**Knowledge, attitude, opinion, perspective, and agreement of Palestinian medical students on strategies/recommendations to curb plagiarism: A multicenter cross-sectional study**

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**Number of words:** 2,490

**Acknowledgments**

The author would like to thank the medical students who participated in the study. An-Najah National University is acknowledged for making this study possible.

**Disclosure of potential conflicts of interest**

The author reports no conflicts of interest.

**Funding**

This study did not receive any funding.

**ABSTRACT**

Plagiarism is a common issue in written academic assignments and graduation theses. This multicenter study was conducted to assess the knowledge, attitude, opinion, perspective, and agreement of Palestinian medical students on strategies/recommendations to curb plagiarism. The study was conducted in a cross-sectional design using a questionnaire in all universities with medical education programs. The questionnaire contained 12 knowledge items, 8 attitude items, 6 opinion/perspective items, and 8 strategies/recommendations to curb plagiarism. Of the 550 invited medical students, 474 completed the study tool. Knowledge, attitude, opinion, perspective, and agreement on strategies/recommendations scores correlated positively. Higher knowledge, attitude, opinion, perspective, and agreement on strategies/recommendations scores were significantly associated with higher academic/training year, grade point average, satisfaction with academic achievement, academic writing skills, informational skills, using citation managers, receiving courses/workshops/lecturers on plagiarism, using plagiarism checking tools, and participation in a scientific paper/graduation thesis writing. Gaps in knowledge about plagiarism were identified among Palestinian medical students. Educators/trainers and other decision-makers in medical schools and higher academic institutions might use the strategies on which the students agreed to curb plagiarism.

**Keywords:** Knowledge, Attitude, Plagiarism, Medical students, Medical education, Questionnaire

# Introduction

Worldwide, medical education has changed dramatically over the last few decades. Today’s medical curricula aim to stimulate critical thinking among medical students, teach them how to collect and analyze data, and how to apply them in clinical situations while caring for patients ([Carberry et al., 2021](#_ENREF_10); [Lee, Hu, & Bilszta, 2020](#_ENREF_36)). Therefore, most medical schools around the world have mandatory graduation/degree projects/thesis ([Frishman, 2001](#_ENREF_18)). In addition to the mandatory graduation project, medical students are often encouraged to engage in extracurricular research activities through their medical educational programs. It has been argued that through engagement in formalized research experiences, medical students can learn new methodologies, develop an ability to evaluate published literature, learn to work in groups, acquire problem-solving skills, writing, and use critical thinking ([Carberry et al., 2021](#_ENREF_10); [Griffin & Hindocha, 2011](#_ENREF_19); [Lee et al., 2020](#_ENREF_36)).

Upon completion of their research projects, medical students are expected to write a graduation thesis. Graduation theses are often written in the form of scientific papers. With the increasing competition among universities and researchers worldwide, there has been mounting interest in disseminating graduation thesis in peer-reviewed and indexed journals ([Griffin & Hindocha, 2011](#_ENREF_19); [Lee et al., 2020](#_ENREF_36)). Additionally, medical students are increasingly recognizing the importance of publishing research papers in indexed scientific journals for their future careers. Previous studies have shown that the number of publications that were extracted from graduation theses submitted to medical schools was less than what was aspired ([Griffin & Hindocha, 2011](#_ENREF_19)). In Finland for example, Nieminen et al reported that less than one-fourth of the medical theses were published in indexed scientific journals ([Nieminen, Sipila, Takkinen, Renko, & Risteli, 2007](#_ENREF_44)). In France, Salmi et al analyzed a random sample of 300 theses submitted to 36 French medical universities in the period between 1993 to 1997 ([Salmi, Gana, & Mouillet, 2001](#_ENREF_51)). The study showed that only 17.0% of the theses resulted in scientific publications. In the UK, not having an opportunity to participate in a research project was reported by medical students as a main barrier to not publishing an article in an indexed scientific journal ([Griffin & Hindocha, 2011](#_ENREF_19)). In the same study, the majority of the medical students stated that they were not encouraged to participate in research projects and publish articles by their seniors.

Medical education is stressful and medical students are often overwhelmed with the didactic requirements and written assignments of the program ([Moffat, McConnachie, Ross, & Morrison, 2004](#_ENREF_42)). The advent of the internet provided students with ample ease of access to scientific papers, presentations, and assignments of other students and researchers. Therefore, plagiarism has become a common issue in written assignments and graduation theses ([Jiang, Emmerton, & McKauge, 2013](#_ENREF_31)). Plagiarism can be defined as the “appropriation of the words, works, methods, ideas, and/or findings of others without authorization and/or acknowledgment of the primary sources and/or authors” ([Bouville, 2008](#_ENREF_9); [Liddell, 2003](#_ENREF_38)). Worldwide, plagiarism is one of the most serious types of scholastic misconduct and breach of academic integrity ([Anderson & Steneck, 2011](#_ENREF_2); [Juyal, Thawani, & Thaledi, 2015](#_ENREF_33)). It has been argued that plagiarism is one of the most common problems facing higher education establishments today. In a study conducted among medical students in Pakistan, about 87% of the students lacked awareness of plagiarism and about 71% admitted that they have committed plagiarism ([Javaeed, Khan, Khan, & Ghauri, 2019](#_ENREF_30)). In another study in Iraq, more than half (about 54%) of medical students admitted that they have committed plagiarism ([Ismail, 2018](#_ENREF_27)).

In Palestine, graduation projects are mandatory in medical education. Therefore, medical students have to submit written graduation theses as a partial requirement for obtaining their Doctor of Medicine (MD) degrees. Additionally, Palestinian medical schools have increased the number of written assignments and research activities to comply with the requirements of the Association for Evaluation and Accreditation of Medical Education Programs, the Quality Council for Higher Education, and the World Federation for Medical Education. Moreover, Palestinian medical schools have turned to online learning during the COVID-19 pandemic, during which there has been an increased number of writing projects and assignments that have replaced on-campus examinations. Many medical schools and higher education institutions around the world have adopted zero-tolerance policies on plagiarism ([Li & Casanave, 2012](#_ENREF_37); [Shirazi, Jafarey, & Moazam, 2010](#_ENREF_53)). Therefore, medical students should be knowledgeable about the different forms of plagiarism and how to avoid them.

Previous studies assessed the knowledge and attitudes of university students toward plagiarism. These studies have shown that adequate knowledge positively impacted the attitudes and practices of students toward plagiarism ([Ž Bašić, I. Kružić, I. Jerković, I. Buljan, & A. Marušić, 2019](#_ENREF_7); [Issrani et al., 2021](#_ENREF_28); [Phyo et al., 2022](#_ENREF_46); [Raj, Venkatachalam, Amaravati, Baburajan, et al., 2022](#_ENREF_49)). It has been argued that plagiarism is one of the scientific and academic integrity issues that can be addressed and corrected with appropriate interventions ([Ž Bašić et al., 2019](#_ENREF_7); [Marusic, Wager, Utrobicic, Rothstein, & Sambunjak, 2016](#_ENREF_41)). Currently, little is known about the knowledge, attitudes, opinions, and perspectives of Palestinian medical students about plagiarism in scientific writing. Additionally, little is known about the extent to which Palestinian medical students agree with strategies/recommendations that can be used to curb plagiarism in scientific and academic writing. Lack of adequate knowledge was previously identified as a promoter of plagiarism ([Husain, Al-Shaibani, & Mahfoodh, 2017](#_ENREF_24)). The research questions were: 1) Do Palestinian medical students have adequate knowledge about plagiarism? 2) What attitudes, opinions, and perspectives do Palestinian medical students have about plagiarism? 3) To what extent do Palestinian medical students agree with strategies/recommendations that can be used to curb plagiarism? 4) Are there correlations between the scores of knowledge scores, attitude scores, opinion/perspective scores, and the extent to which the medical students agree with strategies/recommendations that can be used to curb plagiarism? 5) Are there associations between demographic and academic variables of the medical students with their knowledge, attitudes, opinions, perspectives, and the extent to which they agree with strategies/recommendations that can be used to curb plagiarism?

The objectives of this study were to: 1) assess knowledge of Palestinian medical students about plagiarism in scientific and academic writing, 2) assess attitudes, opinions, and perspectives of the students about plagiarism in scientific and academic writing, 3) measure the extent to which the medical students agree with strategies/recommendations that can be used to curb plagiarism in scientific and academic writing, 4) investigate correlations between knowledge scores, attitude scores, opinion/perspective scores, and the extent to which the medical students agree with strategies/recommendations that can be used to curb plagiarism in scientific and academic writing, and 5) to investigate associations between the demographic and academic variables of the medical students with knowledge scores, attitude scores, opinion/perspective scores, and the extent to which the medical students agree with strategies/recommendations that can be used to curb plagiarism in scientific and academic writing.

# Methods

## Study design

This multicenter study was conducted in a cross-sectional design using a questionnaire as the study tool. Therefore, this study was reported in adherence to the guidelines for reporting cross-sectional studies in which a questionnaire was used as the study tool ([Besag, Vasey, Sharma, & Lam, 2021](#_ENREF_8); [Turk et al., 2018](#_ENREF_55); [von Elm et al., 2007](#_ENREF_56)).

## Study sites

This multicenter study was conducted among medical students in all universities with an active medical education program in Palestine. The study was conducted in the period between March and May 2022.

## Study participants, sample size, and recruitment

The target population in this study was all medical students who were enrolled in an active medical education program in all Palestinian universities in the West Bank. The sample size needed for this study was determined using a sample size estimator that can be freely accessed at ([www.raosoft.com](http://www.raosoft.com)). In this study, the sample size was estimated for a maximum population of 5,000 medical students in all Palestinian universities with an active medical education program. The sample size was estimated at a 95% confidence interval. A 5% margin of error was tolerated. For this study, the sample size was 357 medical students. To ensure achieving the sample size, it was decided *a priori* that 550 medical students would be invited to participate in the study.

In this study, the inclusion criteria were: 1) being at least 18 years old, 2) being enrolled as a medical student in one of the Palestinian universities with an active medical education program, 3) being willing to respond to items in a questionnaire, and 4) willing to provide written informed consent. The medical students who did not agree to provide written informed consent were excluded from the current study. Participation was voluntary and the medical students who participated in this study were not offered any financial or academic incentives. The questionnaire was distributed through a point of contact in each university. The participants in this study were recruited using a convenience sampling approach. The point of contact explained the objectives of the study to the potential participants. Those who expressed willingness to participate were provided a copy of the questionnaire.

## The study tool

The study tool was a questionnaire that was developed from previous studies after an extensive review of the relevant literature ([Željana Bašić, Ivana Kružić, Ivan Jerković, Ivan Buljan, & Ana Marušić, 2019](#_ENREF_6); [Ijeoma J. Ibegbulam & Jacintha U. Eze, 2015](#_ENREF_26); [Lindahl & Grace, 2018](#_ENREF_39)). The questionnaire that was used in this study is provided in Supplementary Table S1. The questionnaire contained four sections. In the first section, the medical students were asked to provide their demographic and academic details like gender, academic/training stage/year, and grade point average (GPA). Additionally, the medical students were asked to self-rate their satisfaction with their academic achievement, satisfaction with their academic writing skills, satisfaction with their informational skills, and satisfaction with their ability to use citation managers using dichotomous rating (dissatisfied or satisfied). The medical students were also asked to indicate if they have had courses, workshops, or lecturers on plagiarism, ever used plagiarism-checking tools, and whether they have participated in a scientific paper or graduation thesis writing. In the second section, the medical students were asked to respond to a 12-item knowledge test. On each item, the medical students had to answer by either: true, false, or I don’t know. In the third section, the medical students were asked to express the extent of their disagreement or agreement on 8 attitude and 6 opinion/perspective items. On each statement, the medical students had to respond by either: strongly disagree, disagree, neutral, agree, or strongly agree. In the fourth section, the medical students had to express the extent of their agreement/disagreement with 8 strategies that can be used to curb plagiarism. Again, the medical students had to respond by either: strongly disagree, disagree, neutral, agree, or strongly agree.

## Testing of the tool

The tool was pilot tested before it was used in the larger study. Face validity was assessed by 8 panelists who were academicians/researchers with extensive experience in academia/research and medical writing (each had > 10 years and > 10 peer-reviewed scientific publications). The panelists were asked to rate each item in the tool using a Likert scale of 1-5 (1 = not suitable at all, 5 = very suitable). The items that were used in the study tool were rated as either suitable or very suitable by all the panelists.

To ensure the readability and comprehensibility of the questionnaire, the questionnaire was pilot tested among 15 medical students who did not participate in the larger study. The medical students were asked to respond to the questionnaire and provide their feedback on the readability and comprehensibility of each item included in the questionnaire. Some items were revised for clarity based on the feedback of the medical students who participated in the pilot testing.

The test-retest method was used to ensure the responses obtained using the questionnaire were stable over a short period. In this study, 30 medical students who did not participate in the larger study were asked to respond to the questionnaire twice. The two administrations were about 24 hours apart. Although a longer period should have provided more reliable results, some previous studies have assessed the test-retest reliability in less than 24 hours ([Jim et al., 2011](#_ENREF_32); [Paiva et al., 2014](#_ENREF_45)). Responses of the medical students in both administrations were correlated using Pearson’s correlations. It was decided *a priori* that a Pearson’s correlation coefficient (Pearson’s r) ≥ 0.80 would ensure the stability of scores.

To ensure item-relatedness, Cronbach’s alpha statistics were used. It was decided *a priori* that a Cronbach’s alpha ≥ 0.70 would be needed to ensure that items were adequately related.

To determine the number of components/domains under which the items in the questionnaire would be grouped, an exploratory factor analysis (factor loadings) was performed. The exploratory factor analysis assessed correlations between the items and the factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.91 (> 0.70) with a statistically significant Bartlett's test of sphericity (Chi-square = 8319.54 (p-value < 0.001). This indicated that the sample was adequate and sufficient to load on factors ([Tavakol & Wetzel, 2020](#_ENREF_54)). Additionally, this indicated that the variables were related. The number of components was determined using an Eigenvalue of ≥ 1. Based on the rotated component matrix, the items were grouped into: knowledge (12 items), attitudes (8 items), opinions/perspectives (6 items), and strategies/recommendations (8 items). The rotated component matrix is shown in Supplementary Table S2.

## Statistical analysis

The medical students were awarded 1 point for each correct answer. For each incorrect answer or I don’t know, the medical students were awarded 0 points. Points obtained for each knowledge item were summed (the possible sum of points could range from 0 to 12) and were transformed into percentages of correct answers (score (%) could range from 0% to 100%). Additionally, incorrect answers and I don’t know were grouped. Ratings of attitudes, opinions, perspectives, and agreement with the strategies/recommendations were summed and transformed into percentages (score (%) could range from 20% to 100%). The data obtained in this study were entered into IBM SPSS for Windows v.21.0. The absolute skewness and absolute kurtosis values were used to assess the data for normal distribution. The data were considered normally distributed when the absolute skewness was in the range of − 2.0 and + 2.0 and the absolute kurtosis was in the range of − 7.0 and + 7.0. Because the data were normally distributed, scores were expressed as mean ± standard deviation (SD). Associations between correct answers and the variables of the medical students were investigated using Chi-square tests. Differences in knowledge, attitudes, opinions, perspectives, and agreement with the strategies/recommendations scores were assessed using *t*-tests. Statistical significance was indicated by a p-value of < 0.05.

## Ethical considerations

The study adhered to the international ethical principles in the Declaration of Helsinki for research involving human subjects. This study qualified for an exemption by the Institutional Review Board of An-Najah National University because the data were anonymous, the study was not associated with any risk to the participants, and participation was voluntary.

# Results

When the responses of the medical students who participated in the pilot testing in both administrations were correlated, Pearson’s r was 0.94 (95% CI: 0.91 to 0.96). This high correlation coefficient indicated excellent stability of responses over a short period.

The Cronbach’s alpha of the 34 items (12 knowledge items, 8 attitudes items, 6 opinion/perspective items, and 8 views on strategies to curb plagiarism) was 0.93. The Cronbach’s alpha for the 12 knowledge items was 0.75 and for the views on strategies was 0.94. On the other hand, Cronbach’s alpha for the 8 attitude items was 0.95 and for the 6 opinion/perspective items was 0.92.

## Demographic and academic variables of the medical students

In this study, 474 of the 550 invited medical students completed the study tool, giving a response rate of (86.2%). Of the medical students, 254 (53.6%) were female and 229 (48.3%) were in their clinical phase (4th to 6th academic/training year). Detailed demographic and academic variables of the medical students who participated in this study are shown in Table 1.

## Knowledge of the medical students about the appropriateness of certain procedures when using the literature sources

In this study, less than half of the medical students correctly answered knowledge items 2, 3, 5, and 12. On the other hand, 373 (78.7%) medical students correctly answered item 6, and 386 (81.4%) medical students correctly answered item 8. Correct and incorrect answers to the 12 knowledge items are shown in Table 2. The detailed answers of the medical students on the 12 knowledge items with the correct answers are shown in Supplementary Table S3.

## Attitudes, opinions, and perspectives of medical students about plagiarism

In this study, more than 70% of the medical students agreed or strongly agreed on attitude items 1, 3, 6, and 8. These items had the highest mean scores. Similarly, more than 70% of the medical students agreed or strongly agreed on the opinion/perspective items 1, 2, and 3. These items had the highest mean scores. Detailed responses of the medical students on the attitude and opinion/perspective items are shown in Table 3.

## Strategies and efforts to curb plagiarism

In this study, more than 70% of the medical students agreed or strongly agreed on items 2, 5, 3, and 7. These items had the highest mean scores. Detailed responses of the medical students on the strategies to curb plagiarism are shown in Table 4.

## Associations between the demographic and academic variables of the medical students with the knowledge, attitudes, opinions/perspectives, and agreement on the strategies/recommendations to curb plagiarism

The mean score on the 12 knowledge items was 61.6% ± 39.1%, the mean score on the 8 attitude items was 79.4% ± 21.8%, the mean score on the 6 opinion/perspective items was 78.9% ± 21.7%, the mean score on the combined 14 attitude/opinion/perspective items was 79.2% ± 21.0%, and the mean score on the 8 strategies/recommendations items was 80.3% ± 21.6%. There was a strong and positive correlation between knowledge, attitudes, opinions/perspectives, and agreement on the strategies/recommendations scores. The correlation matrix is shown in Table 5. Bivariate analysis using *t*-tests showed that knowledge, attitude, opinion/perspective, combined attitude/opinion/perspective, and strategies/recommendations scores were significantly higher for the medical students who were in their clinical phase (4th to 6th academic/training year), who had a GPA of ≥ 3.0, who self-rated their satisfaction with academic achievement as high, who self-rated satisfaction with their academic writing skills as high, who self-rated satisfaction with their informational skills as high, who self-rated satisfaction with their ability to use citation managers as high, who have had received courses/workshops/lecturers on plagiarism, who have had used plagiarism checking tools, and who have had participated in a scientific paper/graduation thesis writing. Details of these differences are shown in Table 6.

# Discussion

## Summary of the key findings

Plagiarism continues to threaten academic integrity in different higher education institutions around the world ([Anderson & Steneck, 2011](#_ENREF_2); [Ismail, 2018](#_ENREF_27); [Javaeed et al., 2019](#_ENREF_30); [Juyal et al., 2015](#_ENREF_33)). For the first time, knowledge, attitudes, opinions, and perspectives of Palestinian medical students about plagiarism and the strategies/recommendations that can be used to curb this phenomenon were assessed. The key findings of the study included the identification of gaps in knowledge and a less-than-optimal attitude toward plagiarism among medical students. The study also reported the strategies/recommendations that the medical students highly agreed with. The study showed that knowledge, attitudes, opinions, perspectives, and agreement scores were highly and positively correlated. Associations between the demographic and academic variables of the medical students with the knowledge, attitudes, opinions, perspectives, and agreement scores were also reported. Educators and decision-makers in higher education and medical schools might use the findings reported in this study to increase awareness of medical students about plagiarism, improve attitudes, and use strategies/recommendations to combat plagiarism.

## Discussion and interpretation of the main findings

## Knowledge, attitudes, opinions, and perspectives about plagiarism

The findings of this study showed that less than half of the medical students did not know that they cannot copy and paste as much as they needed even after citing the source including their previous works, they should place quotation marks around the text that was directly quoted, paraphrased, and cite the source, and they needed to cite what they have heard in talks/lectures/presentations. These findings were consistent with those reported among university students in Croatia, Nigeria, Rwanda, and Saudi Arabia ([Ž Bašić et al., 2019](#_ENREF_7); [Clarke, Chan, Bukuru, Logan, & Wong, 2023](#_ENREF_11); [Ijeoma J Ibegbulam & Jacintha U Eze, 2015](#_ENREF_25); [Issrani et al., 2021](#_ENREF_28)). Except for knowledge of placing quotation marks around the text that was directly quoted, paraphrased, and citing the source, the knowledge of the medical students who participated in this study was higher in these areas ([Ž Bašić et al., 2019](#_ENREF_7)). On the other hand, students in Croatia had higher knowledge about using graphs, tables, and/or pictures and using sources found on the internet.

Commitment to ethical writing and publishing principles implied giving credit where credit was due ([Davis & Polatajko, 2015](#_ENREF_13); [Self & Brown, 2008](#_ENREF_52)). This would also apply when one wants to use what they have heard in lectures, talks, and/or presentations as well as when paraphrasing parts of the original text. In addition to citing the primary sources/authors, using pictures and graphs might also need written permission from the copyright holders ([Franzblau & Chung, 2012](#_ENREF_17); [Jambor et al., 2021](#_ENREF_29)). This would also apply to the images and figures that can be accessed through the internet. Taken together, these findings indicate that students should become aware of avoiding excessive copying and pasting from the works of others even when citing the authors or sources including those that can be found on the internet.

The findings of this study showed that the medical students reported less than optimally positive attitudes toward avoiding plagiarism as indicated by the extent of their agreement on the items. University students in Croatia reported a comparable extent of agreement on some of these items including using systems to detect plagiarism, not citing the sources used in their academic writing, and that one would learn less by verbatim copying the works of others ([Ž Bašić et al., 2019](#_ENREF_7)). On the other hand, the medical students who participated in this study reported a higher tendency to seek the help of their supervisors/advisors when having doubts about citation, citing primary sources, and seeking more knowledge about plagiarism compared to Croatian students. However, Croatian students had higher positive attitudes towards considering plagiarism as the theft of someone's ideas and works. The findings of this study indicated that the attitudes of medical students concerning considering plagiarism as theft of the ideas/works of others and as dishonesty need to be corrected ([Alhadlaq, Dahmash, & Alshomer, 2020](#_ENREF_1); [Shirazi et al., 2010](#_ENREF_53)). Probably, addressing these negative attitudes might help students avoid plagiarism and would improve their use of appropriate citations and giving credit where credit was due ([Davis & Polatajko, 2015](#_ENREF_13); [Self & Brown, 2008](#_ENREF_52)).

Knowledge scores positively correlated with attitudes, opinions, and perspectives scores. Previous studies have shown that knowledge of a certain phenomenon helped individuals develop more positive attitudes toward that phenomenon ([Alhadlaq et al., 2020](#_ENREF_1); [du Rocher, 2020](#_ENREF_14); [Poorolajal, Cheraghi, Irani, Cheraghi, & Mirfakhraei, 2012](#_ENREF_47); [Shirazi et al., 2010](#_ENREF_53)). The findings of this study showed that knowledge, attitudes, opinions, and perspectives scores were positively associated with academic/training year, GPA, satisfaction with academic achievements, writing skills, informational skills, using citation managers, receiving courses/workshops/lecturers on plagiarism, using plagiarism checking tools, and participating in a scientific paper/graduation thesis writing. The findings of this study were not surprising as medical students are expected to learn more and develop positive attitudes toward plagiarism as they advance further in their medical education/training and more engagements in research activities and/or complete more written assignments ([Fazilatfar, Elhambakhsh, & Allami, 2018](#_ENREF_16); [Heckler, Forde, & Bryan, 2013](#_ENREF_23); [Phyo et al., 2022](#_ENREF_46)). Additionally, the medical students who expressed high satisfaction with their writing skills, informational skills, used citation managers, and used plagiarism-checking tools should have the required skills to avoid plagiarism ([Landau, Druen, & Arcuri, 2002](#_ENREF_35)). Moreover, it was not surprising that the medical students who have received courses/workshops/lecturers on plagiarism and those who have participated in a scientific paper/graduation thesis writing had higher knowledge and attitude scores compared to their peers who did not receive courses and those who did not participate in a scientific paper/graduation thesis writing. Previous studies have shown that courses/workshops/lecturers on plagiarism and training sessions on using plagiarism-checking tools might help students avoid plagiarism ([Duff, Rogers, & Harris, 2006](#_ENREF_15); [Gunnarsson, Kulesza, & Pettersson, 2014](#_ENREF_20); [Naithani et al., 2022](#_ENREF_43); [Raj, Venkatachalam, Amaravati, & Baburajan, 2022](#_ENREF_48)). The findings of this study showed that the medical students believed that plagiarism had impacted the works/ideas of other members of the scientific/academic community and their knowledge-seeking behavior about plagiarism. These findings indicate that medical students might benefit from more courses/workshops/lecturers on plagiarism ([Gunnarsson et al., 2014](#_ENREF_20)). It is noteworthy mentioning that some interventions were not effective to reduce plagiarism ([Lynch et al., 2017](#_ENREF_40)). Probably, these futile interventions were hampered by a lack of understanding of what constituted plagiarism, inadequate skills in using plagiarism detection tools and citation managers, and perceived pressures to publish to secure future residency opportunities, tenured positions, and promotions ([Azam & Naeem, 2022](#_ENREF_3)). Taken together, these findings indicate that efforts to increase awareness about plagiarism should be coupled with improving scientific writing skills. Medical schools might organize tailored training sessions on scientific writing, using citation managers, using tools of information technology, and using plagiarism-checking tools. Medical students might also benefit from courses/workshops/lecturers on how to avoid plagiarism. Moreover, medical schools are recommended to encourage students to engage in conducting research and writing scientific papers. These efforts might help students avoid plagiarism ([Kattimani, Kujur, Nagarajan, & Zayabalaradjane, 2022](#_ENREF_34)).

## Strategies/recommendations to curb plagiarism

In this study, the majority of the medical students agreed that students should receive lectures/training on good study/research habits and skills. The extent of agreement on this strategy/recommendation was lower than that reported among students in Nigeria ([Ijeoma J Ibegbulam & Jacintha U Eze, 2015](#_ENREF_25)). Similarly, the majority of the medical students in this study agreed that educators/trainers should punish all cases of plagiarism. The extent of agreement on this strategy/recommendation was higher than that reported among students in Nigeria ([Ijeoma J Ibegbulam & Jacintha U Eze, 2015](#_ENREF_25)). Introductory lectures/seminars/workshops might be introduced during freshmen orientation programs. In a previous systematic review, lack of knowledge/awareness of research ethics, inadequate writing skills, and pressure to publish were identified as factors leading to plagiarism in academic writing ([Guraya & Guraya, 2017](#_ENREF_22)). Therefore, promoting knowledge/awareness and using rigorous plagiarism detection tools might help students avoid plagiarism. In this study, the medical students who received courses/lectures about plagiarism and those who reported using plagiarism-checking tools had significantly higher knowledge scores compared to the students who did not receive courses/lectures and those who did not use plagiarism-checking tools.

Previous studies have suggested balancing prevention and detection strategies with sanctioning policies can help curb plagiarism ([Dahl, 2007](#_ENREF_12); [du Rocher, 2020](#_ENREF_14); [Guraya & Guraya, 2017](#_ENREF_22)). In this study, more than half of the medical students agreed that students who were caught plagiarizing should fail the subject. The Dundee Polyprofessionalism Inventory was developed to identify the perceptions of faculty and medical students about the appropriate sanctions when lapses of academic integrity occur ([Roff, Chandratilake, McAleer, Dherwan, & Gibson, 2010](#_ENREF_50)). The inventory was used among medical students in different countries and variabilities in understanding professionalism and academic integrity were reported ([Babelli, Chandratilake, & Roff, 2015](#_ENREF_5); [Guraya, 2018](#_ENREF_21)). These variabilities resonated with background and cultural differences. Therefore, researchers have called for a unified code that might help preserve academic integrity ([Guraya, 2018](#_ENREF_21)). The findings of this study were consistent with those reported in previous studies on the zero-tolerance policies followed in many medical schools and higher education institutions on plagiarism ([Li & Casanave, 2012](#_ENREF_37); [Shirazi et al., 2010](#_ENREF_53)). However, a considerable percentage of students were reported to believe that self-plagiarism should not be sanctioned in the same degree as plagiarizing from others ([Babelghaith & Wajid, 2022](#_ENREF_4)). Therefore, detailed information on how to avoid plagiarism, including self-plagiarism, should be disseminated to the students. On the other hand, educators/trainers should attempt to balance workloads on students to allow them more time to do in-depth research. Previous studies reported that perceived pressures to publish to secure future residency opportunities, tenured positions, and promotions were identified as factors leading to plagiarism ([Azam & Naeem, 2022](#_ENREF_3)). Arguably, providing the students with sufficient time to conduct in-depth research might help them avoid plagiarism ([Guraya & Guraya, 2017](#_ENREF_22)).

In summary and based on the findings of this study, higher education institutions might combat plagiarism by providing periodic educational/training sessions on good research habits/skills for undergraduate and postgraduate students. Introductory lectures/seminars/workshops should also be included in freshmen orientation programs. The educational/training sessions should provide adequately detailed information on how to avoid plagiarism. Higher education institutions should also use rigorous plagiarism detection tools to check all submitted academic materials for plagiarism. The similarity might be returned to the students with feedback on how to avoid plagiarism. Educators/trainers in higher educational institutions should balance workloads and provide them with sufficient time to do in-depth research. Institutional policies should be adopted to deter plagiarism and promote scientific and academic integrity.

## Strengths of the study

The findings of this study should be interpreted considering several strength points. First, this is the first study to assess the knowledge, attitudes, opinions, and perspectives of Palestinian medical students on plagiarism in scientific writing. Additionally, the study also collected the opinions of medical students on the strategies that can be used to curb plagiarism. The study also identified the demographic and academic variables that were associated with high knowledge scores. The findings of this study could be informative to educators/trainers and other decision-makers in academia. Second, this was a multicenter study that was conducted in all medical schools in Palestine. It has been argued that findings reported from multicenter studies are superior to those reported from single-center studies. Third, the sample size used in this study was larger than the sample size needed for this study. Fourth, the sample included in this study was diverse in terms of demographic and academic variables. Taken together, this diversity and the large sample size should have improved the representativeness of the entire population of medical students in Palestine and the external validity of the findings of this study. Fifth, the tool used in this study was pilot tested for reliability using the test-retest method and Cronbach’s alpha statistics. This should have ensured the suitability of the tool used in this study.

## Limitations of the study

On the other hand, this study had some limitations. First, this study was conducted in a cross-sectional design. The findings reported from cross-sectional studies are reflective of the time window in which they were conducted. Second, this was an observational study. In this study, no intervention was used to improve knowledge or correct the attitudes of medical students toward plagiarism. Third, desirability bias should be expected in this study as the medical students might have provided more positive views, especially on the attitude and opinion section. Fourth, not all demographic and academic variables were associated with high knowledge about plagiarism. Finally, this study assessed the knowledge, attitude, opinion, perspective, and agreement of Palestinian medical students on strategies/recommendations to curb plagiarism. The multiple objectives aimed at this study might have negatively affected the depth of studying each construct. Future studies might be conducted to study each construct separately. This might allow a better understanding of each construct.

# Conclusion

Gaps in knowledge about plagiarism were identified among Palestinian medical students. The medical students who were in their clinical phase, had higher GPA, were satisfied with their academic achievement, writing and informational skills, used citation managers, received courses/workshops/lecturers on plagiarism, used plagiarism checking tools, and participated in scientific paper/graduation thesis writing were more likely to score higher in the knowledge test about plagiarism. Educators/trainers and other decision-makers in medical schools and higher academic institutions might use the strategies on which the students agreed to curb plagiarism. Future studies are still needed to determine if using these strategies could help curb plagiarism.

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