The Practice of Scientific Publications by Pharmacists in Saudi Arabia

Yousef Ahmed Alomi*, BSc. Pharm, MSc. Clin Pharm, BCPS, BCNSP, DiBA, CDE, Critical Care Clinical Pharmacists, TPN Clinical Pharmacist, Freelancer Business Planner, Content Editor and Data Analyst, Riyadh, Saudi Arabia.

Sultan Mohammed Al-Jarallah Bsc. Pahrm, Msc Clin Pharm, Head, Ambulatory Care Pharmacy, Oncology and Hematology Clinical Pharmacist, Pharmaceutical Care Department, Security Forces Hospital, Riyadh, SAUDI ARABIA.

Juman Saad Mohammad Alsaab Erada psychiatric Hospital-Alkharj, Riyadh, SAUDI ARABIA.

Razan Alshehri College of Pharmacy, Taif University, Tail, SAUDI ARABIA.

Khawla Ibrahim Al-shahrani College of Pharmacy, Taif University, Tail, SAUDI ARABIA.

Correspondence:
Dr. Yousef Ahmed Alomi, BSc. Pharm, MSc. Clin Pharm, BCPS, BCNSP, DiBA, CDE, Critical Care Clinical Pharmacists, TPN Clinical Pharmacist, Freelancer Business Planner, Content Editor and Data Analyst, Riyadh 11392, Riyadh, Saudi Arabia.

Phone no: +966504417712
E-mail: yalomi@gmail.com

Received: 07-03-2021;

Accepted: 01-06-2021.

Access this article online

www.ptbreports.org

DOI: 10.5530/PTB.2022.8.4

ABSTRACT

Objectives: In this study, we aimed to assess the practice of scientific publications by pharmacists in the Kingdom of Saudi Arabia. **Methods:** In this cross-sectional survey study, we aimed to assess the practice of scientific publications by pharmacists in Saudi Arabia. We used a self-reported electronic survey questionnaire and distributed it to pharmacists from interns to consultants and specialists in Saudi Arabia. The survey collected demographic information and information about the type of publications made by them, the selected elements used during scientific publications, and the social media platforms where they distribute your publication. We used a 5-point Likert response scale system with close-ended questions to obtain responses. The data were collected through the Survey Monkey system and analyzed using the Statistical Package of Social Sciences (SPSS), Jeffery's Amazing Statistics Program (JASP), and Microsoft Excel software (version 16). **Results:** A total of 543 pharmacists responded to the questionnaire. Of them, more than one-quarter were from the central region (5 (28.55%)) followed by the eastern region (133 (24.49%)), with statistically significant differences between regions (p=0.000). Females responded (321 (59.12%)) more than males (222 (40.88%)). Based on nationality, Saudi nationals (351 (64.64%)) responded more than non-Saudi nationals (192 (35.36%)), with statistically significant differences between them (p=0.000). The average score for type of journal for scientific publications was 3.99 with high scores obtained "article in the international scientific journal" (4.26) and "article in the local scientific journal" (4.22), with statistically significant difference between responses (p=0.000). The average score of pharmacist practice of unique elements during scientific publications was 3.81, with high scores obtained for the element "are your colleague's reviewers" (4.10) and "spelling and grammar checker through special software" (3.95). The average score for the "type of social media platforms to distribute your scientific publications" was 3.33, with high scores obtained for WhatsApp (3.73) and YouTube (3.56). The scores for the single-test reliability analysis of McDonald's ω was 0.939, Cronbach's α was 0.935, Gutmann's λ2 was 0.942, Gutmann's λ6 was 0.976, and greater lower bound was 0.990. **Conclusion:** The practice of scientific publication by pharmacists was found to be fair in Saudi Arabia. An annual report about pharmacists involved in the scientific publication is suggested. We recommend improving the practice of scientific publications by pharmacists in Saudi Arabia.

Keywords : Practice, Scientific, Publications, Pharmacist, Saudi Arabia.

INTRODUCTION

Over the past few years, various biomedical, medical, and pharmaceutical journals have been released in the market in Saudi Arabia. East journal had a policy of submitting a manuscript to the journal. However, the earliest guidelines for writing manuscripts for the biomedical journals were started in the 1980s by the International Committee of Medical Journal Editors (ICMJE) and are regularly updated.[1,2] Moreover, further guidelines were released about writing each type of research article for publication, such as clinical trials, observational studies, pharmacoeconomics, and quality improvement studies. As a result, the number of published research articles emphasizing medical or pharmaceutical research has increased over the past few years.[3] As a result, Saudi Arabia has emerged as the first country in the Arabian subcontinent to top in research publications.[4,5] The Healthcare sciences publications were considered the top second or third among all types of sciences specialties. Pharmacology and pharmaceutics were the top third research category for publications, representing almost 10% of the publications in medical research.[6] Despite previous data about research in Saudi Arabia, we still need in-depth analysis about pharmacists' practice of scientific publications.[7] For instance, the participation of pharmacists with regard to the type of the study design such as randomized clinical studies, observational studies, or systematic reviews. Moreover, research tools usages during research publications, which kinds of publication sections the pharmacist involved, and authorship arrangement of corresponding author or coauthor.

Pharmacists and other healthcare professionals should practice writing manuscripts based on the journal guidelines.[8] The magnitude of the practice in writing the journal articles emphasizes the number of publications they have made annually and the type of journals they have submitted their papers for publications. Moreover, the pharmacists involved authorship ranking and the publication specialty. That includes pharmacy practice, pharmacogenomics, pharmacokinetics, and pharmacoeconomics. Exploring these areas will help pharmacists in strategic planning in

a pharmacy career. Moreover, it allows the educators to update their strategies to improve the practice of publications in the pharmacy field. A previous study was conducted to analyze scientific research conducted by pharmacists and their practice of writing scientific articles for publication.[9] However, to the best of our knowledge, only a single study has discussed the approach of publication of scientific research articles by pharmacists.[10] Therefore, in this study, we aimed to assess the practice of publishing scientific articles by pharmacists in the Kingdom of Saudi Arabia.

METHODS

It was a 6-month cross-sectional study conducted to assess the practice of publishing research articles by pharmacists in Saudi Arabia. We used a self-reported electronic survey questionnaire and distributed it to pharmacists from interns to consultants and specialists in Saudi Arabia. Responses obtained from non-pharmacists and students and incomplete surveys were excluded from the analysis. The survey collected demographic information of the pharmacists and information about the frequently published article/journal types often used the selected elements during scientific publications and social media platforms where they intend to distribute their published articles. Moreover, the number of publications annually, author's position in the scientific publications, type of pharmaceutical sciences interested in writing or publishing. Besides, the methods of the pharmacy scientific publications and costs of publication. We used 5-point Likert response scale system with close-ended questions to obtain responses. According to the previous literature with unlimited population size. The sample was calculated for this cross-sectional study with a confidence level of 95%, *z* score of 1.96, a margin of error of 5%, a population percentage of 50%. In addition, the drop-out rate of 10%. Consequently, the sample size was calculated as 418 with a power of study of 80%.[11-13] The response rate required for the estimated sample size was at least 60–70%.[13,14] The survey was distributed through social media such as WhatsApp and Telegram and via face-to-face contact. A reminder message was sent once every 1-2 weeks. Expert reviewers and pilot testing validated the survey data. Moreover, various reliability tests such as McDonald's ω, Cronbach's α, Gutmann's λ2, and Gutmann's λ6 were tested. The data were collected through the Survey Monkey system, and data were analyzed with Microsoft Excel (version 16), the Statistical Package of Social Sciences (SPSS), and Jeffery's Amazing Statistics Program (JASP) software. We performed descriptive and frequency analysis, the goodness of fit analysis, correlation analysis, and inferential analysis. The STROBE (Strengthening the reporting of observational studies in epidemiology statement: Guidelines for reporting observational studies) guided the reporting of the results of this study.[15-17]

RESULTS

A total of 543 pharmacists responded to the questionnaire. Of them, more than one-quarter were from the central region (155 (28.55%)), followed by the eastern region (133 (24.49%)), with a statistically significant difference between all provinces (p=0.000). Of the total responders, 110 (20.26%) were from private primary healthcare centers, and 97 (17.86%) were from Ministry of Health (MOH) hospitals, with a statistically significant difference between worksites (p=0.000). Moreover, females responded more than males (321 (59.12%) versus 222 (40.88%), respectively). Based on the nationality, Saudi nationals responded more than the non-Saudi nationals (351 (64.64%) versus 192 (35.36%), respectively), with a statistically significant difference between them (p=0.000). Most of the responders were in the age group of 30–44 years (209 (38.49%)), followed by those in the age group of 18–29 years (166 (30.57%)), with a statistically significant difference between all age groups (p=0.000). Most of the pharmacists were community pharmacists (107 (19.74%)), followed by pharmacy supervisors (57 (10.52%)), with a statistically significant difference between all levels of qualification (p=0.000). Most of the responders held Diploma in Pharmacy (202 (37.20%)), followed by Bachelor in Pharmacy (199 (36.65%)), and a Master in Science in Clinical Pharmacy (140 (25.78%)). Most of the pharmacists had a work experience of 6–10 years (140 (34.15%)), followed by 3–5 years (124 (30.24%)), with a statistically significant difference between years of experience (p=0.000). More than two-thirds of the responders were board-certified pharmaceutical specialists (367 (68.21%)), followed by board-certified critical care specialists (220 (40.89%)), board-certified nuclear pharmacists (218 (40.52%)), board-certified ambulatory care specialists (192 (35.69%)), and board-certified nutrition support specialists (187 (34.76%)). Most of the pharmacists practiced in the area of narcotics (61 (11.25%)), clinical pharmacy (59 (10.89%)), and repacking (57 (10.52%)), with statistically significant difference between all sites of pharmacy practice (p=0.000). There was a medium positive correlation between age (years) and years of experience based on Kendall's tau_b (0.414) and Spearman's rho (0.485) values, with statistically significant difference (p<0.001). There was a medium positive correlation between the worksite and current position held based on Kendall's tau_b (0.457) and Spearman's rho (0.610) values, with statistically significant difference (p<0.001) (Tables 1 and 2).

The majority of the responders published an article on their life (346 (63.84%)). Most of the pharmacists (213 (39.23%)) published at least 1–3 and >10 research papers (120 (22/10%)) annually. Most of the responders were the second author (231 (42.94%)) and the first author (210 (39.03%)). Furthermore, most of the pharmacists published research articles about social and behavioral aspects of life (280 (51.66%)), pharmaceutics (271 (50.00%)), and pharmacoeconomics (271 (50.00%)). The majority of the responders published articles such as systematic reviews (313 (58.29%)) and cohort (230 (42.83%)), and they rarely participated in randomized controlled clinical trials (68 (12.66%)) and animal pre-clinical studies (83 (15.46%)). Most of the pharmacists participated in the processes of scientific publication, such as writing a literature review in the Introduction section of the article (309 (57.76%)) and analyzing the data. In addition, they summarized the Results section (305 (57.01%)). On the other hand, they rarely participated in the Correspondence and Communication sub-section (111 (20.75%)), in the interpretation of the results and writing the Discussion section (134 (25.05%)), and in searching and writing References section (139 (25.98%)). The cost of publication to the authors was 0–499 USD and 2500–2999 USD for most responders (136 (25.42%) and 93 (17.38%), respectively) (Tables 3 and 4).

The average score of frequently published types of the article was 3.99, with high scores obtained for the "article published in an international scientific journal" (4.26) and in "local scientific journal (4.22). Next, the lowest scores were obtained for writing a complete Book (3.73) and chapter in the book (3.81), with a statistically significant difference between responses (p=0.000) (Table 5). The average score for the practice of unique elements during scientific publications was 3.81, with high scores obtained for the element "was any of your colleagues was the reviewer" (4.10) and "spelling and grammar checked through special software" (3.95). Furthermore, the lowest scores were obtained for the "journal impact factor" (3.74) and "reliability of the survey" (3.75), with statistically significant differences between responses. Moreover, all elements showed statistically significant differences between responses (p<0.001) (Table 6). Finally, the average score for the type of social media platforms used by the pharmacists to distribute your research article was 3.33, with high scores obtained for WhatsApp (3.73) and YouTube (3.56), and low scores were obtained for Pinterest (2.97) and Facebook (2.98),

Table 1: Demographic, social information.

Locations	Response Count	Response Percent	*p*-value (X2)
Central area	155	28.55%	0.000
North area	115	21.18%	
South area	52	9.58%	
East area	133	24.49%	
West area	88	16.21%	
Answered question	**543**		
Skipped question	**0**		
Site of work	**Response Count**	**Response Percent**	***p*-value (X2)**
Ministry of Health	85	15.65%	0.000
General Medical Directorate in Region	68	12.52%	
MOH government Hospital	97	17.86%	
Non- MOH government Hospital	48	8.84%	
MOH-Primary Care Center	31	5.71%	
Private Hospital	16	2.95%	
Private Primary Care Center	110	20.26%	
Community pharmacy	48	8.84%	
University	27	4.97%	
Pharmaceutical company	8	1.47%	
Non employment	5	0.92%	
Answered question	**543**		
Skipped question	**0**		
Gender	**Response Count**	**Response Percent**	
Male	222	40.88%	0.000
Female	321	59.12%	
Answered question	**543**		
Skipped question	**0**		
Nationality	**Response Count**	**Response Percent**	
Saudi	351	64.64%	0.000
Non-Saudi	192	35.36%	
Answered question	**543**		
Skipped question	**0**		
Age	**Response Count**	**Response Percent**	
18-29	166	30.57%	0.000
30-44	209	38.49%	
45-60	137	25.23%	
> 60	31	5.71%	
Answered question	**543**		
Skipped question	**0**		

Table 2: Demographic, social information.

Pharmacist's Qualifications	Response Count	Response Percent	*p*-value (X2)
Diploma pharmacy	46	8.47%	
BSc. Pharm	199	36.65%	
M.S	91	16.76%	
MSc. Clinical Pharmacy	140	25.78%	
Pharm.D	202	37.20%	
Ph.D	98	18.05%	
MBA	83	15.29%	
Pharmacy Residency Two years (R1)	90	16.57%	
Pharmacy Residency one year (R2)	93	17.13%	
Fellowship	127	23.39%	
Student pharmacist	69	12.71%	
Intern pharmacist	23	4.24%	
Answered question	**543**		
Skipped question	**0**		
Board of Pharmacy Specialties certificate	**Response Count**	**Response Percent**	
Board Certified Ambulatory Care Pharmacist (BCACP)	192	35.69%	
Board Certified Critical Care Pharmacist (BCCCP)	220	40.89%	
Board Certified Nuclear Pharmacist (BCNP)	218	40.52%	
Board Certified Nutrition Support Pharmacist (BCNSP)	187	34.76%	
Board-certified Oncology Pharmacist (BCOP)	39	7.25%	
Board Certified Pediatric Pharmacy Specialist (BCPPS)	58	10.78%	
Board Certified Pharmacotherapy Specialists (BCPS)	71	13.20%	
Board-certified Psychiatric Pharmacist (BCPP)	64	11.90%	
Non	171	31.78%	
Answered question	**538**		
Skipped question	**5**		
Position Held	**Response Count**	**Response Percent**	
General Manager of Pharmaceutical care	13	2.40%	0.000
Manager of Pharmaceutical care at the region	49	9.04%	
Director of Hospital pharmacy	42	7.75%	
Supervisor of pharmacy units	57	10.52%	
Director of Primary care center pharmacy	38	7.01%	
Pharmacy Technicians	51	9.41%	
Lecturer	24	4.43%	
Staff Pharmacist	49	9.04%	

Continued...

Table 2: Cont'd.			
Community Pharmacist	107	19.74%	
Clinical Pharmacist	27	4.98%	
Deputy Director of Pharmacy	49	9.04%	
Manager	26	4.80%	
Pharmaceutical company representative	4	0.74%	
Pharmaceutical company supervisor	1	0.18%	
Non employment	5	0.92%	
Answered question	**542**		
Skipped question	**1**		
Years of experience at Dentists career	**Response Count**	**Response Percent**	
<3	64	15.61%	
3-5	124	30.24%	
6-10	140	34.15%	0.000
11-15	65	15.85%	
> 15	17	4.15%	
Answered question	**410**		
Skipped question	**133**		
Pharmacy practice area	**Response Count**	**Response Percent**	
Inpatient Pharmacy	51	9.41%	
Outpatient Pharmacy	38	7.01%	
Satellite Pharmacy	45	8.30%	
Narcotics	61	11.25%	
Extemporaneous Preparation	28	5.17%	
Clinical Pharmacy	59	10.89%	
Inventory Control	34	6.27%	
Drug Information	4	0.74%	
Emergency pharmacy	39	7.20%	
Medication safety	39	7.20%	0.000
Repacking	57	10.52%	
Pharmacy Education and Training	24	4.43%	
Pharmacy Research	15	2.77%	
Primary care pharmacy	28	5.17%	
Community pharmacy	9	1.66%	
Pharmaceutical company	6	1.11%	
Regulation/Administration	1	0.18%	
Non employment	4	0.74%	
Answered question	**543**		
Skipped question	**0**		

with statistically significant difference between responses. Moreover, all elements showed a statistically significant difference between responses (p<0.001) (Table 7). The scores for the single-test reliability analysis of McDonald's ω was 0.939, Cronbach's alpha was 0.935, Gutmann's λ2 was 0.942, Gutmann's λ6 was 0.976, and Greater Lower Bound was 0.990.

Table 3: Pharmacist authorship of the scientific publications.			
Have you ever published a research paper	**Response Count**	**Response Percent**	***p*-value (X2)**
Yes	346	63.84%	
No	62	11.44%	
I did not publish research before	132	24.35%	0.000
I do not need it	2	0.37%	
Answered question	**542**		
Skipped question	**1**		
How many research papers have you published per year?	**Response Count**	**Response Percent**	
0	82	15.10%	
1-3	213	39.23%	
4-6	85	15.65%	0.000
7-9	43	7.92%	
Ten and more	120	22.10%	
Answered question	**543**		
Skipped question	**0**		
Can you characterize yourself in most of your publications?	**Response Count**	**Response Percent**	
First author	210	39.03%	
Second author	231	42.94%	
Third author	202	37.55%	
Fourth author	158	29.37%	
More than the fourth author	136	25.28%	
Crossponding author	95	17.66%	
Did not publish	8	1.49%	
Answered question	**247**	**538**	
Skipped question	**0**	**5**	
What are the most pharmaceutical sciences to write or publish interested?	**Response Count**	**Response Percent**	
Pharmacoepidemiology and drug safety	226	41.70%	
Pharmacoeconomics	271	50.00%	
Pharmacotherapeutics research	270	49.82%	
Social and behavioral aspects of life	280	51.66%	
Pharmaceutics	271	50.00%	
Pharmacokinetics	181	33.39%	
Pharmacogenomics	195	35.98%	
Medicinal chemistry	233	42.99%	
Pharmacology	246	45.39%	
Pharmacognosy	227	41.88%	
Clinical pharmacy	235	43.36%	
Hospital pharmacy	218	40.22%	
Answered question	**542**		
Skipped question	**1**		

Table 4: Pharmacist participation in the scientific publications.

In which part of the research paper do you most participate?	Response Count	Response Percent	*p*-value (X2)
Meta-analysis	124	23.09%	
Systematic Review	313	58.29%	
Cohort	230	42.83%	
Case series	179	33.33%	
Case control	140	26.07%	
Case report	145	27.00%	
Observational study	118	21.97%	
Randomized controlled trial	68	12.66%	
Letter to the editor	136	25.33%	
General review	171	31.84%	
Clinical practice guidelines	192	35.75%	
Quality improvement study	199	37.06%	
Economic analysis or evaluation	136	25.33%	
Animal pre-clinical study	83	15.46%	
Answered question	**537**		
Skipped question	**6**		
What do most participating in the processes in the pharmacy scientific publications	**Response Count**	**Response Percent**	
Writing the summary or Abstract	169	31.59%	
Writing litterateur review in the introduction	309	57.76%	
Design and writing the Methodology	287	53.64%	
Data analysis and summarize the Results	305	57.01%	
Interpretation of the results and writing the Discussion	134	25.05%	
Searching and writing References	139	25.98%	
Editing and revising the publications	155	28.97%	
Review the vocabulary, grammar, and plagiarism	185	34.58%	
Crossponding and communication with the publisher	111	20.75%	
Answered question	**535**		
Skipped question	**8**		
How much does it cost you to publish one research paper	**Response Count**	**Response Percent**	
0-499 USD	136	25.42%	
500-999	56	10.47%	
1000-1499	49	9.16%	
1500-1999	81	15.14%	
2000-2499	28	5.23%	
2500-2999	93	17.38%	0.000
3000-3499	37	6.92%	
3500-3999	2	0.37%	
4000-4499	29	5.42%	
4500-4999	9	1.68%	
5000 and more	15	2.80%	
Answered question	**535**		
Skipped question	**8**		

Table 5: The Types of publications frequent used for scientific publications.

	76-100 % usage		51-75 %		26-74 %		1-25 %		No		Total	Weighted Average	*p*-value
Article in International Scientific Journal	358	64.39%	88	15.83%	43	7.73%	29	5.22%	38	6.83%	556	4.26	0.000
Article in Local Scientific Journal	357	59.11%	129	21.36%	51	8.44%	29	4.80%	38	6.29%	604	4.22	0.000
Lecture in International Scientific Conference	340	56.29%	122	20.20%	83	13.74%	13	2.15%	46	7.62%	604	4.15	0.000
Lecture in Local Scientific Conference	317	51.38%	97	15.72%	102	16.53%	61	9.89%	40	6.48%	617	3.96	0.000
Chapter in book	304	49.84%	77	12.62%	102	16.72%	62	10.16%	65	10.66%	610	3.81	0.000
Complete Book	269	45.13%	73	12.25%	128	21.48%	75	12.58%	51	8.56%	596	3.73	0.000
Poster in International Scientific Conference	229	42.25%	140	25.83%	73	13.47%	67	12.36%	33	6.09%	542	3.86	0.000
Poster in local Scientific Conference	254	46.78%	119	21.92%	80	14.73%	56	10.31%	34	6.26%	543	3.93	0.000
Answered											**543**		
Skipped											**0**		

Table 6: How frequent used the following particular item during Scientific publications.

	76-100 % usage		51-75 %		26-74 %		1-25 %		No		Total	Weighted Average	*p*-value
Journal impact factor	170	31.31%	188	34.62%	100	18.42%	46	8.47%	39	7.18%	543	3.74	0.000
Plaragrism by special software	179	32.97%	186	34.25%	99	18.23%	41	7.55%	38	7.00%	543	3.79	0.000
Spelling and grammar checker through special software	195	35.91%	211	38.86%	72	13.26%	45	8.29%	20	3.68%	543	3.95	0.000
Your colleagues as reviewer	213	39.23%	246	45.30%	33	6.08%	26	4.79%	25	4.60%	543	4.10	0.000
ORCID number as author or co-author	203	37.52%	217	40.11%	32	5.91%	44	8.13%	45	8.32%	541	3.90	0.000
Reliability of the survey	177	32.60%	202	37.20%	85	15.65%	11	2.03%	68	12.52%	543	3.75	0.000
Validation of the survey	142	26.15%	192	35.36%	76	14.00%	55	10.13%	78	14.36%	543	3.49	0.000
Answered											**543**		
Skipped											**0**		

Table 7: More frequently, you use the type of social media platforms to distribute your scientific publications.

	76-100 % usage		51-75 %		26-74 %		1-25 %		No		Total	Weighted Average	*p*-value
Twitter	77	14.21%	221	40.77%	151	27.86%	21	3.87%	72	13.28%	542	3.39	0.000
LinkedIn	66	12.20%	238	43.99%	146	26.99%	46	8.50%	45	8.32%	541	3.43	0.000
Instagram	94	17.34%	217	40.04%	158	29.15%	23	4.24%	50	9.23%	542	3.52	0.000
Snapchat	94	17.34%	225	41.51%	134	24.72%	34	6.27%	55	10.15%	542	3.50	0.000
YouTube	110	20.30%	205	37.82%	155	28.60%	21	3.87%	51	9.41%	542	3.56	0.000
WhatsApp	151	27.86%	186	34.32%	152	28.04%	16	2.95%	37	6.83%	542	3.73	0.000
Telegram	61	11.25%	242	44.65%	160	29.52%	34	6.27%	45	8.30%	542	3.44	0.000
Line	16	2.95%	210	38.75%	175	32.29%	47	8.67%	94	17.34%	542	3.01	0.000
Facebook	43	7.92%	166	30.57%	181	33.33%	44	8.10%	109	20.07%	543	2.98	0.000
Pinterest	49	9.33%	143	27.24%	164	31.24%	81	15.43%	88	16.76%	525	2.97	0.000
Viber	79	14.82%	153	28.71%	167	31.33%	31	5.82%	103	19.32%	533	3.14	0.000
Answered											**543**		
Skipped											**0**		

Factors affecting the practice of publishing scientific research by pharmacists

Several factors affected the practice of scientific research publications. We adjusted the significant values by using independent samples Kruskal–Wallis test and the Bonferroni correction for multiple tests. The following factors were tested for their effect on pharmacists' practice of scientific publications: location, worksite, gender, age, practice area, current position, and work experience. However, a single factor (i.e., nationality) did not affect the practice of publication, with a non-statistically significant difference (p>0.05). Five locations affected the practice of publication. The Eastern region showed the lowest scores (3.4436), with a statistically significant difference between regions (p=0.000). Non-Saudi nationals showed the lowest score (3.2188), with a statistically significant difference between nationalities (p=0.000). Females scored less than males (3.9254 versus4.2707), with a statistically significant difference between them (p=0.008). Six different age groups affected the practice of publication. Pharmacists in the age group of 65–74 years obtained the lowest score for scientific publications (2.000), followed by those in the age group of >75 years (2.000), with statistically significant difference between all age groups (p=0.000). Fourteen working sites affected the practice of scientific publications, with the lowest score (2.6318) obtained for private primary healthcare centers, with a statistically significant difference between all worksites (p=0.000). Twelve practice areas affected the practice of scientific publication, with the lowest score (2.6502) obtained for the emergency pharmacy and narcotics section (2.6762), with a statistically significant difference between all practice areas (p=0.000). Five levels of work experiences affected the practice of scientific publications by pharmacists. The lowest score (3.5099) was obtained for those with work experience of 6–10 years, with a statistically significant difference between all levels (p=0.000). Fifteen levels of positions held affected the practice of scientific publications made by pharmacists, with the lowest score (2.2696) obtained for those working as a pharmacy technician, followed by director of primary healthcare center (2.4727) and community pharmacy (2.5783), with statistically significant difference between them (p=0.000). Next, multiple regression analysis revealed a weak relationship (R=0.272) with p=0.000) between types of publications and factors affecting them. Five out of eight factors showed non-significant differences (p>0.05). However, three factors showed significant differences. Of the three factors, nationality and years of experience explained 25.4% and 13.5% of the negative relationship, whereas practice area explained 11.9% of the positive relationship to the variation (p=0.000, 0.011, and 0.025, respectively). The bootstrap model confirmed these results. The non-existence of multi-collinearity verified the relationship with the current position factor with Variance Inflation Factor (VIF) of 1.536, 1.397, and 1.381, respectively, which is less than 3 or 5[18-20] (Table 8).

Table 8: Multiple regression of Factors with the Types of publications.[a]

Model		R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
						B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.437 [b]	.191	11.770	.000[b]	6.781	0.524		12.950	0.000	5.752	7.811		
	Locations					−0.119	0.067	−0.085	−1.774	0.077	−0.252	0.013	0.882	1.134
	Sector of work					0.036	0.048	0.049	0.758	0.449	−0.058	0.131	0.489	2.043
	Age (years)					0.028	0.045	0.030	0.613	0.540	−0.061	0.117	0.844	1.186
	Nationality					−1.090	0.240	−0.254	−4.548	0.000	−1.561	−0.619	0.651	1.536
	Sex					−0.346	0.214	−0.080	−1.616	0.107	−0.767	0.075	0.818	1.222
	Practice area					0.055	0.024	0.119	2.250	0.025	0.007	0.103	0.724	1.381
	Current Position					0.029	0.034	0.051	0.871	0.384	−0.037	0.096	0.595	1.681
	Experiences					−0.264	0.104	−0.135	−2.542	0.011	−0.468	−0.060	0.716	1.397

a. Dependent Variable: Pharmacist,s knowledge of reference management software tools, Predictors [b]: (Constant), Location, Site of work, Age (years), Nationality, Pharmacist gender, Practice area, Current Position, and pharmacist experiances

Bootstrap for Coefficients

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
1	(Constant)	6.781	−0.004	0.571	0.001	5.675	8.039
	Locations	−0.119	−0.001	0.068	0.089	−0.254	0.017
	Sector of work	0.036	0.000	0.052	0.486	−0.061	0.144
	Age (years)	0.028	0.001	0.047	0.561	−0.066	0.117
	Nationality	−1.090	0.003	0.217	0.001	−1.506	−0.657
	Sex	−0.346	0.006	0.226	0.130	−0.783	0.130
	Practice area	0.055	0.001	0.027	0.051	0.003	0.111
	Current Position	0.029	−0.001	0.032	0.362	−0.037	0.092
	Experiances	−0.264	−0.005	0.111	0.020	−0.481	−0.051

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Several factors affected the practice of using specific tools of publications. Using the independent samples Kruskal–Wallis test and the Bonferroni correction for multiple tests, we adjusted the significant values. Two factors (i.e., nationality and gender) did not affect the practice of tools of publication (p>0.05). Five locations affected the practice of selected tools of publications by pharmacists. The lowest score (1.8866) was obtained for the central region, with statistically significant differences between regions (p=0.000). Six different age groups affected the use of selected tools of publications with the lowest score (1.000) obtained for the age group of >75 years, with the statistically significant difference between all age groups (p=0.000). Fourteen different worksites affected the use of selected publication tools, with private primary healthcare centers obtaining the lowest score (1.4156), with a statistically significant difference between all worksites (p=0.000). Twelve different practice areas affected the use of selected publication tools by pharmacists, with low scores obtained for emergency pharmacy (1.2894), clinical pharmacy (1.4068), and repacking units (1.6190), with statistically significant difference between them (p=0.000). Five levels of work experience affected the use of selected publication tools by pharmacists. The lowest score (2.1647) was obtained for those with 3–5 years of experience, with a statistically significant difference between all levels (p=0.000). Fifteen positions held by pharmacists affected the use of selected publication tools, with the lowest score (1.2710) obtained for those who worked at a community pharmacy, with a statistically significant difference between all positions (p=0.000). The relationship between the pharmacist practice using particular items during scientific publications and factors affecting it were analyzed via multiple regression analysis. The results showed a weak relationship (R=0.266) with p=0.000) between certain items for scientific publications and factors affecting them. Six out of eight factors showed non-significant differences (p>0.05). However, locations explained 16.4% of the positive relationship, whereas the current position held explained 20.4% of the negative relationship to the variation, with a statistically significant difference between them (p=0.001 and 0.001, respectively). The bootstrap model confirmed this result. Furthermore, the relationship was verified by the non-existence of multi-collinearity with the current position held with a VIF of 1.134 and 1.681, respectively, which is less than 3 or 5[18-20] (Table 9).

Next, we analyzed the factors that affected the pharmacists regarding the distribution of their published articles. Using the independent samples Kruskal–Wallis test and the Bonferroni correction for multiple tests, we adjusted the significant values. Various factors affected the pharmacists' distribution of their scientific publications, including location, worksite, gender, age, practice area, current position held, and years of experience. A single factor (i.e., gender) did not affect the distribution methods with a non-statistically significant difference (p>0.05). However, five different locations affected the practice of distribution methods of scientific

Table 9: Multiple regression of Factors with the particular item during Scientific publications.[a]

Model		R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
						B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.266[b]	.071	3.801	.000[b]	2.352	0.247		9.526	0.000	1.867	2.838		
	Locations					0.102	0.032	0.164	3.199	0.001	0.039	0.164	0.882	1.134
	Sector of work					0.039	0.023	0.120	1.744	0.082	−0.005	0.084	0.489	2.043
	Age (years)					0.041	0.021	0.101	1.917	0.056	−0.001	0.083	0.844	1.186
	Nationality					−0.212	0.113	−0.112	−1.872	0.062	−0.434	0.011	0.651	1.536
	Sex					−0.058	0.101	−0.031	−0.576	0.565	−0.257	0.140	0.818	1.222
	Practice area					−0.003	0.011	−0.017	−0.294	0.769	−0.026	0.019	0.724	1.381
	Current Position					−0.052	0.016	−0.204	−3.258	0.001	−0.083	−0.021	0.595	1.681
	Experiences					0.079	0.049	0.092	1.611	0.108	−0.017	0.175	0.716	1.397

a. Dependent Variable: Pharmacist,s practice of particular item during Scientific publications, Predictors [b]: (Constant), Location, Site of work, Age (years), Nationality, Pharmacist gender, Practice area, Current Position, and pharmacist experiances

Bootstrap for Coefficients

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
1	(Constant)	2.352	−0.007	0.236	0.001	1.905	2.850
	Locations	0.102	0.002	0.037	0.009	0.033	0.177
	Sector of work	0.039	0.000	0.025	0.117	−0.011	0.089
	Age (years)	0.041	0.002	0.021	0.051	0.001	0.085
	Nationality	−0.212	−0.004	0.098	0.033	−0.413	−0.023
	Sex	−0.058	0.001	0.111	0.576	−0.268	0.158
	Practice area	−0.003	0.000	0.013	0.797	−0.030	0.021
	Current Position	−0.052	5.256E−05	0.016	0.002	−0.083	−0.019
	Experiances	0.079	−6.674E−05	0.060	0.187	−0.039	0.196

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

publications. The central region showed the lowest scores (4.7286), with a statistically significant difference between all regions (p=0.000). Non-Saudi nationals obtained a lower score (5.1689) than that of Saudi nationals, with a statistically significant difference between nationalities (p=0.003). Six age groups affect the distribution methods of scientific publications with the lowest scores obtained for those in the age group of 65–74 years (2.1667), with a statistically significant difference between them (p=0.000). In terms of the worksite, 14 private primary healthcare centers (4.2157) obtained the lowest scores, followed by the non-MOH governmental hospitals (4.2481), with statistically significant differences between all worksites (p=0.000). In terms of practice areas, 12 practice areas affected the distribution methods of scientific publications, with the lowest score obtained for emergency pharmacy (4.1562), followed by repacking (4.3711) and clinical pharmacy units (4.4838), with a statistically significant difference between them (p=0.000). Five levels of work experience affected the distribution methods of scientific publications by pharmacists, with the lowest score (4.8070) obtained for those with a work experience of 11–15 years, with a statistically significant difference between all levels (p=0.000). In terms of the position held, 15 positions affected the distribution methods of scientific publications by pharmacists, with the deputy director of pharmacy (4.0946) showing the lowest scores, followed by the community pharmacy (4.2931). There were statistically significant differences between them (p=0.000). A multiple regression analysis revealed the relationship between the practice of a type of social media platforms used to distribute their publications and factors affecting it. In this analysis, the variety of social media platforms used to distribute articles was the dependent variable, and factors affecting it were considered the expletory variable. According to the results, there was a weak relationship (R=0.307 with p=0.000) between the particular items of scientific publications and the factors affecting them. Four out of eight factors showed non-significant differences (p>0.05). However, four factors (i.e., location, nationality, gender, and years of experience) explained 11.5% of the positive relationship, 17% of the positive relationship, 18.6% of the negative relationship, and 20.2% of the negative relationship with a statistically significant difference (p=0.023, 0.004, 0.000, and 0.000, respectively) through multiple regression model and confirmed by Bootstrap model. The non-existence of multi-collinearity verified the relationship with the current position factor with VIF values of 1.134, 1.536, 1.222, and 1.397, respectively, which is less than 3 or 5[18-20] (Table 10).

DISCUSSION

The pharmacist practice of scientific publications reflected their background knowledge.[8] All pharmacists publish a number of articles annually.[3,21] The pharmacists showed a positive attitude toward authorship during publications, and each pharmacist had a specific role during academic writing and publications. Exploring this information will lead to a unique plan for pharmacists in their practice of scientific

Table 10: Multiple regression of Factors with the type of social media platforms used for publications distribution.

Model		R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
						B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	307[b]	.095	5.220	.000[b]	6.249	0.371		16.853	0.000	5.520	6.978		
	Locations					0.108	0.048	0.115	2.274	0.023	0.015	0.202	0.882	1.134
	Sector of work					0.012	0.034	0.025	0.367	0.713	−0.054	0.079	0.489	2.043
	Age (years)					−0.016	0.032	−0.026	−0.507	0.613	−0.079	0.047	0.844	1.186
	Nationality					0.489	0.170	0.170	2.882	0.004	0.155	0.823	0.651	1.536
	Sex					−0.537	0.152	−0.186	−3.543	0.000	−0.835	−0.239	0.818	1.222
	Practice area					0.002	0.017	0.006	0.103	0.918	−0.032	0.036	0.724	1.381
	Current Position					−0.034	0.024	−0.087	−1.415	0.158	−0.081	0.013	0.595	1.681
	Experiences					−0.265	0.074	−0.202	−3.600	0.000	−0.409	−0.120	0.716	1.397

a. Dependent Variable: Pharmacist,s practice of type of social media platforms for publications distributiona, Predictors [b]: (Constant), Location, Site of work, Age (years), Nationality, Pharmacist gender, Practice area, Current Position, and pharmacist experiances

Bootstrap for Coefficients

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
1	(Constant)	6.249	0.008	0.342	0.001	5.580	6.929
	Locations	0.108	−0.004	0.059	0.065	−0.006	0.228
	Sector of work	0.012	0.000	0.043	0.774	−0.069	0.100
	Age (years)	−0.016	0.002	0.034	0.630	−0.081	0.052
	Nationality	0.489	0.007	0.165	0.004	0.183	0.813
	Sex	−0.537	−0.010	0.176	0.003	−0.900	−0.211
	Practice area	0.002	0.001	0.022	0.941	−0.040	0.047
	Current Position	−0.034	0.000	0.028	0.247	−0.089	0.020
	Experiances	−0.265	−0.001	0.093	0.006	−0.442	−0.073

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

publications. Therefore, this study examined the elements of practice through a self-administered electronic survey. It is a validated and high-reliability survey. The questionnaire was distributed locally to pharmacists of different age groups, nationalities, gender, occupational status, and worksites. The responders were selected through a convenient sampling system with a calculated number of subjects based on international guidelines. More than 500 individuals responded to the questionnaire; of them, 60 had published an article at least once in their lifetime, which is a good number. One-third of the responders published at least 1–3 articles annually, which agrees with the results of previous studies.[21] Of those responders, more than one-third were third or second, and the first position during publications, reflecting their role in the publications or being responsible or original research. Almost half of the responders published an article about social science, pharmaceutics, or pharmacoeconomics, which can be done quite fast compared to other types of articles. In addition, the types mentioned above of articles are easy to type the document for publication. During pharmacy school, those topics are easy to research study and not tricky for publications. Most of the responders participated in writing a systemic review, cohort, and observational studies, which is not expensive for publication. However, they had to undergo the process of data collection, analysis, writing, and presenting the data in academic writing. Many of the responders had to work in order to obtain the skills mentioned earlier.

On the contrary, the responders rarely published randomized clinical trials or animal studies because they were costly compared to observational studies. More than half of the responders participated in writing a literature review or analyzed the data for publication, which is not so difficult for the young researchers and students. However, most pharmacists felt that the challenging part of a publication is the corresponding author section, interpretation of the results, and writing the discussion part. Very few pharmacists wrote citations, which requires more experience and writing skills. The average score of pharmacists practicing the type of publications was good, which shows that they published articles in international or local journals. Most pharmacists wish to publish an article in an international journal as they are more popular than a local journal and wish to participate in international conferences, which agrees with the results of a previous study.[22]

In this study, most pharmacists did not participate in writing book chapters and book publication-related work, which is less than what was reported by a previous study.[23] This result might be because book publication requires more time to work on. Moreover, it is not easy to publish with various regulations. Therefore, most pharmacists referred to and cited journal articles than books or book chapters. In addition, the majority of the pharmacists rarely read and referred to books or book chapters. In this study, the average score for practicing some unique items during scientific publications was acceptable, emphasizing their colleague as the reviewer in the journal or spelling and grammar checking through a particular software program. Usually, most research asks their colleagues or friends to review the research to correct any mistakes for good publications. Moreover, many software programs are used for checking spelling and grammar issues, especially for Arabic-speaking authors. Furthermore, most of the responders did not take the journal impact factor or reliability survey test seriously. The impact factor of journals was found to have some defects and inappropriate tool measurements.[24-28] Therefore, the results of reliability tests need to be confirmed by a biostatistician. In addition, pharmacists who have good education and training in biostatistics can do those tests.

Limitations

Although this study had several advantages, such as good sample size and a high-reliability score, it had limitations. First, the responders were from different locations, age levels, gender, practice site, and years of experience. Therefore, we recommend that future research should be conducted with equal or the same demographic information.

CONCLUSION

The practice of publishing scientific research was found to be acceptable in the Kingdom of Saudi Arabia. However, some factors negatively affected the practice, such as the old age of pharmacists, the high level of work experience, and higher position. However, some factors did not affect the practice of publishing articles, such as geographic location, gender, and practice area. Therefore, key performance indicators of scientific publications are suggested to improve the outcome of publication in scientific research in Saudi Arabia.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

Funding

None

Consent for Publications

Informed consent was obtained from all the participants

Ethical Approval

This research is exempted from research and ethical committee or an institutional review board (IRB) approval.
https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html

ABBREVIATIONS

MOH: Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **SPSS:** Statistical package of social sciences; **JASP:** Jeffery's Amazing Statistics Program; **STROBE:** Strengthening the reporting of observational studies in epidemiology; **ADR:** Adverse Drug Reaction.

ORCID ID

Yousef Ahmed Alomi https://orcid.org/0000-0003-1381-628X

REFERENCES

1. Journal IC of M. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. International Committee of Medical Journal. 2019.
2. Liumbruno GM, Velati C, Pasqualetti P, Franchini M. How to write a scientific manuscript for publication. Blood Transfus. 2013;11(2):217–26.
3. IMS Health. Advancing Academic Research. IMS Inst Healthc Informatics. 2015;1–20.
4. Awad Al-Mutairi K, Abdo Al-Shami S. Scientific Research in Saudi Universities: Science Thrives in the Desert. 2015;4(3):85–90.
5. Alshayea A. Scientific Research in the Kingdom of Saudi Arabia: Potential for Excellence and Indicators of Underdevelopment. High Educ Stud. 2013;3(5):47–51.
6. Zaki NW, Sidiq M, Qasim M, Aranas B, Hakamy A, Ruwais N, *et al.* Stress and psychological consequences of COVID-19 on healthcare workers. J Nat Sci Med [Internet]. 2020;3:299. Available from: https://link.gale.com/apps/doc/A637713628/AONE?u=tou&sid=AONE&xid=4b620aea
7. Alhaider I, Mueen Ahmed KK, Gupta BM. Pharmaceutical research in the Kingdom of Saudi Arabia: A scientometric analysis during 2001-2010 [Internet]. Vol. 23, Saudi Pharmaceutical Journal. 2015. p. 215–22. Available from: http://dx.doi.org/10.1016/j.jsps.2013.07.008
8. Evuarherhe O, Gattrell W, White R, Winchester CC. Professional medical writing support and the quality, ethics, and timeliness of clinical trial reporting: A systematic review. bioRxiv. 2018;7:1–8.
9. Alomi YA, Alghamdi SJ, Alattyh RA. National Survey of Drug Information Centers Practice: Research and Publication System at Ministry of Health Hospitals in Saudi Arabia. Adv Medical, Dent Heal Sci. 2018;1(1):12–5.

10. Hussain M, Rehman R, Baig M. Manuscript Writing and Publication Workshop: An Invoking Pilot Study on Enhancing Cognitive Research Capabilities in Health Sciences Institutes of Pakistan. Cureus. 2020;12(6).
11. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Vol. 35, Indian Journal of Psychological Medicine. 2013. p. 121–6.
12. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterol Hepatol from Bed to Bench. 2013;6(1):14–7.
13. G.Ezhumalai. How big a sample do I need require. Ann SBV. 2017;6(1):39–41.
14. Johnson TP, Wislar JS. Response rates and nonresponse errors in surveys [Internet]. Vol. 307, JAMA - Journal of the American Medical Association. 2012. p. 1805–6. Available from: http://www.aapor.org/Standard_Definitions2.htm.
15. Erik Von Elm, Douglas G. Altman, Matthias Egger, Stuart J. Pocock, Peter C. Gøtzsche JPV. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for Reporting Observational Studies. PLoS Med [Internet]. 2007;4(10):1623–7. Available from: http://www.epidem.com/
16. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies [Internet]. Vol. 370, www.thelancet.com. 2007. Available from: www.plosmedicine.org
17. Langan SM, Schmidt SA, Wing K, Ehrenstein V, Nicholls SG, Filion KB, *et al*. The reporting of studies conducted using observational routinely collected health data statement for pharmacoepidemiology (RECORD-PE). BMJ. 2018;363:1–19.
18. Liao D, Valliant R. Variance inflation factors in the analysis of complex survey data. Surv Methodol. 2012;38(1):53–62.
19. Akinwande MO, Dikko HG, Samson A. Variance Inflation Factor: As a Condition for the Inclusion of Suppressor Variable(s) in Regression Analysis. Open J Stat. 2015;05(07):754–67.
20. Thompson CG, Kim RS, Aloe AM, Becker BJ. Extracting the Variance Inflation Factor and Other Multi-collinearity Diagnostics from Typical Regression Results. Basic Appl Soc Psych. 2017;39(2):81–90.
21. Awaisu A, Bakdach D, Elajez RH, Zaidan M. Hospital pharmacists' self-evaluation of their competence and confidence in conducting pharmacy practice research. Saudi Pharm J. 2015;23(3):257–65.
22. Shafeeq H, Hammond DA, Swanson JM, Li C, Devlin JW. Critical care PGY-2 graduate perceptions and practices regarding residency project publication. Am J Pharm Educ. 2019;83(2):197–204.
23. S SS, Kumar BTS. Awareness of Open Access Scholarly Publications among Science Faculty members in selected Universities of Karnataka State. 2018 (August).
24. International Committee of Medical [journal]. Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals [internet]. International Committee of Medical [journal. p. 2019]. Available from: http://www.icmje.org/icmje-recommendations.pdf.
25. Seglen PO. Why the impact factor of journals should not be used for evaluating research. Br Med J. 1997;314(7079):498-502.
26. Kumar A. Is "Impact" the "Factor" that matters…? (Part I) J Indian Soc Periodontol. 2018;22(2):95-6. doi: 10.4103/jisp.jisp_195_18, PMID 29769760.
27. Campbell P. Escape from the impact factor. Ethics Sci Environ Polit. 2008;8(1):5-7. doi: 10.3354/esep00078.
28. Hecht F, Hecht BK, Sandberg AA. The journal "impact factor": a misnamed, misleading, misused measure. Cancer Genet Cytogenet. 1998;104(2):77-81. doi: 10.1016/s0165-4608(97)00459-7, PMID 9666797.