Table 3, the number of collaborating institutions per publication displays that authors published 114 articles from only one institution with 0 collaborating institutions, equivalent to 32.1% of publications in this study.

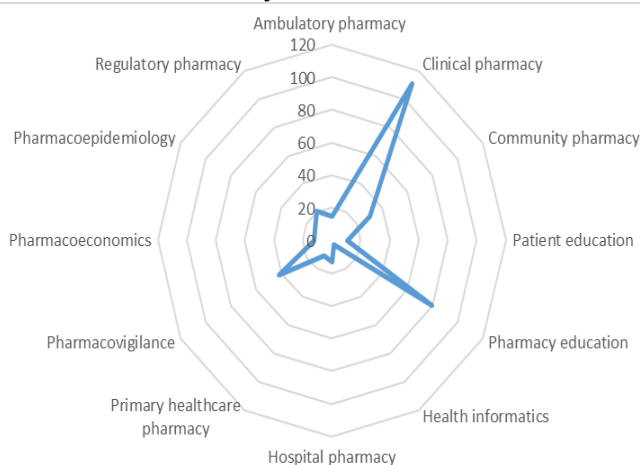


Fig. 2 Publications based on disease and population of interest

Table 2 Number of authors per publication

Number of authors	Number of publications	Percentage
18	1	0.28%
15	1	0.28%
14	3	0.85%
13	5	1.40%
12	1	0.28%
11	4	1.12%
10	6	1.69%
9	6	1.69%

Continuation of Table 2

8	16	4.50%
7	31	8.70%
6	42	11.8%
5	52	14.6%
4	62	17.4%
3	71	20%
2	37	10.4%
1	14	3.94%

Table 3 Number of collaborating institutions per publication

Number of collaborating institution	Number of publications	Percentage
10	1	0.28%
9	1	0.28%
7	1	0.28%
6	2	0.56%
5	5	1.40%
4	12	3.38%
3	36	10.1%
2	74	20.6%
1	108	30.4%
	114	32.1%

Table 4 Countries that collaborate with Qatar in pharmacy practice research

Country	Number of Publications
United Kingdom	48
Canada	35
United States	18
New Zealand	16
Egypt	10
United Arab Emirates	10
Malaysia	6
Australia	5
Kingdom of Saudi Arabica	5
Ireland	5
Jordan	3
Kuwait	3
Lebanon	3

Continuation of Table 4

Italy	1
Hungary	1
Oman	1
Switzerland	1
South Africa	1
Turkey	1

Out of the 355 publications, 135 publications have international collaborations, equivalent to 38% of publications. Qatar pharmacy practice research has collaborated with the countries listed in Table 4 with the number of publications for each country. The United

Kingdom has the most publications in cooperation with Qatar.

The total number of journals that pharmacy practice research in Qatar has published in is 152 journals. The top 10 journals with the highest number of publications are listed in table 5 with quality indicators, including H-index, impact factor, quartile, cite score, and eigenfactor. The journal with the most publications is the International Journal of Clinical Pharmacy, with 21 publications, equivalent to 5.9% of the total publications, followed by Currents in Pharmacy Teaching and Learning with 15 publications, equivalent to 4.2% of the publications.

Table 5 Top 10 journals and their quality

Journal	Number of publications	Impact factor	H-index	Quartile	Cite score	Eigenfactor
International Journal of Clinical Pharmacy	21	1.616	57	Q4	3	0.003
Currents in Pharmacy Teaching and Learning	15	NA	17	Q2	1.2	NA
American Journal of Pharmaceutical Education	13	2.398	58	Q1	2.5	0.002
Research in Social and Administrative Pharmacy	12	2.844	41	Q1	3.9	NA
Eastern Mediterranean Health Journal	8	0.678	46	Q3	1.1	0.003
International Journal of Clinical Pharmacy	8	1.616	71	Q1	3	0.003
International Journal of Pharmacy Practice	8	NA	35	Q2	2.2	NA
Journal of Interprofessional Care	7	1.726	69	Q3	2.9	0.003
Journal of Thrombosis and Thrombolysis	7	2.054	64	Q3	5	0.006
Saudi Pharmaceutical Journal	7	2.879	42	Q1	5.9	NA

The studies were categorized based on disease or populations of interest and presented in Fig. 2 and based on the significant area of research presented in Fig. 3. These figures are radar charts, where for each category if it is at the center of the wheel, it represents 0 publications in this category and increases as it gets closer to the edge. The diseases that got the most attention were infectious diseases, followed by diabetes, cardiovascular disease, and cancer. The disease with the minor publications is obesity, with only one publication, as shown in Fig. 2. In contrast, pharmacy practice research focused on clinical pharmacy, followed by pharmacy education, then pharmacovigilance. Finally, the least addressed area is health informatics, with only three publications, as shown in Fig. 3.

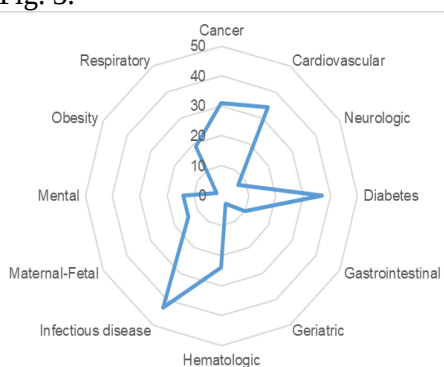


Fig. 3 Publications based on the major area

The analysis was done on SPSS and MS-Excel by two authors (RH and MIMI) and checked by all authors to ensure validity and reliability. Furthermore, for categorizations shown in Fig. 3, it was taken into consideration that there may be some confusion on what is considered clinical pharmacy and what is considered hospital pharmacy research; therefore, straightforward definitions for areas that may overlap were used to enhance the reliability of the study. For a study to be defined as clinical pharmacy research, it should involve clinical pharmacists as authors and be about pharmacists providing "patient care that optimizes medication therapy and promotes health and disease prevention." It is described by the American College of Clinical Pharmacists, whereas hospital pharmacy research was a research that looks at "preparing, storing, compounding, and dispensing medicines and medical device" as explained by the European Association of Hospital Pharmacists [21, 22].

4. Discussion

This study aimed to use bibliometric indicators to describe research activity in the pharmacy practice area in Qatar from 2005 till 2020. The search results showed 355 studies, with the earliest publication in 2005. This period can be directly related to the year clinical

pharmacy was introduced in Qatar, around 2005, by an in-house foundation program in clinical pharmacy [23]. However, in the earlier period, the publication activity was deficient. This publication begins to rise in the subsequent years that is most likely due to the opening and advancement of the national and only pharmacy program in Qatar in 2007 at Qatar University, which gained its accreditation by the Canadian Council on Accreditation of Pharmacy Programs (CCAPP) in 2008 and accreditation by the same council for its PharmD program in 2013 [23]. Moreover, the research productivity from the healthcare settings such as Hamad Medical Corporation and Primary Health Care Corporation started to grow after establishing this college of pharmacy.

Generally, citations are less in more recent years and older years. The newer publications need more time to be cited. This citation pattern has been described as logical and reasonable in previous bibliometrics in different fields [24]. However, an indicator of high-quality or relevant research is that considerably recent articles were cited with an average of 0.38 and 1.85 citations. It indicated that research produced is highly relevant and referred to by other research fast. However, high citation numbers may not necessarily indicate quality.

Alongside the increase in the annual number of publications, there is an apparent increase in local collaboration in research yearly. This increase can indicate an increased number of researchers and institutions in the pharmacy practice area or increased interest of pharmacists in performing research. On the other hand, the impact of an increase in the number of authors per article is increased visibility of research, as shown in a study conducted in Puerto Rico. The study revealed that multi-author articles gain higher visibility and increase further with multi-institution collaborations, followed by a more significant increase when the research has international collaborations. [25] In our study, most of the publications were written by more than one author. Around two-thirds of the publications have at least one collaborating institution. Likewise, international collaborations in pharmacy practice research in Qatar are impressive, with more than one-third of the publications having collaborations with authors and institutions from other countries. Conclusively, Qatar's collaboration in pharmacy practice research leads to excellent visibility, which will be disseminated to the scientific community, thus having a significant impact, more citations, and worldwide recognition [25, 26].

In addition to increased citations with international collaboration, the extent of gain depends on the country

of collaboration. A previous study implied that if a study collaborates with a country with a high impact, the gain would be greater than when collaborating with a lower impact [27]. For pharmacy practice research precisely, Al Ageel et al. has inferred that high-impact countries are the United States, Canada, and the United Kingdom [15]. The three countries with the most collaboration in Qatar's pharmacy practice research are the United Kingdom, Canada, and the United States.

When a journal has high quality based on its impact factor, H-index, cite score, eigenfactor, and quartile, it is expected that the publication will also be of high quality [28]. Our study showed that the impact factor of the journals being published is relatively low. The average impact factor per year with the top 10 journals used in pharmacy practice research in Qatar is not high, suggesting the low-moderate quality of the journals. Therefore, it may indicate the low-moderate quality of research as it has been showing that the best journals are the hardest to publish in, depending on the impact factor [29]. However, relying on the impact factor alone is not reasonable for judging the research as it is usually multidisciplinary journals with higher impact factors. We can see that the ten most used journals for publishing were mainly focused on pharmacy journals rather than multidisciplinary [30]. The quartiles of journals are mostly Q2. The journal's quality based on quartiles will be similar to the impact factor as quartile ranking is made based on the journal's impact factor.

Apart from the impact factor, another indicator of journal quality could be the h-index of the journals, which Hodge and Jeffrey described as a good compliment, or even an improvement, for assessing journal quality alongside the impact factor [31]. If we considered a good H-index above 20, above 40 is very good, and above 60 is outstanding, this would mean that the averages of H index per year and for all the articles are above 20, with 11 of the years having an average H index above 40 and two years out of those 11 years have an average H index above 60. In parallel, we presented the H-indices of the top 10 journals used in research. Only one of the journals had an H-index below 20 and the others - above 40, with three above 60. Contrary to the impact factors of the journals, the H index shows high-quality journals, therefore suggesting high-quality research.

Moreover, looking at the area the journals focus on is essential. When pharmacy practice research is published in foreign journals that are not familiar with pharmacy practice leads to the use of non-standardized and misleading terminology and overlooking the nuance of pharmacy practice research [32]. From the top 10

journals used, only Eastern Mediterranean Health Journal, Journal of Interprofessional Care, and Journal of Thrombosis and Thrombolysis are not specific to pharmacy practice. Therefore, the choice of journals is somewhat reasonable.

In order to guide future research, the gaps in current research must be identified. The radar charts identified topics that are getting enough recognition and attention in pharmacy practice research in Qatar and the neglected areas or lack the attention they require. The disease that has had the most articles are infectious disease, diabetes, cardiovascular disease, and cancer. These results profoundly align with QNRS, QU, and NHS priorities. These have prioritized research about non-communicable chronic disease, emphasizing cancer, cardiovascular disease, and diabetes [10-12]. The NHS also accentuates the importance of preventing communicable diseases for a healthier population [12]. However, mental health, the health of pregnant women, and geriatrics were also emphasized in the NHS as a priority. However, these areas have not been addressed enough; the same goes for obesity which was one of the priorities in QU. However, only one publication discusses obesity in pharmacy practice in Qatar [12].

One of the priorities in QU research areas is ICT which pharmacy practice research can contribute to through research looking at health/pharmaco-informatics, but only addressed in 3 of the publications and the least addressed area in Qatar pharmacy practice research [11]. The next least addressed pharmacy practice research area is patient education and primary healthcare pharmacy. Patient education is crucial, and as a significant QNRS, QU, and NHS research priorities are preventing disease, which can be achieved effectively by education [10-12]. Managing non-communicable chronic disease is a significant concern in Qatar regarding primary health care. This management is usually conducted in primary healthcare settings [10-12].

Similarly, ambulatory pharmacy has not been primarily addressed by the publications included in this study. One study concluded that other healthcare providers believe there should be an expansion in pharmacists' role in ambulatory care settings [33]. Moreover, the hospital pharmacy area is also overlooked as expected since a research capacity-building program in hospitals for pharmacists was only conducted in 2015 [8]. Likewise, pharmacoeconomic studies have not been given as much recognition as wanted in Qatar, which correlates with the results of an earlier systematic review on pharmacoeconomic studies in the middle-east [34].

Contrary, areas of pharmacy practice research that were well addressed are clinical pharmacy, pharmacy

education, and pharmacovigilance. Omar et al. mentioned that hospitals' healthcare providers in Qatar have positive attitudes towards clinical pharmacists as an essential part of the healthcare team, suggesting that the effort of the pharmacy practice research in Qatar on clinical pharmacy has resulted in positive outcomes [33]. However, in the same study, healthcare providers expressed their uncertainty on pharmacists monitoring for adverse effects, therefore, supporting the importance of pharmacovigilance studies in pharmacy practice and should be taken as an initiative to continue to improve in this area in Qatar [33]. Lastly, Qatar's intense focus on pharmacy education in pharmacy practice research is of great benefit and importance. The research and advancement efforts will be reflected on pharmacy graduates when they practice.

5. Conclusion and Recommendations

This study was conducted to assess and describe the publication activity in pharmacy practice in Qatar during the years 2005 to 2020. Therefore, we identified research gaps and set a direction for future research while aligning this with national priorities. It was found that there is a positive progression in the quantity of research and local and international collaborations. The quality of published research work is generally good, and the number of citations publications are receiving is adequate. Generally, national priority areas regarding the disease are being well addressed by research. Finally, clinical pharmacy, pharmacy education, and pharmacovigilance are beneficial and crucial research with adequate publications.

There are a few study recommendations. Firstly, a similar complementary study that looks at pharmaceutical science research in Qatar can lead to results that will add to and enhance the results of this study. The academicians and pharmacists in practice should focus on journals to publish in high-quality journals and pharmacy practice-oriented journals. More focus must be drawn on a disease that has not been well addressed in the past for future research. Current research like mental health, geriatrics, and disease in pregnancy need more investment in publications. More research should also focus on ambulatory, hospital, and primary healthcare settings. Likewise, the research area of health informatics, pharmacoeconomics, and patient education was also not well addressed by previous research. Hence, researchers must try to address these areas more.

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