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Plagiarism and text-matching software: awareness, attitude and knowledge of research students in India

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Abstract

Higher educational institutions in India actively address plagiarism through policies, training, and library initiatives. Despite efforts, frequent plagiarism incidents leading to retractions suggest gaps in understanding policies or their effectiveness. This study explores research students' awareness of anti-plagiarism norms and differences by gender. Findings reveal misconceptions about unintentional versus intentional plagiarism. Notably, 31.1% of respondents didn't recognise content similarity as plagiarism. Interestingly, gender showed no significant difference in intentional plagiarism incidents. Awareness of policies correlates with text-matching software use. The role of university libraries in educating students on ethics and plagiarism prevention is crucial for fostering integrity in research and education.

Keywords: Academic misconduct, UGC regulations, Plagiarism, Text-matching software

Introduction

Scientific misconduct, as defined by The Office of Research Integrity (2023), includes "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or reporting research results." Plagiarism, a common form of scientific misconduct, is on the rise, posing a significant threat to the integrity of scientific endeavors (Gross 2016). The retraction has become a necessary response to address the widespread issue of plagiarism among authors, as detailed by Hesselmann and Reinhart (2021).Research on the awareness levels of students regarding plagiarism is essential to uphold academic integrity and prevent misconduct. Understanding students' comprehension of plagiarism policies and practices helps educators tailor educational interventions to address gaps in knowledge and reduce unintentional plagiarism. It also fosters a culture of ethical behavior where students understand the importance of originality and honesty in academic work.

Higher education institutions have implemented policies that engage students and faculty in countering Plagiarism (Parnther, 2022). Emphasising prevention over punishment is a guiding principle for all stakeholders of scholarly communication (Akbar

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and Picard 2019). In India, the University Grants Commission (UGC) introduced the "UGC (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018" to discourage plagiarism. The University Grants Commission, Indiahas introduced the University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018, which provide definitions for various terms, including academic integrity, author, commission, common knowledge, degree, departmental academic integrity panel, faculty, higher educational institution, notification, plagiarism, program, researcher script, staff, students, university, and year. According to these regulations, the use of technology is mandated to ensure that theses, dissertations, and publications are free of plagiarism at the time of submission. The UGC regulations have not specified whether free-to-use or proprietary TMS should be used.

Plagiarism encompasses various notions, including translations, unreferenced paraphrases, and even aspects of intent. There are various software available for plagiarism detection and prevention. However, labeling these software as text-matching tools is more accurate, as they cannot directly identify plagiarism. Wulf (2014;2018) has observed that it's crucial to understand that Text-matching software (TMS) or anti-plagiarism software doesn't conclusively identify plagiarism. Instead, they highlight text similarities that require assessment by an instructor to determine if plagiarism has occurred. Foltýnek et al. (2020) undertook a collaborative assessment of 15 web-based text-matching systems for plagiarism. The researchers from seven countries evaluated these systems across eight languages, assessing their effectiveness on single-source and multi-source documents and conducting usability tests. The results revealed that while some systems can help detect certain instances of plagiarism, they don't catch all cases and may incorrectly flag non-plagiarised content as problematic. Human judgement is mandatory for deciding if plagiarism has occurred.

The Regulations outlined certain guidelines for conducting similarity checks, indicating that certain elements should be excluded from consideration. These elements include quoted works, references, bibliography, table of contents, acknowledgments, and other forms of common knowledge.

The levels of similarity have been categorised into four levels:

- Level 0: Similarity up to 10%.
- Level 1: Similarity above 10 to 40%.
- Level 2: Similarity above 40 to 60%.
- Level 3: Similarity above 60%.

The Regulations 2018 advocate the establishment of a Departmental Academic Integrity Panel (DAIP) and an Institutional Academic Integrity Panel to handle and resolve cases of plagiarism within the university. The universities are empowered to take suo motu notice of plagiarism cases and initiate actions in accordance with the UGC Regulations. The repeated instances of Plagiarism at Level 3 will result in disciplinary actions, including the possibility of suspension or termination of the research students. It shows the seriousness with which instances of repeated plagiarism at higher levels should be treated by academic institutions. The UGC has further issued a public notice on

self-plagiarism to alert research students.The University Grants Commission (UGC) in India has introduced a mandatory 2-credit course on Research Publishing and Ethics (RPE) for all research students. Libraries organise workshops for students on all topics covered in RPE.

Automated tools such as Text-matching software (TMS) play a crucial role in reducing incidents of plagiarism. TMS checks content originality, mitigating issues arising from unintentional matches with already published research. A study by Daoud et al. (2019) revealed a decrease in plagiarism incidents among scholars with the use of TMS. However, it's essential to acknowledge the limitations of TMS, as highlighted by Nieto (2020). TMS may struggle to differentiate between plagiarism and similarities in content.

Addressing and containing plagiarism in higher education has become a significant challenge, as numerous researchers engage in unethical practices and employ various strategies to evade detection (Macdonald and Carroll, 2006). The widespread availability of information on the internet is a leading contributor to encouraging Plagiarism (Auer and Krupar, 2001; Granitz and Loewy, 2007; Sisti, 2007; Drisko, 2023). Despite the imposition of severe penalties for plagiarism, intentional or unintentional, under the UGC regulations 2018, the frequency of plagiarism cases has not decreased(Pradhan and Kumar, 2023). Indian students view the University Grant Commission's stringent guidelines as a positive initiative. However, effectively implementing these guidelines requires addressing the root causes of plagiarism.FarhaMukattash, andAl-Delaimy (2021) noted that such incidents have risen despite stringent regulations to stop plagiarism. Devi (2020) reviewed the trends in plagiarism prevention in research and discussed the various causes behind plagiarism and why students and research scholars resorted to it. It highlighted initiatives undertaken by bodies like the University Grants Commission (UGC) and governmental programs such as UGC CARE, Shodhganga, and Shodh Shuddhi to uphold research standards. It discussed the levels of plagiarism as quantified by the UGC in 2018 and provided a state-wise analysis of anti-plagiarism tools used by Indian universities. The findings indicate that 88.9% of Indian universities utilised anti-plagiarism tools to uphold academic integrity in higher education.

Further studies investigating students' opinions about UGC regulations are required to get a holistic view. There is a need to understand that despite strict regulations and training/workshops on plagiarism, the number of cases of plagiarism has not decreased. The study attempts to understand research students' awareness of UGC regulations on plagiarism, perception of different aspects of plagiarism, availability, use, and constraints of free TMS. This study also helps in understanding incidents of unintentional plagiarism due to a lack of awareness. The study will benefit libraries in implementing policies and training for deterring plagiarism by better understandingresearch students' perceptions of plagiarism, usages, and constraints in TMS. This study aims to enhance awareness and utilisation of TMS among research students'.

The structure of the rest of the paper is as follows: The review of literature subsection covers relevant literature and highlights up-to-date knowledge on the prevalence of plagiarism, causes and nature of plagiarism, gender differences on plagiarism and other issues, and research gaps in relevant areas. Adequate coverage of national and international research is ensured to provide a holistic overview of the scenario. The 'Research objective and methodology' subsection proposed outcomes of the research study to

achieve the mandate and aim of this research: population, sampling technique, and sample size for conducting the study. Designing the instrument and its implementation are also covered in this subsection. The next subsection, "Results," highlights the statistical analysis of data collected through the survey. Descriptive and inferential statistical techniques have been used in this study. This statistical analysis is strengthened by the relevant literature. The "discussion" component summarises outcomes and practical aspects of statistical analysis, its implications, and its application in minimising plagiarism. This section also elaborates on the limitations of the study and issues that can be covered in future studies. The last section of the research paper is the "conclusion."

Review of literature

Mostofa et al. (2021) analysed the research students' awareness of plagiarism. The findings revealed a high level of awareness among the researchers. The study proposed a structural model to understand the substantial measures researchers adopt to prevent plagiarism. Farha, Mukattash andAl-Delaimy (2021) evaluated students' understanding of plagiarism at the post-graduate level in pharmacy by administering a questionnaire to 103 students. The students responded that plagiarism was tantamount to stealing. Further, the study found that despite the students' understanding of plagiarism as misconduct, there was a high plagiarism rate among the students. The study advocated for strict policies to prevent plagiarism in education and research. Research students need to have good writing skills and an understanding of the importance of integrity in education and research to prevent plagiarism. The research students need to be educated about the various policies, rules, and regulations on integrity. Back-translation is a tactic employed by students to obfuscate the origin of a manuscript, wherein the original text is translated using language translation software (Jones and Sheridan 2015). Presenting translated work without properly acknowledging the source is categorised as Plagiarism (Jones 2009). The important factors for plagiarism are ignorance, paucity of time, and lack of paraphrasing skills. Awareness about plagiarism and the uses of TMS has helped deter Plagiarism (Mostofa et al. 2021). Adamu and Muhammad Dan-Iya (2020) conducted a survey and based on 153 responses, reported that using TMS has prevented research students from plagiarising and developed the ability to avoid misconduct.

Arabyat et al. (2022) studied the frequency of TMS usage in higher education institutions. Out of 173 faculty members, 78.1% have been using TMS. Turnitin and iThenticate were the commonly used TMS to check the originality of the content before sending it for publication. Nieto (2020) emphasised that plagiarism detection is a complex and multi-layered task entailing the identification of copied text and differentiating the real incidences of plagiarism from those that are not. Dong and Shi (2021) critically reviewed plagiarism detection features and limitations of the Grammarly software and discussed various ways to use the tool in academic research. The authors have highlighted a few limitations: a subscription is required to utilise the premium services, although it offers basic service with a free account. Grammarly assists in resolving writing issues such as spellcheck and occurrences of grammatical bugs but also lacks robustness in writing skills such as paraphrasing, quoting, or summarising. It has no interactive interface where students can post questions and interact with their peers. Thus, it does not encourage collaboration with associates. Kulkarni et al. (2021) critically analysed

technical aspects of TMS, such as language, data set availability, and highly sophisticated algorithms. While students may be aware of freely available anti-plagiarism software or text-matching tools, exercising caution and prudence in their use is crucial. There are notable downsides to relying on such free tools. For instance, these tools often operate with a smaller backend database, resulting in limited effectiveness in detecting plagiarism. Further, their utilisation of basic plagiarism detection algorithms may lead to detecting less similarity and overlooking subtle forms of plagiarism, such as paraphrasing. Furthermore, free versions typically offer limited features and lack customisation options commonly found in premium counterparts (Saravanan et al., 2023; Adithan and Surendiran, 2018). Privacy and security measures in freely available anti-plagiarism tools may not be foolproof. Students should avoid uploading personal or sensitive content onto the portals of such tools. Another drawback is the lack of robust user support for free software or tools. When encountering problems, users may not receive adequate assistance (Condurache and Bolboaca, 2022).

Devi (2020) conducted an in-depth examination of the prevailing trends and approaches aimed at preventing plagiarism in research, and investigated the underlying factors that lead researchers to engage in plagiaristic behaviour.The article highlighted that 88.9% of Indian universities are using TMS. The study recommended frequent organisation of plagiarism awareness programmes. Another study was conducted to compare the effect of workshops/ training held in virtual and physical modes on acquaintance and attitude of students on plagiarism. The findings revealed that both methods enhanced the students' understanding of Plagiarism (Nikjo et al. 2021).

Kumar and Mohindra (2019) surveyed 152 respondents from Punjab University and found that 60.5% of the respondents knew about the penalty imposed for different levels of plagiarism under "UGC Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions Regulations, 2018". Raj et al. (2022) conducted a cross-sectional study to examine the level of understanding and attitude towards plagiarism among undergraduate medical students in India through a semi-structured questionnaire. The findings revealed that the knowledge score fell in the poor category, and the attitude score was moderate. Kumar (2019) discussed methods to check the similarity of the contents and the repercussions of plagiarism detection under the UGC regulations 2018. The paper suggested measures to be taken before publishing articles to avoid plagiarism.

Mills (1994) termed unintentional plagiarism accidental when a researcher is not following the rules and guidelines for referring to academic material due to a lack of awareness and understanding. Accidental porlagiarism is more frequent when the researchers are non-native English language users. Vij, Makhdumi, and Soni (2009) defined unintentional plagiarism as encompassing instances such as quoting without proper acknowledgment, inadequate paraphrasing, and unfamiliarity with referencing and citation guidelines. Okaphor and Agbara (2022) emphasised that intentional or unintentional plagiarism acts as a destructive force, undermining academic integrity and ethical standards.

Gender and plagiarism

Numerous studies have explored gender differences in moral values and cheating behavior in academic contexts. While some experts argue that females demonstrate stronger

adherence to moral values than males (Bateman and Valentine 2010; Lento et al. 2018), others suggest that gender has minimal impact on morality and cheating behavior (Krawczyk 2012). Finn and Frone (2004) treated gender as a control variable when studying attitudes toward plagiarism and cheating. Research indicates that females generally hold more negative attitudes towards cheating than males (Whitley et al. 1999; Fisher and Brunell 2014), possibly due to societal expectations and childhood socialisation experiences (Gilligan 1982).

Apesteguia et al. (2012) found that females tend to exhibit higher ethical sensitivity and concern for others, contrasting with males, who often prioritise competitive self-achievement. Factors such as self-control, shame, and moral beliefs influence gender differences in cheating behavior (Gibson et al. 2008). Research shows that penalties may be more effective in deterring cheating among female students (Tittle and Rowe 1973), and demographic factors influence students' perceptions of Plagiarism (Hu and Lei 2015; Zhang et al. 2018). Jereb et al. (2018) reported significant gender differences in attitudes towards plagiarism, with females generally showing more negative attitudes.

The literature review underscores the complexity of plagiarism, the efficacy of TMS in prevention, and the nuanced relationship between gender and academic dishonesty. It provides a comprehensive foundation for understanding the current state of awareness, prevention measures, and ethical considerations in the academic landscape. There were several studies conducted on various aspects of plagiarism but didn't focus on the level of awareness in the context of UGC regulations, 2018, and its implementation in higher educational institutions.The other aspects were also not highlighted in other studiesthat are a part of the present study, such as the penalty of Plagiarism under UGC Regulations 2018 and the occurrence of unintentional plagiarism among the research scholars.

Research objectives

- To assess the research students' understanding about Plagiarism and unintentional Plagiarism.
- To investigate gender differences in the reported incidents of unintentional plagiarism.
- To ascertain the difference in the reported incidents of unintentional plagiarism across disciplines.
- To assess the research students' understanding of UGC Regulations 2018 on preventing Plagiarism and unintentional Plagiarism.
- To find the association between awareness of UGC regulations 2018 and committing unintentional plagiarism.
- To describe the research students' awareness about using Text-Matching Software (TMS).
- To find the association between awareness of UGC regulations 2018 and use of TMS.
- To investigate gender differences in the use of TMS.
- To describe the research students' awareness about the availability of free-to-use TMS.
- To investigate the gender differences in the awareness about the free-to-use TMS.
- To explore and examine the differences in the use of free TMS across disciplines.

The parameters under investigation exhibit a nominal or ordinal nature. Consequently, the authors employed non-parametric tests to examine the following null hypotheses.

Null hypotheses

The null hypotheses are aligned with the research objectives of the study. The literature review segments also revealed the importance of associating parameters covered in the null hypotheses with plagiarism and using TMS.

H01: There is no significant difference between male and female respondents (research students) in reporting incidents of unintentional plagiarism.
H02: There is no significant difference in the reported incidents of unintentional plagiarism across disciplines.
H03: There is no association between awareness of UGC Regulations 2018 and committing unintentional plagiarism.
H04: There is no association between awareness of UGC Regulations 2018 and the use of TMS.
H05: There is no significant difference between male and female respondents' (research students') use of TMS.
H06: There is no significant difference in awareness about free TMS among male and female research students.
H07: There is no significant difference in the use of TMS across disciplines.

All the null hypotheses are two-sided, and the level of significance is 5%.

Methodology

The study was designed on a questionnaire-based survey method. The questionnaire was a blend of close-ended and open-ended questions.

The questionnaire aimed to gather self-reported data from research students on their awareness and understanding of plagiarism and their opinions on various aspects of plagiarism. It sought to collect information on their experiences with text-matching software, including its usage and limitations. The questionnaire also explored their familiarity with the University Grants Commission (UGC) Regulations 2018 regarding plagiarism prevention. Furthermore, it investigated their knowledge of plagiarism prevention strategies and their perceived effectiveness.

The questions were designed to align with the research objectives and the null hypotheses formulated in the study. There were 25 closed-ended questions presented in the form of statements covering various facets of plagiarism, and respondents were asked to express their opinions or attitudes using a five-point Likert scale, ranging from 'Strongly Agree' to 'Disagree' with others options as 'Agree', 'Don't know' and 'Neutral'. The closed-ended questions focus on predetermined aspects guided by research objectives and literature review, thus limiting responses to issues selected by the authors.

Two open-ended questions were included to allow for a more open and diverse range of responses. These open-ended questions allowed respondents to express their opinions and suggestions on plagiarism freely. The formulation of these questions was grounded

in a thorough literature review, enhancing the validity of the questions and ensuring that they aligned with existing scholarship in the field.

The study population consisted of research students enrolled in PhD programmes at higher educational institutions in India. To the best of the authors' knowledge, no centralised repository or database in India contains information about students enrolled in Ph.D. programs in India. Consequently, the authors employed the Snowball sampling technique. The entire population consists of students in PhD programmes; hence, the subjects of the survey were homogeneous regarding their understanding of plagiarism. A sample of 450 subjects was selected for conducting the survey.

The survey was conducted using Google Forms; a link to this form was sent to individuals in the sample through e-mail. The questionnaire was inducted in January 2023, and responses were collected for the next three months. The data was analysed with the help of MS Excel and SPSS software.

The individuals enrolled in PhD programs are commonly referred to as researchers or research students in India; hence, these terms are used to address the subjects of this study. Under the research policy of the authors' employers, ethical approval was not obligatory for this study. Nevertheless, the authors maintain sensitivity and adhere to common ethical principles throughout the study's design, implementation, and reporting phases.

Results

Responses were received from 151 subjects out of a sample of 450; thus response rate was 33.5%. Almost all the male and female respondents claimed that they were aware of plagiarism. The survey reported that 96.0% of respondents shared that they were aware of plagiarism. Only 2 respondents expressed ignorance about concepts of plagiarism; thus, the gender of respondents makes no difference in the awareness about plagiarism (Table 1).

Table 2 reflects the research students' opinions on the different aspects of plagiarism.

The respondents were asked whether the similarity of contents with already published works is another form of plagiarism. A significant portion of respondents, 31.1%, did not regard content similarity as another form of plagiarism. On being asked if rephrasing or summarising without attributing to the source was equivalent to plagiarism, 86.2% of respondents opined that it was plagiarism.

To questions regarding the translation of one's own or others' content into different languages without giving credit to the source will be treated as plagiarism, a significant majority, 87.6% of respondents, viewed this as an act of plagiarism; further, 76.6% of

Table 1 Awareness about the Plagiarism

Gender	Awareness about the Plagiarism					Total
	Yes		No		Can't say	
	No.	%	No.	%		
Female	63	98.4	1	1.6	0	64
Male	82	94.3	1	1.1	4	87
Total	145	96.0	2	1.3	4	151

Table 2 Opinions of different aspects of plagiarism

Parameters	Extent of agreement with statements					Total
	Strongly Agree	Agree	Don't know	Neutral	Disagree	
Similarity and plagiarism are the same concepts	25	45	3	25	47	145
Paraphrasing or summarising without acknowledging the original source is Plagiarism	69	56	4	11	5	145
Translations of contents without acknowledgement is Plagiarism	79	48	6	10	2	145
Copying images or text of own published work is Plagiarism	53	59	3	15	15	145

respondents asserted that copying substantial portions of text and providing in-text citations was equivalent to plagiarism. Interestingly, 10.3% of respondents believed duplicating images, text, and one's previously published work was not plagiarism.

Unintentional plagiarism

The survey reported that 33.8% of respondents i.e. 51, never engaged in plagiarism, and 40.4% of respondents, i.e. 61, confessed that they committed plagiarism, but it was unintentional. However, these respondents felt that plagiarism is misconduct and should be avoided. The Pearson Chi-Square test examined the null hypothesis H01, i.e. There is no significant difference between male and female respondents in reporting incidents of unintentional plagiarism.

The significance level of the Chi-square test failed to reject the null hypothesis H01 ($X^2(1, n=112)=3.3, p=.069$); thus, there was no difference in male and female respondents in reporting incidents of unintentional Plagiarism, Table 3.

Unintentional plagiarism in different disciplines

Respondents who engaged in unintentional plagiarism were classified by their discipline. Among the respondents, 44.9% of Social Science research students, 43.3% of the Humanities, and 36.4% of the Management research students reported that they had committed unintentional plagiarism. Unintentional plagiarism was least prevalent in Science, Engineering, and Health Sciences disciplines. The difference in the occurrence of unintentional plagiarism across the disciplines (null hypothesis H02) was statistically examined with the Chi-square test.

The significance level of the Chi-square test failed to reject the null hypothesis (H02) ($X^2(3, n=112)=1.79, p=.616$); hence, there was no difference in incidents of unintentional plagiarism across the disciplines, as shown in Table 4.

Awareness of UGC regulations, 2018 against plagiarism

Universities must use TMS to check the originality of research theses before submitting for evaluation and award of the PhD degree as per the UGC Regulations 2018. The majority of respondents, 96.1%, claimed that they were aware of concepts of plagiarism, and 75.5% of respondents claimed they were mindful of UGC regulations on plagiarism.

Table 3 Occurrence of unintentional plagiarism in males and females

Gender	Occurrence of Unintentional Plagiarism					Total	
	Yes		No		Can't say		
	No	%	No	%			
Female	23	35.9	28	43.8	13	64	
Male	38	43.7	23	26.4	26	87	
Total	61	40.4	51	33.8	39	151	
Statistical parameters		**Value**		**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square		3.312		1	.069		
Continuity Correction[b]		2.655		1	.103		
Likelihood Ratio		3.324		1	.068		
Fisher's Exact Test						.087	.051
N of Valid Cases		112					

[b] computed for 2X2 table

Table 4 Occurrence of unintentional plagiarism across the disciplines

Discipline	Unintentional Plagiarism Committed					Total
	Yes		No		Can't say	
	No	%	No	%		
Social Sciences	35	44.9	27	34.6	16	78
Science/Engineering/Health Sciences	9	28.1	10	31.3	13	32
Management	4	36.4	6	54.5	1	11
Humanities	13	43.3	8	26.7	9	30
Total	61	40.4	51	33.8	39	151
Statistical parameters	**Value**	**df**		**Asymp. Sig. (2-sided)**		
Pearson Chi-Square	1.797[a]	3		0.616		
Likelihood Ratio	1.798	3		0.615		
N of Valid Cases	112					

[a] *.1 cell (12.5%) has an expected count less than 5. The minimum expected count is 4.55*

The study examined whether awareness about UGC regulation is acquired by reading the texts of the regulations or through other means, as shown in Table 5.

Among the respondents who claimed awareness of the UGC regulations, 57% had not read the full text. Such respondents might develop misconceptions about the provisions of regulations, with incomplete knowledge gained from alternative sources and without a thorough reading of regulations.

Table 5 Awareness and reading of full texts of UGC regulations, 2018

Awareness about UGC Regulations	Read the full text of the UGC Regulations, 2018				Total
	Yes		No		
	No.	%	No.	%	
Yes	49	43.0	65	57.0	114
No	0	0.0	37	100.0	37
Total	49	32.7	101	67.3	151

Table 6 Awareness of UGC regulations 2018 on plagiarism and the occurrence of unintentional plagiarism

Awareness of UGC Regulations	Engagement in Plagiarism Acts Unintentionally					Total
	Yes		No		Can't say	
	No.	%	No.	%		
Yes	42	36.8	53	46.5	19	114
No	10	27.0	19	51.4	8	37
Total	52	34.4	72	47.7	27	151
Statistical Parameter	**Value**		**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	.398		1	.528		
Continuity Correction	.162		1	.687		
Likelihood Ratio	.400		1	.527		
Fisher's Exact Test					.650	.345
N of Valid Cases	112					

Unintentional plagiarism due to ignorance

Among the respondents who were aware of UGC regulations, 36.8% had engaged in unintentional plagiarism. While 27.0% of those respondents who were ignorant of UGC Regulations had engaged in unintentional plagiarism, awareness of UGC Regulations did not help avoid unintentional plagiarism, as shown in Table 6.

The null hypothesis H03, i.e., there is no association between awareness of UGC regulations 2018 and committing unintentional plagiarism, was examined with the Pearson Chi-Square test. The significance level of the Chi-square test failed to reject the null hypothesis(H03) ($X^2(1, n=112)=0.398, p=.529$); thus, there was no association between awareness of UGC Regulations 2018 on plagiarism and committing unintentional plagiarism, as shown in Table 6.

Penalties levied for unintentional plagiarism

The UGC Regulations 2018 stipulate a penalty for plagiarism of more than 10%. The severity of plagiarism has been categorised into four levels to determine the appropriate penalty. Respondents were questioned about their awareness that unintentional plagiarism penalties were equivalent to intentional plagiarism, as indicated in Table 7.

A total of 64.9% of the research students knew intent played no part in determining the penalty for plagiarism. Research students, 13.2%, claimed that they were aware of UGC Regulations and felt that the penalty for unintentional plagiarism was not the same

Table 7 Penalty of plagiarism under UGC regulations 2018

Awareness about UGC Regulations	Penalties levied for unintentional plagiarism are the same as for intentional					Total
	Yes		No		Can't say	
	No.	%	No.	%		
Yes	74	64.9	15	13.2	25	114
No	12	32.4	10	27.0	15	37
Total	86	57.0	25	16.6	40	151

Table 8 Provision of penalty under UGC regulation helps in refining the quality of contents

Awareness about Plagiarism	Provision of penalty under UGC regulation helps in refining the quality of contents					
	Strongly Agree	Agree	Don't know	Neutral	Disagree	Total
Yes	41 (28.3%)	74 (51.0%)	10 (6.9%)	17 (11.7%)	3 (2.1%)	145

as for intentional plagiarism; 21.9% of these research students were unclear about the concept.

Respondents were asked whether the provision of penalty under UGC Regulations helped refine the quality of contents, Table 8.

Among the respondents, 79.3% felt that the provision of penalty under UGC Regulations would help refine the quality of content. In contrast, only three respondents rejected it, and 27 respondents had no idea or were neutral about this concept.

Use of TMS

The study found that 73.5% of respondents checked the work's originality before publication. It noted that the use of TMS to check the originality of the work was more prevalent among respondents who were aware of UGC Regulations; 78.9% of respondents knew about UGC Regulations, and 56.8% of others (not aware of UGC Regulations) used TMS to check the similarity as shown in Table 9.

The null hypothesis H04 i.e. There is no association between awareness of UGC Regulations 2018 and use of TMS, was examined with the Pearson Chi-Square test, as shown in Table 9. The significance level of the Chi-square test rejected the null hypothesis H04 ($X^2(1, n=138)=5.8, p<.05$); thus, the use of TMS increased with better awareness of UGC Regulations.

Among the respondents, 75.9% of males and 70.3% of females used TMS to check the originality of their work. The null hypothesis H05, i.e., There is no significant difference between male and female respondents in using TMS, was examined with the Pearson Chi-Square test, as shown in Table 10.

The significance level of the Pearson Chi-square test failed to reject the null hypothesis (H05) ($X^2(1, n=151)=0.58, p=.44$); there was no difference between males and females in using TMS.

Table 9 Use of Text Matching Software (TMS) with awareness of UGC regulations

Awareness about UGC Regulations	Use of TMS to check the originality of the work					Total
	Yes		No		Can't say	
	No.	%	No.	%		
Yes	90	78.9	16	14.0	8	114
No	21	56.8	11	29.7	5	37
Total	111	73.5	27	17.9	13	151
Statistical Parameter	**Value**	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**	
Pearson Chi-Square	5.806	1	.016			
Continuity Correction	4.646	1	.031			
Likelihood Ratio	5.287	1	.021			
Fisher's Exact Test				.022	.019	
N of Valid Cases	138					

Table 10 Difference in males and females in using TMS

Gender	Use of TMS to check the originality of work				Total	
	Yes		No			
	No	%	No	%		
Female	45	70.3	19	29.7	64	
Male	66	75.9	21	24.1	87	
Total	111	73.5	40	26.5	151	
Statistical Parameter	**Value**		**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	.583		1	.445		
Continuity Correction	.333		1	.564		
Likelihood Ratio	.580		1	.446		
Fisher's Exact Test					.461	.281
N of Valid Cases	151					

Awareness of free-to-use TMS software

In this study, 47.0% of participants were not aware that TMS was accessible for free. Among the male and female respondents, 53.1% and 52.9%, respectively, were aware of the availability of free-to-use TMS (Table 11).

The null hypothesis H06, i.e., There is no significant difference in awareness about free TMS among male and female research students, was examined with the Pearson Chi-Square test. The significance level of the PearsonChi-square test failed to reject the null hypothesis H06 ($X^2(1, n=151)=0.001, p=.976$); thus, there was no difference in awareness about free TMS among male and female respondents.

Use of free TMS in different disciplines

The use of free TMS is the most prevalent in the discipline of Management, with 72.7% of respondents using free TMS, while its use was the least prevalent in the discipline of Science/Engineering/Health Sciences, with only 43.8% of respondents using free TMS.

Table 11 Difference in awareness about free TMS among males and females

Gender	Awareness about the availability of free-to-use TMS software				Total	
	Yes		No			
	No.	%	No.	%		
Female	34	53.1	30	46.9	64	
Male	46	52.9	41	47.1	87	
Total	80	53.0	71	47.0	151	
Statistical Parameter	**Value**		**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	.001		1	.976		
Continuity Correction	.000		1	1.000		
Likelihood Ratio	.001		1	.976		
Fisher's Exact Test					1.000	.554
N of Valid Cases	151					

Table 12 Use of free TMS across the disciplines

Discipline	Free TMS used in different disciplines				Total
	Yes		No		
	No	%	No	%	
Social Sciences	42	53.8	36	46.2	78
Science/Engineering/Health Sciences	14	43.8	18	56.3	32
Management	8	72.7	3	27.3	11
Humanities	16	53.3	14	46.7	30
Total	80	53.0	71	47.0	151
Statistical Parameter	**Value**	**df**			**Asymp. Sig. (2-sided)**
Pearson Chi-Square	2.841	3			.417
Likelihood Ratio	2.918	3			.404
N of Valid Cases	151				

The null hypothesis H07, i.e., There is no significant difference in the use of TMS across disciplines, was statically examined using the PearsonChi-square test, as shown in Table 12.

The significance level of the Pearson Chi-square test failed to reject the null hypothesisH07 ($X^2(3, n=151)=2.84, p=.47$); thus, there was no difference in the use of free TMS across the disciplines.

Discussion

In exploring plagiarism awareness among research students, this study challenges prior findings, particularly those suggesting gender disparities in understanding plagiarism. Contrary to Yasami and Yarmohammadi (2014), who indicated that plagiarism is more common among male students, our study found no significant gender difference in

awareness. Overall, 96% of respondents were aware of plagiarism, with slightly higher awareness among females.

Ethical writing practices are crucial in academia, where the acknowledgment of original ideas and sources is essential. Among the respondents, 87.6% recognized that copying text without citation, including from different languages, constitutes plagiarism, and 76.6% agreed that using large chunks of text with citations is also plagiarism. There was consensus that paraphrasing and translation without attribution are plagiarism. However, 31.1% failed to distinguish between similarity and plagiarism, a trend also observed by Memon (2020), where 85.5% of students struggled to differentiate the two. Further, 47% were unaware of freely available text-matching software (TMS). In line with Ruslan et al. (2020), 86.2% believed that rephrasing without attribution is plagiarism, yet many students relied on synonyms to avoid detection due to weak paraphrasing skills.

The study revealed that 25% of respondents considered free plagiarism detection software (PDS) inferior to paid TMS, with no gender difference in awareness of free TMS. Awareness of UGC regulations has improved the use of these tools. After becoming familiar with regulations, students realized their prior actions could be categorized as unintentional plagiarism, highlighting the importance of education and training. Staner (2018) emphasized that awareness and training, particularly on TMS, reduce unintentional plagiarism.

While 64.9% of students understood that penalties for unintentional plagiarism are the same as for intentional plagiarism under UGC regulations, many held misconceptions, believing that unintentional plagiarism carries lesser penalties. Still, 79.3% believed that penalties improve the quality of academic content, supporting the findings of Abbas et al. (2021), who noted that university policies effectively control plagiarism.

Somers et al. (2023) emphasized the potential of tools like Assignment Watch, which help monitor content uploaded on file-sharing websites. This software aids in early detection, allowing instructors to take prompt action, with field tests demonstrating a reduction in plagiarism cases after implementation.

The availability of free TMS has allowed students to scrutinize their work without incurring subscription fees. However, workshops are necessary to raise awareness of their limitations. Students must understand that TMS often retains a copy of submitted documents, as noted by Ledwith and Risquez (2008) and Foltynek et al. (2020). Marjanović, Tomašević and Živković (2015) have suggested that organizations should use commercial antiplagiarism software rather than relying on free versions.

Despite improved awareness of plagiarism regulations, intentional plagiarism persists. The study's findings, showing increased awareness yet continued cases of intentional plagiarism, suggest that research students need to recognize their ethical responsibilities in fostering academic integrity. Efforts to raise awareness, particularly about the moral dimensions of research integrity, are essential (Staner, 2018).

Respondents, particularly those familiar with UGC regulations, are increasingly proactive in using TMS before publication. This demonstrates how awareness of regulations encourages students to adopt tools and practices that safeguard the originality of their work. However, the study noted disciplinary differences in TMS usage, with less frequent use in Science, Engineering, and Health Sciences. This aligns with Blecic et al. (2022), who found that academic discipline influences perceptions of academic integrity.

The study also identified a gap between perceived and actual knowledge of UGC regulations. Many students expressed confidence in their understanding of plagiarism but had not read the regulations thoroughly, leading to misconceptions. For example, substantial numbers believed that similarity and plagiarism are the same, or that self-plagiarism (reusing one's previously published work) is not a violation. Eret and Gokmenoglu (2010) similarly observed that misunderstandings about plagiarism contribute to students engaging in misconduct.

Orientation programs and workshops are necessary to address these knowledge gaps, alongside the provision of literature on best practices in research integrity. Libraries and academic institutions should actively disseminate information on plagiarism policies to maintain research standards. Moreover, students must exercise caution when relying on free anti-plagiarism software, as these tools often lack comprehensive databases, privacy protection, and customer support (Saravanan et al., 2023; Adithan and Surendiran 2018). Ultimately, awareness, education, and appropriate tool usage are critical to promoting academic integrity.

The study underscores the need for ongoing education and awareness about plagiarism, particularly the use of TMS, to ensure the integrity of academic research. Workshops, orientation programs, and access to updated tools will empower research students to avoid plagiarism and uphold ethical writing standards.

Recommendations for future

It is recommended that future investigations be conducted to assess the efficacy of initiatives designed to enhance awareness and compliance with regulations governing academic honesty and rigor, as well as the implementation of anti-plagiarism software in educational and research settings Longitudinal studies should assess how awareness levels and attitudes toward plagiarism evolve over time as students conduct and publish their research. Qualitative research is essential to understand students' perceptions of plagiarism. Future studies could explore how technological advancements influence students' attitudes towards plagiarism. Further, research should examine how policy implementation correlates with instances of plagiarism and how age or experience affects attitudes toward plagiarism. Furthermore, conducting in-depth analyses of proprietary software and free Text-Matching Systems (TMS) would illuminate their respective advantages and disadvantages.

Research on faculty awareness of plagiarism is crucial for ensuring consistent application of standards across courses and disciplines. It enables institutions to provide necessary support and training to faculty members, equipping them to teach about plagiarism and accurately assess student work effectively. Ultimately, such research maintains fairness in evaluation processes and upholds the educational values of integrity and scholarly rigor.

Conclusion

This study has explored the awareness, attitudes, and practices concerning plagiarism among research students enrolled in PhD programs at higher education institutions in India. The findings offer valuable insights into perceptions of plagiarism, the use of TMS, and gender-based differences in awareness and engagement in plagiarism.

Most respondents displayed a strong awareness of plagiarism, reaching a consensus on critical aspects such as recognising the equivalence of similarity and plagiarism, identifying paraphrasing without acknowledging as plagiarism, and translations without attribution as a form of plagiarism. Incidents of plagiarism detection and retractions have increased in recent years, primarily attributed to the widespread availability of TMS. However, using thesaurus and auto-translation software/tools has also contributed to plagiarism by enabling the alteration of original texts to evade detection by text-matching software. Utilising TMS and writing/documentation tools has both advantages and disadvantages.

The study highlighted the widespread use of TMS to verify the originality of work. Analysis revealed a significant association between awareness of institutional regulations on anti-plagiarism and the use of TMS. The use of TMS increased with a better understanding of plagiarism regulations, underscoring the importance of educational and training initiatives to raise awareness about UGC Regulations on plagiarism. Gender-based differences in awareness of freely available TMS were examined, with results indicating equal access to information about the availability of free TMS across genders.

The study observed that despite the increased use of TMS, instances of plagiarism have not decreased. Despite the severe penalties outlined in the UGC Regulations 2018, plagiarism cases persist. This suggests that regulations on anti-plagiarism and technological solutions alone are insufficient to combat plagiarism; libraries and institutions must also educate research students about the legal, social, and moral implications of plagiarism.

Upon becoming acquainted with plagiarism regulations and related aspects, research students recognised that their past actions could be classified as unintentional plagiarism. Therefore, training and awareness programs regarding plagiarism and using TMS can help minimise unintentional plagiarism.

The library staff can aid faculty members in staying informed about new technologies and strategies for detecting and preventing plagiarism. The university libraries play a crucial role in fostering a culture of avoiding plagiarism. Recognising their special responsibility, these libraries may actively promote the use of LMS and practices to avoid coping with texts without acknowledging the source through sensitisation sessions and workshops. These sessions serve as a platform to enlighten students about the detrimental effects of plagiarism on both their education and the broader research community.

University libraries play a crucial role in preventing various forms of misconduct, including plagiarism, and fostering a culture of honesty in education and research. They offer access to extensive information resourcess, ensuring that students and research students have ample relevant materials to explore, comprehend, and use in their own work. Libraries actively contribute to raising awareness and sensitising students to the concept of plagiarism by providing education, support, and counseling.Library professionals with advanced education levels are more actively involved in managing plagiarism within university libraries. Libraries frequently conduct information literacy programs/awareness sessions to educate and sensitise individuals on effective methods for searching, evaluating, and using accurate and authentic information. The awareness sessions are also organizedto address the concept of plagiarism, explain its

consequences, and provide guidance on utilising anti-plagiarism and reference management tools. Universities also have integrity and ethics offices whose personnel are responsible for sensitising research students to issues of ethics and plagiarism. In collaboration with the ethics office personnel, the library staff can play a significant role on university campuses in raising awareness among research students about the seriousness of plagiarism.

Abbreviations

UGC University Grants Commission
TMS Text-Matching Software
SPSS Statistical Package for the Social Sciences

Supplementary Information

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Supplementary Material 1.

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Declarations

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