



Perceived attitudes and barriers towards medical research: a survey of Jordanian interns, residents, and other postgraduates

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Purpose: We investigated research barriers among Jordanian medical postgraduates to understand the current context of the local health research landscape and improve scholarly output.

Methods: Using a validated questionnaire, Jordanian interns, residents, specialists, and consultants were examined for their perceived attitudes and barriers towards research. Participants were conveniently sampled from public, university, military, and private institutions. Differences in responses were examined using the Student t-test and analysis of variance. Binary logistic regression was utilized to examine predictors of being able to publish.

Results: A total of 1,141 Jordanian medical postgraduates were recruited, of which 61.3% were junior postgraduates (i.e., interns and residents in their first 2 years of residency) while 38.7% were senior postgraduates (i.e., senior residents, specialists, and consultants). Around 76.0% of participants had no peer-reviewed publications. Of those with least one publication (n=273), only 31.1% had first authorships. Participants portrayed dominantly positive attitudes towards the importance of research. There were no significant differences between junior and senior postgraduates for overall attitudes (p=0.486) and knowledge barriers scores (p=0.0261). Conversely, senior postgraduates demonstrated higher mean organizational barriers (p<0.001). Seniority (odds ratio [OR], 5.268; 95% confidence interval [CI], 3.341–8.307), age (OR, 1.087; 95% CI, 1.019–1.159), academic standing (OR, 1.730; 95% CI, 1.103–2.715), and confidence (OR, 1.086; 95% CI, 1.009–1.169) were positive predictors of publication in peer reviewed journals.

Conclusion: The Jordanian medical research landscape is riddled with all forms of different barriers. The reworking of current and integration of new research training programs are of utmost importance.

Key Words: Research barriers, Jordan, Postgraduates, Medical education, Attitudes, Perceptions

Introduction

Medical research in the recent decades has been laying the understructure for new innovations in clinical practice

and patient care through evidence-based medicine [1]. It greatly contributes to the advancement of medicine through developing a deeper understanding of various diseases which ultimately helps in the detection, diagnosis, treatment, and prevention of these diseases, leading to

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improved patient care [2]. In addition to its value within education, medical research enhances the development of skills pertaining to critical thinking and critical appraisal [3]. It has also been shown that early research exposure is associated with continued academic work in later stages of the medical profession [4]. Therefore, medical research is perceived by many to have a vital role in any residency program and has been regarded as a cornerstone skill for modern clinicians [5].

Owning to the vital role of research, obstacles on numerous levels may precipitate as critical setbacks in the advancing of medical practice and development of high-quality care [6]. The body of literature identified a plethora of research barriers across both undergraduate and postgraduate levels including lack of dedicated time allocated for research, lack of financial support, absent mentorship, and lack of knowledge and confidence [7–10]. The lack of training in basic research skills also constructed a barrier as it is associated with the development of positive attitudes towards scholarly activities [11]. Nonetheless, despite the aforementioned hurdles, healthcare professionals' attitudes towards research are generally positive [1].

In contrast with the wealth of studies dissecting research barriers among Western practitioners, there is a dearth of studies trying to identify research barriers among Jordanian postgraduates and healthcare workers. Therefore, this study aims to investigate research barriers among Jordanian medical postgraduates as means to understand the current context of the local health research landscape and to improve scholarly output.

Methods

1. Setting, sampling, and design

We conducted this cross-sectional investigation of

research barriers among medical postgraduates as an extension to our work targeting medical undergraduates [12]. We attempted to recruit Jordanian medical postgraduates from October 2021 to March 2022. Per the latest Jordanian Medical Association statistics, a total of 42,364 doctors are registered across Jordan, of which 21.9% are females and 78.1% are male. Jordanian postgraduates are stationed in either university, public, military, or private hospitals. Medical postgraduates included interns, residents, specialists, and consultants. Participants were stratified per seniority in which interns and residents within their first 2 years of residency were considered junior postgraduates, while residents in their final 2 years of residency, specialists, and consultants were considered senior postgraduates. We classified our sample into junior and senior postgraduates based on the following rationale: Junior postgraduates are primarily tasked with clinical duties which prepares and polishes their abilities to conduct independent patient care. Research interest among them is derived from personal interest rather than an academic requirement at their stage of clinical training. Conversely, senior postgraduates are mandated by their institutions to either publish as a requirement for training completion (in the case of senior residents) or to attain or sustain academic promotions (in the case of specialists/consultants).

The study utilized an online, self-administered questionnaire that was developed and distributed using Google Forms (Google LLC, Mountain View, USA). Participants were approached to join the study through their official social media groups or encrypted institutional-based WhatsApp groups. To maximize reach and optimize the recruitment process, heads of departments at Jordan's public, university, military, and private institutions distributed the questionnaire to their supervised medical personnel. Participants who were designated as one of the aforementioned postgraduate categories, gave an informed

consent to participate, and completed at least 80% of the questionnaire were included in the study.

The estimated sample size was calculated using G*Power ver. 3.1 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany; <http://www.gpower.hhu.de/>) and EpiInfo (Centers for Disease Control and Prevention, Atlanta, USA). At a power of 95%, an α margin of error of 5%, and an effect size of 30%, a minimum sample of 652 participants was needed to demonstrate statistical differences of appropriate power. Using an allocation ratio of 2-to-1, the minimum number of participants yielded 217 senior and 435 junior postgraduates. Convenience and snowball sampling were used to reach required sample size.

2. Data collection instrument

We have utilized a previously validated questionnaire comprised of four domains [12]. These domains include (1) demographics, (2) research background, (3) attitudes, and (4) barriers to research. Items comprising the attitudes and barriers domains were scored on a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). The Cronbach α values for the questionnaire's domains were 0.815 for the attitudes' domain, 0.773 for the knowledge barriers domain, 0.852 for the organizational barriers' domain, and 0.737 for the miscellaneous barriers' domain. The overall Cronbach α for all barriers domains was 0.860.

3. Statistical analysis

All collected data was cleaned, coded, and analyzed on IBM SPSS ver. 23.0 (IBM Corp., Armonk, USA). Categorical variables (e.g., gender) were presented as frequencies (number [%]), while continuous variables (e.g., age) were presented as means \pm standard deviations. Items comprising the attitudes and barriers domains were presented as the means of their 5-point Likert scale responses. A categorical presentation of the item's

responses is provided as supplementary material (Supplement 1). Mean differences in responses and domain scores were examined using the Student *t*-test and analysis of variance (ANOVA). Total attitudes and barriers scores were determined by calculating the average mean of all items constituting said domains and compared between categories using the aforementioned statistical tests. A binary logistic regression model was devised to examine predictors of being able to publish.

Multiple correction for multiple *t*-tests was conducted using the Holm-Bonferroni sequential method, while ANOVA testing was corrected for using the Bonferroni post-hoc method. Correction for regression analysis was not conducted as it was an exploratory analysis of controlled predictors. Also, the conservative nature of correction reduces type I errors on the expense of increasing type II errors. All statistical tests are conducted with a 95% confidence interval and a 5% error margin. A *p*-value of less than 0.05 is considered statistically significant.

The study's protocol was approved by the Mutah University Institutional Review Board (Ref # 311221). Consent was required prior to study participation. Participants were informed that they will not be compensated for their completion of the questionnaire.

Results

1. Characteristics of recruited sample

A total of 1,141 Jordanian medical postgraduates were recruited in this study with a male-to-female ratio of 1.1-to-1. About 61.3% of participants were junior postgraduates while 38.7% were senior postgraduates. Participants were recruited from university hospitals (69.1%), ministry of health (15.2%), private institutions (11.3%), and military hospitals (4.5%). The greater

majority of participants had no peer-reviewed publications (76.1%) and were not currently working on a research project (54.3%). Of those who had at least one publication (n=273; one publication, n=139; two publications, n=63; ≥three publications, n=71), only 31.1% had first authorships. Number of publications, first author publications, and willingness to pursue academia were significantly associated with seniority (all p<0.001). Table 1 demonstrates the characteristics of included participants.

2. Attitudes towards research

Overall, all included participants portrayed dominantly positive attitudes towards the importance of research. Most participants perceive research as an important tool for promoting sound reasoning (83.3%), a vital component in the pursuit of clinical fellowships (80.5%), and a facilitator of better health services and patient care (79.9%). Only 47.3% perceive research as a source of stress during clinical work, which was reported significantly greater among junior postgraduates (p<0.001). A total of

Table 1. Characteristics and Research Background of Included Participants

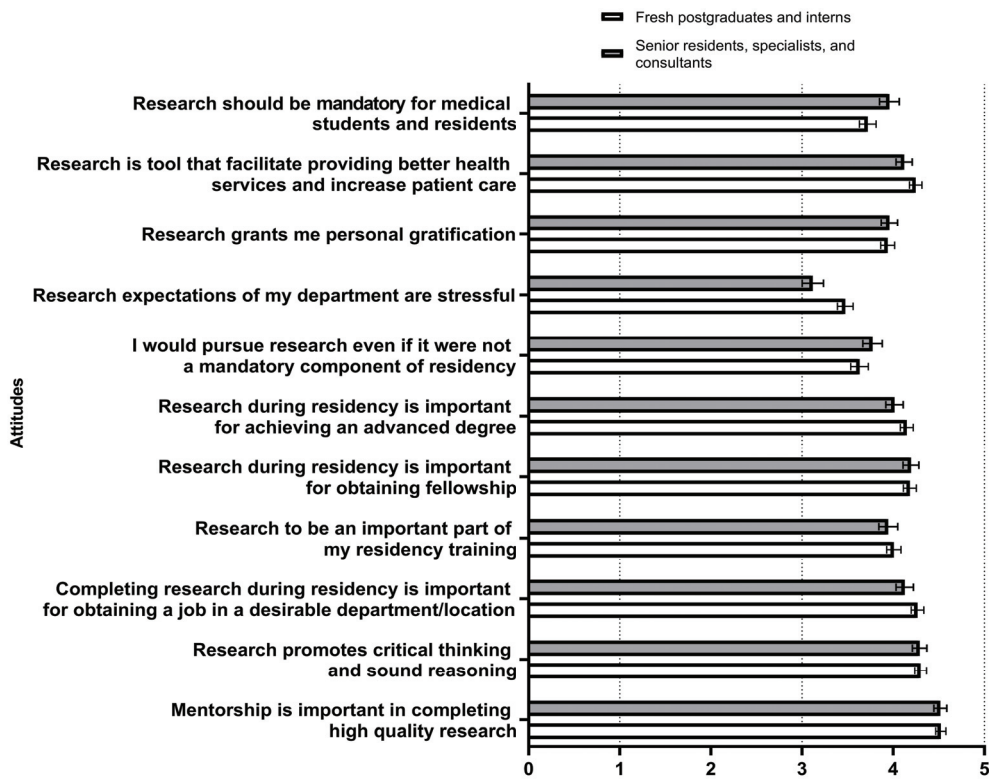
Characteristic	Total	Fresh graduates and interns	Senior residents, specialists, and consultants	χ^2 (df)	p-value
No. of participants	1,141	700	441		
Gender				15.721 (1)	<0.001***
Male	605 (52.9)	338 (48.3)	266 (60.3)		
Female	537 (47.1)	362 (51.7)	175 (39.7)		
Grade point average				19.672 (2)	<0.001***
Excellent	255 (22.3)	181 (25.9)	74 (16.8)		
Very good	627 (55.0)	410 (58.6)	217 (49.2)		
Good or below	202 (17.7)	104 (14.9)	98 (22.2)		
Unreported ^{a)}	57 (5.0)	5 (0.7)	52 (11.8)		
Marital status				177.349 (1)	<0.001***
Single	996 (87.3)	684 (97.7)	312 (70.7)		
Married	145 (12.7)	16 (2.3)	129 (29.3)		
No. of peer reviewed publications				141.991 (3)	<0.001***
0	868 (76.1)	614 (87.8)	254 (57.6)		
1–5	241 (21.1)	82 (11.7)	159 (36.1)		
6–10	18 (1.8)	4 (0.6)	14 (3.2)		
>10	14 (1.2)	0 (0.0)	14 (3.2)		
Currently working on a research project				38.363 (1)	<0.001***
No	619 (54.3)	329 (47.0)	290 (65.8)		
Yes	522 (45.7)	371 (53.0)	151 (34.2)		
Previous research training				1.875 (1)	0.18
No	610 (53.5)	363 (51.9)	247 (56.0)		
Yes	531 (46.5)	337 (48.1)	194 (44.0)		
Publications as first author				55.402 (1)	<0.001***
No	1,056 (92.6)	680 (97.1)	376 (85.3)		
Yes	85 (7.4)	20 (2.9)	65 (14.7)		
Willingness to pursue academia				17.548 (1)	<0.001***
No	476 (41.7)	326 (46.6)	150 (34.0)		
Yes	665 (58.3)	374 (53.4)	291 (66.0)		

Data are presented as number or number (%).

df: Degrees of freedom.

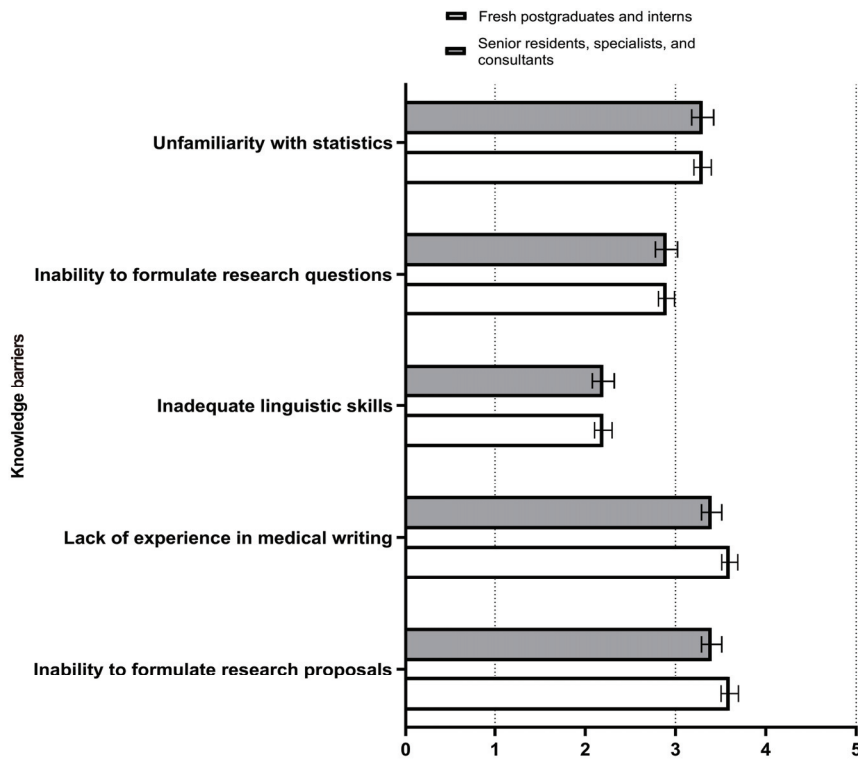
***p<0.001. ^{a)}Marked categories denoting unreported data were not included in the chi-square analysis.

Fig. 1. Participants Attitudes Towards Research



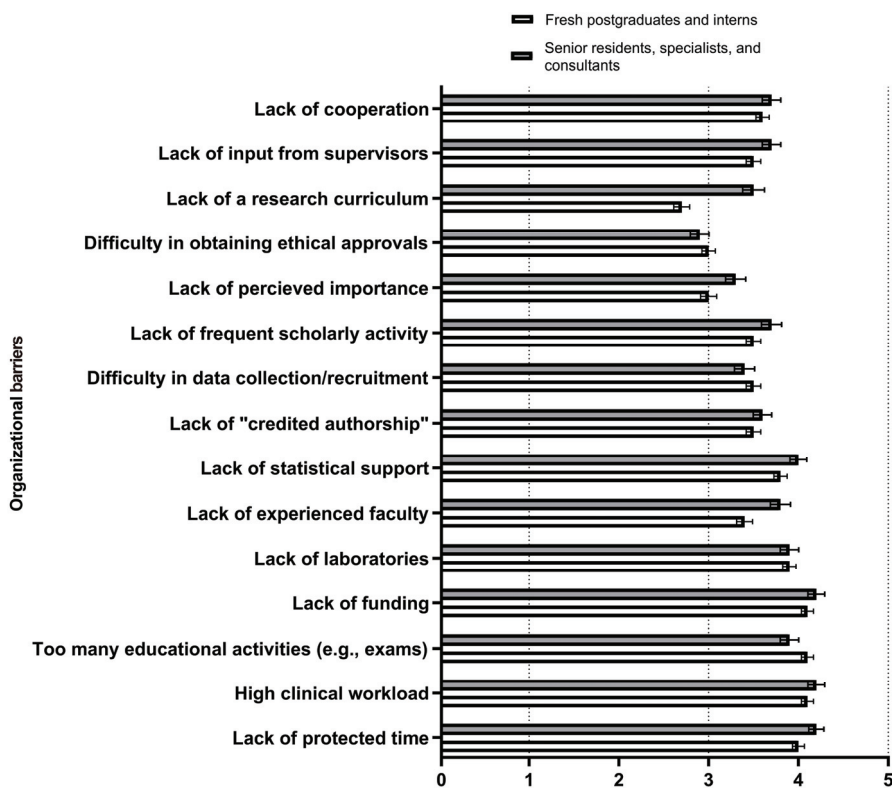
Bars denotes the item's mean while error bars represent confidence intervals of means.

Fig. 2. Participants Perceived Knowledge Barriers



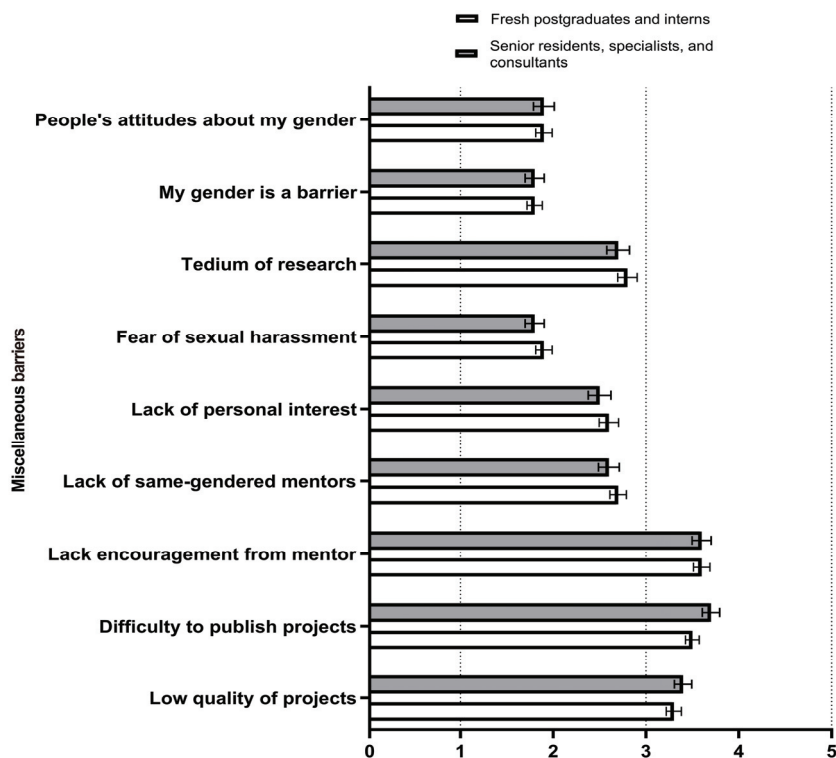
Bars denotes the item's mean while error bars represent confidence intervals of means.

Fig. 3. Participants Perceived Organizational Barriers



Bars denotes the item's mean while error bars represent confidence intervals of means.

Fig. 4. Participants Perceived Miscellaneous Barriers



Bars denotes the item's mean while error bars represent confidence intervals of means.

64.2% believe that research activities should be mandatory during clinical training; a notion that was significantly more supported by senior postgraduates ($p=0.018$).

Fig. 1 demonstrates that attitudes of postgraduates towards research. Figs. 2, 3, and 4 demonstrate the perceived knowledge, organizational, and miscellaneous barriers among included postgraduates.

3. Failure of support & scarcity of resources

Among our participants, 46.6% were unfamiliar with statistical principles. In turn, 62.7% of participants believed that their institutions failed to provide adequate statistical support. Moreover, lack of funding for scholarly activities and lack of laboratories and other research facilities were noted as major hindrances to conducting medical research by 74.4% and 63.7% of participants, respectively. Senior postgraduates were significantly more appreciative of these resource limitations such as lack of funding ($p=0.002$) and lack of laboratory facilities ($p<0.001$).

4. Lack of proper research infrastructure

More than half of the included participants believed that there is a lack of both experienced faculty members (53.2%) and scholarly activity (52.1%) within their respective institutions. Moreover, the greater majority of participants agreed that research is not perceived as important within their institutions (36.9%) neither do exist any research-oriented curriculums (29.1%). Compared to their junior counterparts, senior postgraduates were significantly more likely to perceive lack of experienced faculty members ($p<0.001$), lack of departmental scholarly activity ($p=0.012$), and lack of a research curriculum ($p<0.001$).

5. Lack of proper student–mentor relationships

Across the included sample, 54.2% believed that there is a significant lack of input from their research supervisors. Moreover, 55.0% of postgraduates indicated that they do not receive encouragement from their mentors. However, only 22.4% reported difficulty in finding same–gender research mentors. Finally, postgraduates complained of the lack of credited authorships when participating in research (54.2%). Interestingly, junior postgraduates were more likely to appreciate lack of mentor encouragement ($p=0.028$), while their senior counterparts were more likely to report lack of credited authorship ($p<0.001$) and input from mentors ($p=0.048$).

6. Failure of the current research curriculums

In addition to unfamiliarity with statistics, medical postgraduates reported lack of experience with formulating research methodologies (56.0%), writing research manuscripts (57.4%), and identifying appropriate research topics or formulating research questions (33.7%). The inability to formulate methodologies or manuscripts were significantly more reported by junior postgraduates ($p=0.041$ and $p=0.035$, respectively).

7. Institutional barriers

Lack of protected research time (74.3%), high clinical workload (76.1%), and congested educational workload (e.g., exams and clerkships) (73.0%) were the most commonly reported institutional barriers among postgraduates. The latter was significantly more reported by senior postgraduates ($p<0.001$). Additionally, postgraduates indicated that there is significant difficulty in performing data collection or recruiting participants within their respective institutions' medical systems (51.2%). Moreover, 54.0% noted that there is a lack of

cooperation from healthcare authorities and staff when it comes to conducting research; a phenomenon significantly more appreciated by senior postgraduates ($p=0.030$). Finally, only 27.5% reported on ethical approval difficulties.

8. Factors associated with attitudes and perceived barriers

There were no significant differences between junior and senior postgraduates for overall attitudes ($p=0.486$), knowledge ($p=0.0261$), and miscellaneous scores ($p=0.882$). Conversely, senior postgraduates demonstrated higher mean organizational barriers ($p<0.001$) and total barriers scores ($p=0.035$). Knowledge, organizational, and total barriers scores were significantly different among different institutions ($p=0.002$, $p<0.001$, and $p<0.001$, respectively). Post-hoc analysis demonstrated that participants from the ministry of health perceived significantly higher knowledge, organizational, and total barriers scores than their university hospital counterparts ($p=0.001$, $p<0.001$, and $p<0.001$, respectively). Participants who had a history of peer-reviewed publications, were currently working on a research project, or had previous extra-curricular research training demonstrated more positive attitudes ($p=0.009$, $p<0.001$, and $p<0.001$, respectively), less perceived knowledge barriers (all $p<0.001$), miscellaneous ($p=0.032$, $p=0.014$, and $p=0.016$, respectively), and total barriers scores (all $p<0.001$). Factors affecting total attitudes and barriers scores are demonstrated in the supplementary material (Supplement 2).

On multivariate binary logistic regression, senior postgraduates (odds ratio [OR], 5.268; 95% confidence interval [CI], 3.341–8.307; $p<0.001$), age (OR, 1.087; 95% CI, 1.019–1.159; $p=0.011$), grade point average (GPA) (OR, 1.730; 95% CI, 1.103–2.715; $p=0.017$), and confidence (OR, 1.086; 95% CI, 1.009–1.169; $p=0.028$) were positive predictors of publication in peer reviewed journals (Supple-

ment 3). In addition, conducting retrospective (OR, 1.745; 95% CI, 1.152–2.645; $p=0.009$), cross-sectional (OR, 2.749; 95% CI, 1.938–3.900; $p<0.001$), basic science studies (OR, 1.980; 95% CI, 1.077–3.642; $p=0.028$), and systematic reviews (OR, 1.945; 95% CI, 1.107–3.415; $p=0.021$) were positive predictors of publication. On the other hand, knowledge barriers score was the only significant negative predictor (OR, 0.917; 95% CI, 0.875–0.960; $p<0.001$).

Discussion

1. Summary of findings

In summary, Jordanian postgraduates demonstrate positive attitudes towards research. Identified research barriers included lack of protected research time, lack of funding, lack of statistical support, and the inability to design studies. Perceived research barriers varied among seniors and junior postgraduates. Compared to their junior counterparts, senior postgraduates were more appreciative of resource-centered barriers. Moreover, they were more likely to recognize the poor academic infrastructure within Jordanian medical institutions as a major barrier to conducting research. Conversely, junior postgraduates were more likely to suffer research hurdles stemming from their high clinical and educational workloads. Research productivity was significantly associated with seniority, academic status, perceived confidence, and conducting certain types of research designs. Our findings are reiterated in both Arab and Western literature [13–15]. Similarities between results could be attributed to the global standardized model of residency programs and medical educational system, while lack of conformity could be attributed to systematic and cultural differences as there is a greater emphasis on clinical than academic skills in developing nations [13].

2. Attitudes towards research

In general, Jordanian medical postgraduates demonstrated positive attitudes towards the value, benefits, and implications of research. This is analogous to the attitudes of medical undergraduates in Jordan as well as in other parts of the world [12]. There is a universal consensus over the role of scholarly activity in improving patient care, health outcomes, and patient satisfaction through the promoting critical thinking, expanding the frontiers of evidence based medical practice and addressing of its gaps [12,13,16,17]. Owing to the exceptionally competitive nature of residency programs and fellowship opportunities as well as the substantial amount of weight placed on research experience prior to the acceptance process, there is a huge demand on postgraduates to engage in research. Although in varying degrees, this behavior has been widely reported by numerous specialties and countries [13].

3. Barriers towards research

Lack of protected research time, influenced by high clinical workloads and educational activities (e.g., exams) was the most pronounced organizational barrier among postgraduates; which is in tandem with the literature [13,15,18]. Relative to their senior counterparts, research is more stressful for fresh graduates and interns. Due to the significant rates of burnout among Jordanian residents [19], the burden of mandated research without providing any kind of monetary compensation, resources, or protected time, may hinder their scholarly engagement. This is showcased among our sample of ministry of health postgraduates which had the highest levels of perceived barriers and are associated with significant burnout syndrome [19]. A similar pattern was found in Japan, as residents in community hospitals had less research contributions than those in university hospitals [20]. This might be explained by the fact that the ministry of health

is not an academic establishment, thus, predisposed to lacking academic mentorship; a major barrier in post-graduate research [21,22].

In our cohort, postgraduates attributed weak research training within their institutions as a debilitating barrier to research. From their perspective, being a clinician does not necessitate proper research skills or understanding. This is further aggravated by the lack of faculty well experienced in academia, and consequently lack of available activity which can be cited and learned from. Additionally, the available faculty members are not perceived as communicative with their mentees nor provide insightful input. These findings are consistent with the literature as residents expect a fully realized bond with their mentors which include prolonged supervision, guidance, emotional support, and encouragement [23].

Starting from 2019, all Jordanian medical schools integrated research curriculums within their undergraduate programs [12]. We demonstrate that most included participants lack the ability to formulate manuscripts or design research, which highlights the defects within such implementations. These defects include absence of statistical education, lack of student feedback, and a theory-based approach that lacks integration with real scholarly practice. These limitations are further extended by the lack of statistical support and the inaccessibility of research resources (e.g., laboratories) [13,14].

Our findings demonstrated that having previous extracurricular research training was associated with improved attitudes and lower perceived barriers towards research. The literature demonstrated that research training programs within residency programs positively impact residents' research activity [20,21]. Therefore, the integration of such programs within Jordanian residency programs is of utmost importance. These programs should provide dedicated research seminars for residents

to cover all aspects of medical research, primarily statistics, and also offer guidance and collect feedback on a frequent basis. In addition, institutions should be encouraged to implement a reward system for residents' research as means to promote the initiation and propagation of research [24].

Among our cohort, postgraduates feel underappreciated as they report not receiving enough "credited authorships" where deserved. An investigation of orthopedic residents found that the number of first authors in residents' publications is low, which was attributed to either the low contributions of residents or the generation of authorship orders based on academic seniority [25]. Authorship logistics must be transparent as it is vital for the progression of postgraduate medical careers and may influence research participation. According to the World Association of Medical Editors, it is unethical to fail to identify authors with significant contributions. Unfortunately, irrespective of dedication, "non-experts" like medical students and residents are made ghost authors neither are they compensated for their time or effort. Such practices discourage both undergraduates and postgraduates alike from carrying out additional research.

4. Factors predictive of being able to publish

Overall, our findings demonstrate that senior postgraduates were more likely to publish compared to fresh graduates and interns. This finding is in line with the literature as later years of postgraduate training were associated with higher number of publications [15,26]. Within Jordanian institutions, postgraduates are obligated to have a peer-reviewed published article before finishing residency, while more senior faculty engage in research for promotions. Interestingly, senior postgraduates had more perceived organizational barriers. This could be attributed to the broader and deeper understanding among senior postgraduates of the academic medical system and

its functionality, rendering them more likely to identify such barriers. Conversely, fresh postgraduates may not be subjected to such barriers due to the presence of a senior supervisor.

Additionally, higher GPA and confidence in leading a research project were positive predictors of publication. Our findings imply that there may be an overlap between the skills necessary for medical practice and research [27]. In addition, academically accomplished individuals may have had more opportunities to engage in research projects or work with faculty members, making them more effective in conducting and finalizing a research paper. Another possible explanation is that individuals who have had previous exposure to research or have already published may have greater confidence in their ability to conduct and publish research, leading to a positive feedback loop.

We demonstrated that Jordanian postgraduates frequently conduct cross-sectional studies, retrospective cohorts, systematic reviews, and basic sciences studies. A similar pattern was seen among internal medicine residents in the United States [28]. These designs were positive predictors of publication. The popularity of these type of studies could be attributed to their accessibility, as they mostly rely on existing data that is often readily available. Moreover, these designs are cost-effective [29]. The latter is of vital importance as lack of funding was one of major barriers among our cohort. Jordanian medical faculties are willing to accept studies but not fund them. Their prevailing narrative suggests that research funding is a zero-sum game, implying that every dollar spent on research is a dollar that could have been saved for education, healthcare, and infrastructure. While research has led to significant advancements in medicine and healthcare in developed countries, it may not always be applicable in resource-limited settings in the developing world. This seems to be a global issue as funding was found

to be a crucial barrier among researchers [30].

5. Limitations

Several limitations impacted the results of our study such as the cross-sectional design, close-ended questionnaire, and sampling technique.

6. Conclusion

Despite their positive attitudes, Jordanian postgraduates face a plethora of knowledge and organizational barriers to research. At the undergraduate level, research curriculums should be reworked, while a research training program should be implemented at the residency level. Medical institutions should allocate resources for the development and facilitation of research programs.

Supplementary materials

Supplementary files are available from <https://doi.org/10.3946/kjme.2023.263>

Supplement 1. Participants Responses to the Questionnaire's Items.

Supplement 2. Factors Affecting Attitudes and Barriers Scores.

Supplement 3. Binary Logistic Regression of Factors Predicting Publishing in Peer Reviewed Journals.

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