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Knowledge of Scientific Misconduct in Publication among Medical Students in Riyadh, Saudi Arabia

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ABSTRACT

Background: *The recent requirements from the Saudi Commission for Health Specialties encourage medical students to conduct more research to increase their chances of acceptance in residency programs. This may influence the students to focus on publishing with less emphasis on avoiding scientific misconduct.* ***Aim:*** *To assess the knowledge of scientific misconduct in publication among medical students at King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia.* ***Settings and Design:*** *A questionnaire based cross-sectional study was conducted at the College of Medicine in KSAU-HS, Riyadh, Saudi Arabia.* ***Methods:*** *The 3rd and 4th year male medical students were selected by purposive sampling after their Problem based learning (PBL) sessions. The questionnaire included questions related to publication ethics and scientific misconduct. The SPSS version 22 was used for data analysis and management. Chi-square test was used for comparing the correct response for each question in the questionnaire with the academic year of the students.* ***Results:*** *A total of 117 (3rd year=56, 4th year=61) students participated in the study. There were 87 (74%) students who had heard about the term "publication ethics". Of the participants, 19 (16%) had correct knowledge about fabrication in research and 42 (36%) knew what gift authorship is. Knowledge about the fabrication of data was found to be statistically higher in the 3rd year (25%) vs. 4th year (8%) students, (p=0.01).* ***Conclusion:*** *The study identified areas of deficiencies in knowledge of different aspects of publication ethics among medical students at KSAU-HS. There is a need to raise awareness of publication ethics in research among medical students during their academic years.*

Keywords: Research ethics, Ethics, Scientific misconduct, Medical students, Publications

INTRODUCTION

Research has played a crucial role in the advancement and progression of the science of medicine. In this epoch of evidence based medical practice, up to date published literature is the principal reference for optimal patient care and discovering solutions to unresolved medical queries is the main ground behind conducting research. In medical research, publishing one's work constitutes the fundamental element. Publishing is now considered a solid indicator of a candidate's quality and a direct predictor of personal and professional development of a student [1].

Specific interest in publication ethics in the past has led to the establishment of several organizations that aim to regulate ethical publication practices. Among these organizations, the International Committee of Medical Journal Editors (ICMJE) and the Committee on Publication Ethics (COPE) are the most prominent, which were founded in 1978 and 1997, respectively [2,3]. Their criteria for authorship have been widely adopted by hundreds of journals to standardize the definitions and thereby secure responsibility and accountability of authorship in medical journals [4].

Despite the presence of the COPE and ICMJE guidelines, the ethics of publication are relatively neglected and scientific misconduct in the publication is seen. This includes fabrication (generating nonexistent results), falsification (manipulating, changing, or omitting data or results with the intention of giving a false impression), and plagiarism (presenting other's writings and ideas as one's own) of data. Other ethical breaches that deviate from what is accepted in research practice include misapplication of authorship criteria, salami slicing, bias, duplicate publication, conflict of interest and deliberate erroneous utilization of statistical methods [5,6].

Practices of scientific misconduct in publication, such as plagiarism, fabrication, duplicate publication, and salami slicing, are often explained by the "publish or perish" culture in academia which pressures students to rapidly and continually publish more and more research projects to further advance their careers and give them an advantage over their peers [7]. Evidence of violations to the standard ethical code has been reported among postgraduate medical trainees in Saudi Arabia [8]. Such ethical breaches affect the integrity of medical literature and ultimately lead to its contamination [9]. Medical students are expected to show traits of integrity, honesty, truthfulness, and trustworthiness in academia and research. However, studies have shown an increase in academic misconduct in medical colleges and educational institutions [7,10-12].

In Saudi Arabia, during the recent years, there has been a substantial increase in the number of medical colleges with a greater emphasis on the quantity over quality of medical students [13]. Also, a change in policy has been adopted in which medical graduates who participate and publish research articles have an advantage for acceptance into residency programs [14]. The recent Saudi Commission for Health Specialties applicant curriculum vitae score guide states that a student who has a published research or has participated in writing a proposal for a research project gets two extra points. These count in the overall score set by the Saudi Commission for Health Specialties in their point system for evaluating, differentiating, and filtering applicants for residency program entry [14,15]. Hence, with these increasing requirements from the Saudi Commission for Health Specialties, students and interns may try to attempt to come up with research ideas and publish their articles more quickly in order to secure the residency position of their interest. As the residency application deadline approaches, the aim of some students might become finishing the project in hand by any means necessary and this, unfortunately, may include violating the standard ethical code [11].

A study conducted in Pakistan by Ghias, et al., exploring self-reported academic misconduct on medical students revealed higher percentage of ethical misconduct in older students. This was thought to be due to multiple factors such as stress, increased demand and evaluations, and possibly due to younger students not having as many chances to commit misconduct activities such as older students [16].

All the above factors highlight the significance of assessing publishing practices and measuring knowledge of publication ethics among medical students and fresh medical graduates. The aim of the current study was to measure the knowledge of publication ethics in 3rd and 4th year male medical students at the College of Medicine in King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

METHODS

Study Design, Study Setting and Subjects

A questionnaire based cross-sectional study was carried out in December 2017 at the College of Medicine in King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia. The 3rd and 4th year male medical students (clinical year students) were selected by purposive sampling after their Problem based learning (PBL) sessions.

Sample Size

A sample size of 110 was estimated using Raosoft sample size calculator [17]. This was based on estimated outcome response of 50% with a margin of error of ± 10% at the 95% confidence interval.

Data Collection Form

The data collection form used was obtained from the Mubeen, et al., study [18]. Consent was taken from each participating medical student before the questionnaire was administered. The questionnaire consisted of 3 parts; the first inquired about demographic data, while the second inquired about contribution towards research and questions related to the knowledge of research ethics committees including the International Committee of Medical Journal Editors (ICMJE) criteria, and Committee on Publication Ethics (COPE). The last part comprised of 11 multiple choice type questions on knowledge of publication ethics and scientific misconduct including criteria for authorship, article submission, gift authorship, fabrication, falsification, plagiarism, and photo manipulation [18].

Sampling Technique

The sampling technique used in this study was purposive sampling. The questionnaire was distributed to 3rd and 4th

year male medical students at the College of Medicine after their PBL sessions.

Data Management and Analysis

The Statistical package for the social sciences (SPSS) version 22 (IBM Corp. Released 2013, IBM SPSS statistics for Windows, Armonk, NY) was used for data management and analysis. Descriptive statistics were used to assess the baseline demographics; by calculating the frequencies and percentages. Chi-square test was used for cross-tabulation with academic year and knowledge of scientific misconduct in publication. A p-value<0.05 was considered to show a statistically significant difference.

Ethical Considerations

The study was approved by the Institutional Review Board, King Abdullah International Medical Research Centre, Ministry of National Guard Health Affairs, Riyadh, Saudi Arabia. Participants were informed of their right to abstain from participation in the study.

RESULTS

A total of 117 male students were included, of these 56 (48%) were 3rd year and 61 (52%) were 4th year students. The majority of students; i.e. 86 (74%) were high school graduates, while 31 (26%) entered medical school after obtaining a bachelor's degree. More than half the students (53%) had a Grade Point Average (GPA) of <4.5/5, while 54 (47%) had a GPA of ≥ 4.5/5 (Table 1).

Table 1 Baseline characteristics of participants (N=117)

Variable	Category	N	%
Year of Study	3rd year	56	48%
	4th year	61	52%
Entry Level	High School Graduates	86	74%
	Bachelors entry	31	26%
Grade Point Average (GPA)*	<4.0	14	13%
	4.0-4.49	46	40%
	4.5-5.0	54	47%
*Out of 5			

Among the participants, the majority 87 (74%) reported having heard of publication ethics in research, and 69 (59%) students stated they were aware of the research ethics review committee/board in their institution. There were 19 (16%) students who had published a research article. There were 19 (16%) students who had heard of Committee on Publication Ethics (COPE), and 17 (15%) students who had heard of International Committee of Medical Journal Editors (ICMJE) authorship criteria (Figure 1).

Figure 1 Medical students' knowledge of research review committees, and awareness of publication ethics (N=117)

Among the 117 participating students, 19 (16%) had correct knowledge on fabrication, 33 (28%) knew that they need to wait for journal decision before submitting their manuscript to another journal, while 34 (29%) identified photo manipulation as an example of scientific misconduct in academic writing. There were 42 (36%) students who knew that a gift author was a person who was listed as an author but did not meet the criteria for authorship. Also, 44 (38%) students recognized that a person who was extensively involved in data collection only does not meet authorship criteria but can be acknowledged in the research article for their contribution. The highest percentages of correct answers were for the definition of publication ethics 85 (73%), followed by definition of plagiarism 71 (61%) (Figure 2).

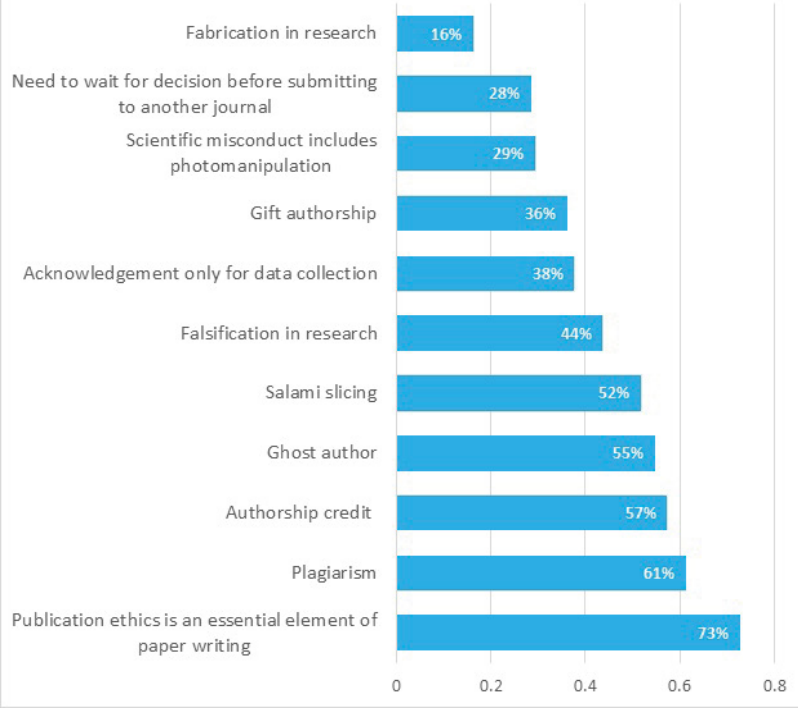

Figure 2 Percentage of correct responses about scientific misconduct among all participants (N=117)

Table 2 shows the comparison of 3rd and 4th year students having correct answers for each question about knowledge of publication ethics and major scientific misconducts. The percentage of correct responses was compared for each statement. Knowledge about the fabrication of data was found significantly higher in 3rd (25%) vs. 4th (8%) students (p=0.01). Another significant difference was whether a person who was extensively involved in data collection fulfills the criteria for authorship or not was higher in 4th year students (48%) vs. 3rd year (27%), (p=0.02). There was a borderline significant difference (p<0.1) for two other questions. Among 4th year students, 60% gave correct answers for "salami slicing" as compared to 43% of 3rd year students (p=0.06). Also, a correct response for who gets authorship credit was identified by 66% of 3rd year students as compared to 49% of 4th year students (p=0.07). All other questions showed no significant differences.

Table 2 Comparison of correct responses about publication ethics by year of study

Questions	Year of Study		p-value
	3rd year (n=56)	4th year (n=61)	
All statements for fabrication are true except: Allow someone else to write a paper for you	14 (25%)	5 (8%)	0.01*
The author can submit again an already sent manuscript to another journal: Need to wait for decision irrespective of time frame	15 (27%)	18 (30%)	0.70
Scientific misconduct in academic writing also include: Photo manipulation	15 (27%)	19 (32%)	0.56
If a person does not meet accepted authorship criteria but is listed as a personal favor or in return for payment, he/she is: Gift authorship	23 (42%)	19 (31%)	0.23

If a person is involved extensively in data collection, he/she can be: Acknowledged/does not qualify for authorship	15 (27%)	29 (48%)	0.02*
All statements for falsification in research are true except: Reporting results against research hypothesis	26 (46%)	25 (41%)	0.55
Salami slicing is defined as: Breaking up or segmenting a large study into two or more publications	23 (43%)	36 (60%)	0.06
If someone who made substantial contributions to the research or that merited authorship and fails to be listed as an author, he/she is a Ghost author	31 (55%)	33 (54%)	0.89
Authorship credit should be based on: Substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data, and drafting the article or revising it critically for intellectual content and final approval of the version to be published	37 (66%)	30 (49%)	0.07
Appropriation of another person's ideas, processes, results, or words without giving appropriate credit is known as Plagiarism	30 (55%)	41 (67%)	0.16
Publication ethics in research: Is an essential element of paper writing	41 (73%)	44 (72%)	0.90
*Significance level <0.05			

DISCUSSION

This cross-sectional study evaluating the knowledge of scientific misconduct showed deficiencies in knowledge among the student. Among the participants, 16% had published original research. These results were also similar to those of the Mubeen, et al., study from Pakistan in which 13% of the participants had published original research [18]. Another study conducted among medical interns in Jeddah, Saudi Arabia showed an even lesser rate of research publication in which only 3% of respondents had a published research paper [19]. This, however, contrasts with a study conducted in Canada in which 47% of the participating medical students who hold a graduate degree had published a research paper [20]. This may also be due to the difference in curricula adopted by the different countries, in which technically advanced countries like Canada have a greater emphasis on basics of research conduction and are more aware and responsive to such guidelines. It could also be simply because of the general lack of training medical students receive in medical school. A study conducted on senior medical students at one college in Saudi Arabia showed that 88% of respondents stated that lack of training courses in research was a barrier to them conducting research [21].

Knowledge about the institutions that aim to foster ethical publication practices like (COPE) and (ICMJE) was measured. Among the participants, 15% had heard of the ICMJE criteria for authorship vs. 11% from the Mubeen, et al., a study [18]. Also, when asked about whether they had heard of COPE or not, 15% of the participants responded with a yes, as compared to 9% of the Mubeen, et al., participants [18].

Data fabrication is a broad category of research misconduct that is defined as generating non-existent results or altering an existing set of data in order to enhance or publish the paper in hand [22]. In this study, 16% of students were aware of the definition of fabrication. These findings are consistent with the Mubeen, et al., study from Pakistan in which 16% of the students knew about the fabrication of data [18]. An older study conducted in the United States in 1992 to examine violations from 41 investigators being disciplined for scientific misconduct found that 24 of them were accused of fabricating or falsifying data [23].

Gift authorship is when a person's name is enlisted as an author but did not make any significant contribution to meet the ICMJE authorship criteria [24]. Conversely, a ghost author is someone who was not listed as an author even though they made a notable contribution to the research [25]. In this study, 35% of students had the knowledge of gift authorship, and 55% knew what a ghost author is. These results were higher compared to the Mubeen, et al., study, in which only 18% of their students knew about gift authorship, and only 38% gave the correct answer to the definition of ghost authorship [18]. It has been reported in the literature that roughly one in four articles showed misapplication of authorship criteria and improper appointment of authors [26].

The use of someone else's work or copying it and presenting it as one's own without giving credit is considered as plagiarism [27]. The knowledge of plagiarism among students in this study was relatively high as 61% of students had the correct answer for the definition of plagiarism. The reason for this may be due to the fact that students are constantly reminded of it as part of the formal research curriculum, and all their research related assignments go

through a plagiarism check by the in-university research unit. These results are inconsistent with the Mubeen, et al., study in which only 11% of their students had correct knowledge about plagiarism [18].

One of the limitations of the present study is that the study is based only on male medical students of one medical college. Secondly, students' behaviors of publication ethics and self-reported acts of scientific misconduct were not explored. Also, first and second year students were not included.

CONCLUSION

The study identifies low levels of awareness among the students of even the basic definitions of scientific misconduct and should be followed through, after implementation of a review course or program, with a future study to review, compare and assess the benefit of the intervention. There is a specific need to increase students' knowledge regarding fabrication, submission to journals, photo-manipulation, and gift authorship.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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