

Educational Article

## Understanding of medical students about predatory journals: A comparative study from KSA and New Zealand

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Received 4 April 2020; revised 3 July 2020; accepted 6 July 2020; Available online 21 August 2020



### المخلص

**أهداف البحث:** في هذه الدراسة، قمنا بفحص مدى فهم طلاب الطب من المملكة العربية السعودية ونيوزيلندا للدوريات المقترسة.

**طرق البحث:** أرسلنا استبانة ذاتية إلى طلاب السنة الرابعة والخامسة من كليتي طب في المملكة العربية السعودية ونيوزيلندا من مارس إلى يوليو ٢٠١٩. تم إجراء مقارنات بين المجموعات وتحليلها.

**النتائج:** أكمل ٢٦٣ طالبا الاستبانة (معدل الرد: ٥٩.١٪ في السعودية، و٣١٪ في نيوزيلندا). كانت الخبرة البحثية السابقة أعلى بشكل ملحوظ بين طلاب السعودية (٥٦.٦٪) مقارنة بالطلاب النيوزيلنديين (٣٢.٣٪). شعر عدد أكبر بكثير من طلاب السعودية (٧٥.٦٪) أنهم كانوا تحت ضغط للنشر خلال دراستهم في كلية الطب مقارنة مع ١٢.٣٪ فقط من طلاب الطب النيوزيلنديين. بينما كان ما يقارب ثلث الطلاب في كلا البلدين على دراية بـ "النشر المفتوح" (٣٠.٨٪ في السعودية مقابل ٤٢.٢٪ في نيوزيلندا)، أشار عدد قليل من الطلاب إلى وعي ذاتي بمصطلح "المجلة المقترسة" (٩.١٪ في السعودية مقابل ٧.٨٪ في نيوزيلندا)، أو "قائمة بيل" (٢.٥٪ في السعودية مقابل ٠٪ في نيوزيلندا). نشر عدد قليل من الطلاب من كلا البلدين في المجلات المقترسة (٢٦.١٪ [٢٣/٦] في السعودية مقابل ١٢.٥٪ [٨/١] في نيوزيلندا). تلقى بعض الطلاب تحذيرات أو نصائح حول الدوريات المقترسة (٤.٥٪ في السعودية مقابل ١.٥٪ في نيوزيلندا). وجدت غالبية المجيبين من البلدين صعوبة في تحديد الطبيعة المقترسة للمجلات.

**الاستنتاجات:** في دراستنا، كان فهم طلاب الطب للمجلات المقترسة ضعيفا. هناك ما يبرر اتخاذ تدابير في المناهج، وفي خارج المناهج وأن يكون هناك تعزيزا مؤسسيا للوعي حول المجلات المقترسة.

**الكلمات المفتاحية:** طلاب الطب؛ فهم؛ المجلات المقترسة؛ المملكة العربية السعودية؛ نيوزيلندا

### Abstract

**Objective:** This study examines the extent of understanding of medical students from KSA and New Zealand (NZ) about predatory journals.

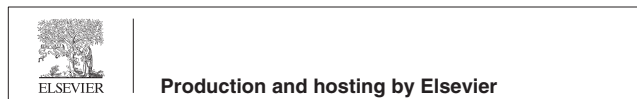
**Methods:** From March to July 2019, self-administered questionnaires were sent to fourth- and fifth-year students of two medical schools in KSA and NZ. Between-group comparisons were carried out using the two-sided Student's *t* test and the Chi-square test. Statistical significance was determined at a *p*-value < 0.05.

**Results:** A total of 263 students completed the questionnaire (response rate: 59.1 percent KSA; 31 percent NZ). Prior research experience was significantly higher among KSA students (56.6 percent) as compared to NZ students (32.3 percent; *p* = 0.0006). A significantly higher number of KSA students (75.6 percent) felt that they were under pressure to publish studies during their term at medical school as compared to only 12.3 percent of NZ medical students (*p* < 0.0001). While one-third of the students in both countries were familiar with 'open-access publishing' (30.8 percent KSA versus 42.2 percent NZ), only a few displayed awareness about 'predatory journals' (9.1 percent KSA versus 7.8 percent NZ; *p* = 0.7) or 'Beall's list' (2.5 percent KSA versus 0 percent NZ; *p* = 0.02). A

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Peer review under responsibility of Taibah University.



<sup>1</sup> PubMed Link: <https://www.ncbi.nlm.nih.gov/pubmed/?term=Abu-Zaid+A%5BAu%5D>.

small number of students from both countries had published in predatory journals (26.1 percent [ $n = 6/23$ ] KSA versus 12.5 percent [ $n = 1/8$ ] NZ,  $p = 0.4$ ). A few students had received warnings or advice regarding predatory journals (4.5 percent KSA versus 1.5 percent NZ;  $p = 0.2$ ). A majority of respondents from both the countries found it hard to identify predatory journals.

**Conclusion:** This study identified that the understanding and knowledge of medical students regarding predatory journals is rather poor. This indicates that curricular, extracurricular, and institutional measures to promote awareness about predatory journals are warranted.

**Keywords:** KSA; Medical students; New Zealand; Predatory journals; Understanding

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## Introduction

Predatory journals refer to periodicals that employ a pay-to-publish scheme, with or without intentional deception, and often forgo the necessary rigorous peer-review of the submitted content. The term 'predatory journal' was introduced and popularised by an academic librarian, Jeffrey Beall.<sup>1</sup> The number of predatory journals that publish in paper and electronic formats, and encompass multiple biomedical disciplines, has rapidly increased over the past decade.<sup>2</sup> Several lists of potential or probable journals that are predatory exist on the Internet.<sup>3</sup> The repercussions of disseminating dubious research in these journals is a cause of significant concern.

Predatory journals have become a subject of intense research in recent years.<sup>4</sup> Various studies have focused on the negative impact of these journals, the methods used to identify the journals, and the solutions to stop the availability of manuscripts for these untrustworthy journals.<sup>4</sup> Educational efforts are being made to combat the rise of predatory journals, and these also aim to raise awareness about these journals.<sup>5</sup> It is notable that, at times, even seasoned researchers have been tricked into publishing in predatory journals; however, there are others who blatantly seek them out, often as a quick path to boost their academic achievements.<sup>6</sup>

Researchers and students have been previously warned about the potential exploitation by these predatory journals.<sup>7</sup> Given the inexperience of neophyte researchers and students, there is a possibility that they may be easily lured by 'sugar-coated invitation e-mails' to submit their research to these journals.<sup>8</sup> Moreover, the pressure on medical students to establish competitive portfolios<sup>9</sup> may be a considerable motive to seek fast publication avenues through such rapacious pseudo-journals.

As per our knowledge, studies have not formally assessed medical students' awareness regarding predatory journals. Medical students represent the future generation of clinician-

educators and clinician-scientists who would have an impact in the field of medicine through their unique experiences in teaching, patient care, and scholarly activities.<sup>10,11</sup> Other than encouraging curricular and extracurricular research activities, exploring the awareness of predatory journals among medical students is a crucial step to develop effective interventions and prevent publishing in these fraudulent journals.

Students' attitude towards academic publishing is influenced and shaped by several factors, including the social and cultural contexts of their lives, medical school curricula, academic mentors, and the pressure to publish to further substantiate their curriculum vitae. The perception regarding predatory publishing may be conceptualised differently across different cultural groups.<sup>12</sup> This study examines the level of awareness of medical students from two countries and their experience with predatory journals. The hypothesis is that students generally lack adequate knowledge and awareness regarding predatory journals.

## Materials and Methods

### Study setting

The questionnaire-based study was conducted from March to July 2019 at two medical schools: Alfaisal University, Riyadh, KSA; and the University of Otago, Christchurch, New Zealand. The study participants included only students in the clinical phase of their undergraduate medical programme (i.e. fourth- and fifth-year medical students). The rationale for targeting this subset was primarily based on their relatively greater engagement in research activities and scientific publishing as compared to their juniors.<sup>10,13</sup> As a part of the medical curriculum, students at both institutions are introduced to evidence-based medicine and the principles of biomedical research conduct. However, publication in journals is not a mandatory curricular requirement at either institution. This study has been approved by the Institutional Review Board at Alfaisal University, Riyadh, KSA (reference: IRB-18084), and the University of Otago Human Ethics Committee, New Zealand (reference: D18/207).

### Study questionnaire

Based on previous studies,<sup>6,14</sup> the survey questions were developed by two of the authors (YA and AA). The questionnaire was then peer-reviewed by a third author (ISA) to cross-check for proper content, relevance, and clarity. The primary language of instruction is English at both the institutions. Thus, the questionnaire has also been formulated in English language with the assumption that the medical students from both the institutions are proficient in the language. The questionnaire has been designed to collect data on student demographics (two questions), previous research experiences (four questions), knowledge of and attitude towards open-access publishing (three questions), and predatory journals (six questions). The questionnaire was then pre-tested on a group of students from Alfaisal University ( $n = 15$ ) to examine the face-validity and ensure proper interpretation of questions. The questionnaire was found to be easy to understand, and thus no further changes were needed. For the questions pertaining to open-access

publishing (three questions) and predatory journals (six questions), Cronbach's alpha co-efficient was used and it demonstrated acceptable reliability of the data (score = 0.71).

*Statistical analysis*

Most of the data were reported as numbers and proportions. Between-group comparisons have been conducted with two-sided Student's t test (for continuous data) and the Chi-square test (for categorical data). For all purposes, statistical significance was determined as p-value < 0.05. The analyses were performed using the Statistical Package for the Social Sciences (SPSS) software version 22.0.0.0 (SPSS Inc., Chicago, IL, US).

**Results**

*Demographics of study sample*

Of the 545 invited medical students, 263 completed the study questionnaire, this included 198 students from KSA

(n = 198/335; response rate 59.1 percent) and 65 students from New Zealand (n = 65/210; response rate 31 percent). A female preponderance was observed in the respondents from both groups (61.6 percent KSA, and 64.6 percent New Zealand).

*Prior research experiences*

Participation in faculty-mentored research activities was significantly higher in Saudi students (56.6 percent) as compared to New Zealand students (32.3 percent; p = 0.0006). However, the publication rates were not different between the two student groups (11.6 percent versus 12.3 percent, respectively; p = 0.9). A significantly higher number of students from KSA (75.6 percent) felt they were under pressure to publish during medical school as compared to 12.3 percent of the medical students from New Zealand (p < 0.0001). A relatively small percentage of students in both countries received any advice or warning regarding predatory journals (4.5 percent versus 1.5 percent, respectively; p = 0.2).

*Open-access journals*

A reasonable proportion of students from both countries, 30.8 percent from KSA and 42.2 percent from New Zealand (p = 0.1), were familiar with the concept of open-access publishing. However, their attitude towards open-access journals was inconsistent (Table 1).

*Predatory journals*

A minority of the medical students from both countries were familiar with the term 'predatory journal' (9.1 percent in KSA versus 7.8 percent in New Zealand, p = 0.7). Similarly, a minority of the students were aware of the 'Beall's list',<sup>1</sup> although the difference between KSA students (2.5 percent aware) and New Zealand students (0 percent aware) was statistically significant (p = 0.02). Certain characteristics assisted a small number of students to identify whether a journal is predatory (Table 2).

**Table 1: Students' attitude towards open-access journals.**

		KSA (n = 198) n (%)	New Zealand (n = 65) n (%)	p value <sup>a</sup>
All open-access journals are predatory	True	49 (24.7%)	1 (1.5%)	p < 0.0001
	False	15 (7.6%)	13 (20%)	
	Unsure	134 (67.7%)	51 (78.5%)	
It is easy to differentiate predatory from legitimate open-access journals	True	4 (2%)	1 (1.5%)	p = 0.8
	False	48 (24.2%)	17 (26.2%)	
	Unsure	146 (73.8%)	47 (72.3%)	

<sup>a</sup> Two-tailed Chi-square test; statistical significance as p value < 0.05.

**Table 2: Students' attitude towards characteristics of predatory and legitimate journals.**

		KSA (n = 198) n (%)	New Zealand (n = 65) n (%) <sup>a</sup>	p value <sup>b</sup>
Journals lacking an impact factor are classified as predatory	True	11 (5.6%)	1 (1.6%)	p = 0.1
	False	23 (11.6%)	3 (4.8%)	
	Unsure	164 (82.8%)	58 (93.5%)	
Journals not indexed in PubMed are classified as predatory	True	3 (1.5%)	1 (1.5%)	p = 0.008
	False	47 (23.7%)	4 (6.2%)	
	Unsure	148 (74.7%)	60 (92.3%)	
Journals that charge an article processing fee are classified as predatory	True	9 (4.5%)	1 (1.6%)	p = 0.002
	False	36 (18.2%)	1 (1.6%)	
	Unsure	153 (77.7%)	61 (96.8%)	
Journals whose headquarters are based in a developed country are not classified as predatory	True	6 (3%)	1 (1.6%)	p = 0.008
	False	46 (23.2%)	4 (6.3%)	
	Unsure	146 (73.7%)	59 (92.2%)	

<sup>a</sup> Some of the questions were not answered by a few of the participants from New Zealand; therefore, the total does not always equate to n = 65.

<sup>b</sup> Two-tailed Chi-square test; statistical significance as p value < 0.05.

A small proportion of medical students received e-mails to invite them to submit an article to a suspected predatory journal. The instance of this was higher among students in KSA (6.1 percent) than New Zealand (1.5 percent) ( $p = 0.05$ ). Notably, several students who had never published prior to this and were not corresponding authors also received invitation emails to submit to predatory journals. The number of medical students who published in predatory journals was not small, six out of twenty-three publications by KSA students (26.1 percent) and one out of eight publications by New Zealand students (12.5 percent) were in these journals. The difference was not statistically significant ( $p = 0.4$ ). Prior research participation has been associated with awareness regarding predatory journals among the students from KSA ( $p = 0.045$ ) but not from those in New Zealand ( $p = 0.49$ ).

## Discussion

As per our knowledge, this is the first report regarding the awareness of predatory journals among medical students. This study reports a general lack of awareness regarding predatory journals among the surveyed medical students. Less than 10 percent of the respondents were familiar with the term 'predatory journal'. A proportion of the students, albeit small, had received invitations e-mails to submit to suspected predatory journals, this was higher among students from KSA (a third-world developing country) than New Zealand (a first-world developed country). It is a matter of speculation if this difference is a result of 'targeted promotion' by predatory journals. However, the proportion of medical students who have received advice or warnings about predatory journals is extremely low (less than 5 percent).

The scarcity of relevant literature regarding medical students and predatory journals has limited our attempt to compare and contrast the study findings with published literature. However, in a recent study by Christopher and Young,<sup>15</sup> a higher proportion (23 percent) of veterinary and medical graduates and residents (from several developed countries) reported that they are aware of the existence of predatory journals. The proportion of respondents who were aware of the Beall's list was relatively low (4.8 percent). It should be noted that the respondents in Christopher and Young's study<sup>15</sup> were attendees of scientific writing courses (thus representing a different and arguably more knowledgeable cohort).

The research engagement among KSA students was higher than that among New Zealand students. While this could be due to sampling differences, this finding also reflects the same information as previously conducted studies. Amgad et al.,<sup>12</sup> in a recent meta-analysis, found that students from developing countries have a higher interest in research. The authors attribute the high interest to possible career-related anxiety, which could lead to increased vested interest in pursuing research to enhance their curriculum vitae. This notion is also supported by a higher proportion of KSA students who have reported a feeling of intense pressure to publish at an early stage of their careers.

Close inspection of the data as reported by our respondents reveals two potentially concerning findings. The

first is that, despite a significantly higher reported participation in research by KSA medical students, the opportunities to get published are not very high. This could primarily be because of three reasons: (1) lower quality of research (thus producing less 'publishable' results), (2) the 'White Bull' effect<sup>16</sup> (i.e. senior researchers taking all the credit or authorship for research done by medical students), or (3) higher emphasis on other means of research dissemination (i.e. conference presentations rather than peer-reviewed publications). The second is that a relatively high proportion of the publications of these respondents are in predatory journals. This needs to be interpreted with caution because of the low number of publications, thus precluding a robust analysis. Further study into this aspect of medical students' research (including such factors as the position of the person deciding where to publish) is warranted.

This study offers insights regarding common misconceptions associated with predatory journals. These include confusing open-access journals as being synonymous with predatory journals<sup>17</sup> and underestimating the difficulty with which the two can be differentiated. A majority of the respondents (especially from New Zealand) found it difficult to identify whether a journal is predatory on the basis of certain characteristics (e.g. lack of an impact factor). These observations may partly be explained by the lack of a clear definition and criteria for predatory journals.<sup>4</sup>

Publishing in predatory journals entails serious aftermaths for medical student authors, their affiliated institutions, and the scientific community as a whole. These repercussions include, broadcasting fraudulent and low-quality research, tarnishing a student's publication portfolio, denigrating an institution's research standing, and squandering substantial financial resources. There is a dire need for ensuring mass awareness of predatory journals among medical students who are among the most vulnerable victims.<sup>7</sup> This awareness fundamentally necessitates incorporation of formal curricular teaching about the science of legitimate scholarly publishing.<sup>7,18</sup> Specifically, this curricular teaching can be integrated within the research methods or evidence-based medicine course (in both preclinical and clinical phases) which is a component of almost all medical school curricula. Furthermore, institutional libraries should actively partake in the process by conducting relevant workshops and educating students about the up-to-date guidelines and methods to recognise the rapidly increasing number of predatory journals. Additionally, ethics research committees should oversee all research publications originating from their institutions and warrant that these publications are disseminated in legitimate periodicals.<sup>19</sup>

It is imperative to note that while some students are tricked into publishing in predatory journals by means of deceptive solicitation tactics, other students may willingly publish their work in such journals by blaming the academic pressure to publish.<sup>9</sup> Medical students should bear in mind that 'ends do not justify means' in science. In order to deter intentional self-driven motives to publish in predatory journals, ethics research committees should consider imposing 'penalties' on medical students who publish in such periodicals.<sup>19</sup> The ambassadors of research (particularly undergraduate research bodies, faculty, and research



mentors) should work towards ensuring legitimate practice of scientific publishing by novice medical students.

This study has several strengths. It is the first report about the awareness of predatory journals among medical students. It has a comparative study design from two geographically different countries. While our study provides preliminary results, concrete conclusions cannot be drawn, and the authors acknowledge several limitations. The response rate for the survey (especially from New Zealand) was relatively low. Additionally, the use of anonymous surveys may have led to a self-selected group of medical students, which may in turn lead to under- or over-estimating the results. Future studies from our collaborative group (KSA and New Zealand) should include a qualitative study design employing focused semi-structured interviews. This study is projected to gain deeper insights regarding medical students' awareness of open-access and predatory publishing, as well as the perceived attitude and motivation towards publishing in predatory journals. Furthermore, large, multi-centre studies should be conducted at various schools locally and internationally to generate solid conclusions and provide the opportunity to compare and contrast study findings.

### Conclusion

To conclude, the study demonstrates the relatively poor awareness regarding predatory journals among the surveyed students from KSA and New Zealand. Literature regarding these journals is scarce. Further research is required from across the world to provide more generalised perspectives on the topic. Curricular, extra-curricular, and institutional means to promote awareness among medical students regarding predatory journals are warranted.

### Source of funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Conflict of interest

The authors have no conflict of interest to declare.

### Ethical approval

This research was approved by the Institutional Review Board at Alfaisal University, Riyadh, KSA (reference: IRB-18084), and the University of Otago Human Ethics Committee, New Zealand (reference: D18/207).

### Authors contributions

YA and AA contributed to ethical approval paperwork, study design, data collection, data analysis, study supervision, and initial drafting of the manuscript. ISA contributed to the data analysis and initial drafting of the manuscript. MGB contributed to the study design and data collection. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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**How to cite this article:** Alamri Y, Al-Busaidi IS, Bintalib MG, Abu-Zaid A. Understanding of medical students about predatory journals: A comparative study from KSA and New Zealand. *J Taibah Univ Med Sc* **2020**;15(5):339–343.