



Taxonomy of Research Misconducts: A Conceptual Analysis

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Abstract

Any scientific research not only follows systematic steps and procedure but also encompasses research ethics, which is very essential for every researcher to be aware of. The Committee on Publication Ethics (COPE) has therefore issued a “research code of conduct” and advises the researcher and editors how to manage the cases of research and publication misconduct. Ethical standards given by ethics committee refrains the researchers’ involvement in doing dishonest practices during research work. Unfortunately the detrimental attitude towards publishing the paper quickly and improve academic score has piloted to unethical practices in scientific research. Violation in the principles of research integrity results fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results which is considered as research misconduct in scientific research. The present study aims to furnish different taxonomy of research misconduct with assisting the review of related literature. Besides, this article will hope to minimise the dopiness and anxiety of early career researcher and help them to keep away from different misconduct or wrong doing in research practices.

Key words: Fabrication, Falsification and Plagiarism (FFP), Ethical Approval, Missing Data, Informed Consent, Post hoc analysis, Authorship Issues, Redundant Publication, Conflict of Interest and Salami Slicing

Introduction

Integrity of researcher is very essential for the quality and credibility of research. Researchers have notable social and moral responsibility to acknowledge the standards prescribed by the ethics committee. Research misconduct, is characterized by the lack of adherence to certain scientific norms. There is no uniform internationally recognized definition of research misconduct. The Office of Research Integrity defines research misconduct as “fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results (The Office of Research Integrity 2016; Yadav & Singhal, 2022). Other definitions are broader and include types of wrongdoings, such as intentional research protocol violations, falsification of a resume, inappropriate assigning of authorship, and not declaring a conflict of interest (Broome et al. 2005; Buzzelli 1993). Research misconduct is devastating to research. Research misconduct not only damages the reputation of research and wastes time and money (Martinson et al., 2005). The prevalence of research misconduct has been estimated to 2% (fabrication and falsification) and 1.7% (plagiarism) in meta-analyses of several surveys (Fanelli, 2009; Pupovac & Fanelli, 2015). A study from Nigeria revealed that 68.9% of investigators admitted to at least one of eight listed forms of scientific misconduct (Okonta and Rossouw, 2013). In a follow-up report, these authors from Nigeria showed that more than half of the respondents were aware of a colleague who had committed misconduct defined as “non-adherence to rules, regulations, guidelines and commonly accepted professional codes or norms” (Okonta and Rossouw, 2014).

A study from India determined the extent of occurrence of misconduct in publications amongst biomedical researchers. Out of the 155 respondents, 65.1% reported the offering of gift authorship; 56.7% had knowledge of an individual who altered or fabricated data; and 53.5% observed plagiarism (Dhingra and Mishra 2014). Palla & Singson (2022) reported that the top three influencing factors for scientific misconduct were unavailability of adequate funds (35%), pressure from research supervisors (29%) and desperation to publish articles (25%). Sen et al.(2016) found that the overall knowledge about plagiarism was low among undergraduate medical students. Palla & Singson (2022) reported that the top three influencing factors for scientific misconduct were unavailability of adequate funds (35%), pressure from research supervisors (29%) and desperation to publish articles (25%). The participants had witnessed research misconduct in different forms i.e., data fabrication, falsification, and plagiarism. Awasthi & Ranjan, (2019) concluded that research scholars are partially aware of the research ethics and need some more counselling on this ethical education. It is also found that those with inadequate knowledge about plagiarism tend to have permissive attitudes towards plagiarism as well as less critical of this practice. Suseela & Uma (2017) examined a study of users’ perception at the University of Hyderabad. The survey result indicated that around 80 percentages of respondents were aware of the concept, functionality features of plagiarism detection tools. 80 to 90 percentages agreed that implementing plagiarism detection tools were satisfied with the information and screening services provided by the library. Severe research misconduct (such as FFP) and QRP are fundamental challenges, thus, there is broad agreement that research integrity is crucial for the quality of and trust in research (Bosch et al., 2012; Forsman, 1999; Neill, 2006).

Taxonomy of Research Misconduct

Terminology	Meaning
Fabrication	Fabrication means making up research result or data and reporting them as true. Fabrication commonly occurs when the researcher fills out the experiment with assumed data without collecting the data from the field (Kang & Hwang, 2020; Yadav & Singhal, 2022).
Falsification	Falsification is the changing or exclusion of research result or data to support hypotheses, assertion, other data etc. It is changing some parts of research process which let the result more significant, relevant and sensational than they are in reality (Yadav & Singhal, 2022).
Plagiarism	Plagiarism is using another's ideas, information without giving appropriate credit to the authors. In other words, it means the practice of taking someone else's work or ideas and passing them as one's own (Dar, Lone & Shaingojri, 2022; Kang & Hwang, 2020; Suseela, 2016).
Failure to get ethical approval	Ethical approval is the permission from registered ethics committee to collect data from human participant protecting their dignity, rights, safety and welfare. Collecting data from human participant without ethical is a serious misconduct in scientific and human research. (Smith, et al., 2004)
Not admitting that some data are missing	Missing data occurs due to miss consultation with participants, refuse to take participate by some participants and subject mortality during the course of experiment and longitudinal studies. Not admitting missing data by the researcher causes serious problem in conducting and generalizing research findings (Pasgett, Skilbeck & Summers, 2014).
Conducting research on human without informed consent	Informed consent must have been obtained from registered ethics committee to produce materials about the participants if there is any possibility to recognize the individuals. Conducting research on humans without informed consent is unethical (Sengupta & Honavar, 2017).
Publication of Post hoc analysis without declaring it	Post hoc analyses are conducted to indicate exactly where statistically significant differences exist after the declaration of ANOVA results or after declaration of rejecting the null hypothesis. Publication of post hoc analyses without declaring the significant result is considered as research misconduct.
Authorship Issues	Authorship in research publication means the one who has produced considerable intellectual contribution to the published work (Elsevier, 2017). It creates a serious issue when the researcher approach credit to someone who is not contributed or qualified as an author or not giving credit or removing someone deserving from the authorship. (Marcovitch, 2007)
Redundant publication	Redundant or duplicate publication is publication of a paper that overlaps substantially with one already published without giving proper credit to the previous publication (Marcovitch, 2007).
Conflict of interest refers	Conflict of interest refers to the situation in which an individual give prior preference to his/her personal interest and liability over his/her duties and responsibilities as a researcher to gain some financial benefits from the research work (AAMC, 1990).
Salami slicing	Salami slicing is publishing two or more papers by segmenting or breaking up a large study into small parts (Smolcic, 2013). Authors try to slice the study by sharing the hypotheses, methodology and population in different small papers which is not acceptable in scientific research (Elsevier, 2017).

Fabrication

Fabrication is one of the most severe violations of research integrity. It is considered serious research misconduct. Falsification is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record (Kang & Hwang, 2020). In other words, fabrication means making up research result or data and reporting them as true (Yadav & Singhal, 2022). Here the researcher tries to report false data without collecting data from the field (Martyn, 2003). Fabrication commonly occurs when the researcher fills out the experiment with assumed data without collecting the data from the field. Fabrication of data is common for both the academic and scientific research studies. Several reports of fabricated data have been outlined by different editors and publishers across the world. Yoshitaka, a Japanese researcher and Fujii, a renowned associate professor of anaesthesiology were found to have fabricated data in their study (Pellegrini, 2018). The act of fabrication can be a result of lack of remuneration or fund to carry out field workers in research, lack of institutional, social and political support to collect data from the field and conservative attitude of the researcher to collect data for saving money (Kang & Hwang, 2020; Gerrets, 2016).

Falsification

Falsification is the changing or exclusion of research result or data to support hypotheses, assertion, other data etc. Falsification involves misrepresentation of the research by changing data or results or by tampering with equipment, research methods, or materials (Yadav & Singhal, 2022). It is changing some parts of research process which let the result more significant, relevant and sensational than they are in reality (Ling, 2018). Fabrication is to making up non-existing data or result while falsification is to edit, add, remove and alter result or data (Martyn, 2003).

Plagiarism

Plagiarism is illegitimate use of another's intellectual property. MLA Handbook for Research paper writers defined plagiarism as a "False presumption of Authorship". It is using another's ideas, information without giving appropriate credit to the authors (Dar, Lone & Shairgojri, 2022; Kang & Hwang, 2020). Plagiarism means the practice of taking someone else's work or ideas and passing them as one's own (UGC Regulation, 2018). Obviously, it is dishonesty and the disrespectful attitude of the individual/s towards originality of the creation, thought and content, and also it is a threat to the original identity of the creator of the work, when someone else intentionally copies without giving credit to the original work (Suseela, 2016).

Types of Plagiarism

- **Complete plagiarism/ intellectual theft:** Submit work under one's name when somebody else has created it.
- **Source-based plagiarism:** Reference a source that is incorrect or does not exist i.e. a misleading citation. May also occur when the author cites only the primary source without citing the secondary source from where information was obtained.
- **Verbatim plagiarism:** Copy word-to-word from original work without quoting & citing it.
- **Self-plagiarism:** Reuse significant portions of own previously published work without attribution.
- **Paraphrasing plagiarism:** Use someone else's writing with some minor changes in the sentences (using synonyms) and using it as one's own.
- **Mosaic/patchwork plagiarism:** Interlay someone else's phrases or text within own work.

It is a serious research misconduct and professional violation. Therefore, it is important to give appropriate credit to the author or the source. Acknowledge is the right way to provide credit to the original author. In case of verbatim or text plagiarism authors name must be enfolded in quotation and by providing citation to its origin (Yadav & Singhal, 2022).

Failure to get Ethical Approval

Ethical approval is a very important component of research process. This approval must be obtained before data collection and approaching the human participants to provide information (Gadhade, Hiray & Balaraj, 2020). The main purpose of ethical approval is to protect the dignity, rights, safety and welfare of both the researcher and the participants involved in the research process. By obtaining the ethical approval the researcher manifest that he/she has accepted the ethical standards of conducting research.

Sometimes researchers are collecting data from the research site involving human participants without obtaining ethical approval certificate from the concerned authority. Collecting data from human participants without approval is a big threat to the dignity, safety and welfare of both the researcher and the participant. Collecting data without approval is considered as serious research misconduct (Smith et al., 2004). Ethical approval from registered ethics committee certifies the responsible conduct of research, confidentiality and justice of the subject and taking care of the autonomy of the researcher for conducting the research (ICMR, 2017).

Not Admitting that some Data are Missing

Missing data is very common in research particularly research in humanities. It occurs due to miss consultation with participants, refuse to take participate by some participants and subject mortality during the course of experiment and longitudinal studies. Different statistical techniques have been used for dealing with the issues of missing data but sometimes these statistical techniques fail to address impact of missing data (Allison, 2002; Enders, 2010; Graham, 2012)

Although treating missing data is usually not the focus of a substantive study but not admitting that some data are missing for the study is considered as a serious research misconduct which causes serious problems in conducting and generalizing the research findings (Padgett, Skilbeck & Summers 2014). First, missing data can introduce potential bias in parameter estimation and weaken the generalizability of the

results (Rubin, 1987 ; Schafer, 1997). Second, ignoring cases with missing data leads to the loss of information which in turn decreases statistical power and increases standard errors (Peng, et al. 2006). Missing data therefore has the potential to influence analysis in a number of ways. Clearly, where there is a relatively large amount of missing data and only the complete cases are analysed, the sample size may be seriously reduced. This results in a loss of power, leading to increased risk of Type II errors, whereby meaningful differences are missed (McKnight et al., 2007). Finally, most statistical procedures are designed for complete data (Schafer and Graham, 2002). Before a data set with missing values can be analyzed by these statistical procedures, it needs to be edited in some way into a “complete” data set. Failing to edit the data properly can make the data unsuitable for a statistical procedure and the statistical analyses vulnerable to violations of assumptions.

Conducting Research on Humans without Informed Consent

As per the guidelines of Drugs and Cosmetics Rules-2005, Government of India, it is compulsory to get approval from DCGI (Drugs Controller General of India) registered ethics committee before starting a drug trial. It is also mandatory to inscribe clinical trial with the Clinical Trials Registry of India before starting clinical trials with human participants. Informed consent is essential for the research of humanities. Indian Council of Medical Research (ICMR) is also outlined ethical approval of ethics committee before conducting medical studies in India (Sengupta & Honavar, 2017). Some journals reported that consent must have been obtained to produce materials about the participants if there is any possibility to recognize the individuals (Marcovitch, 2007; Padgett, Skilbeck & Summers 2014).

Obtaining informed consent from all the participant of the study is very critical but it should not be treated lightly by the researcher. The authors should be aware about the guidelines issued by the DCGI and ICMR for human clinical research. Different authorities have issued informed consent form which should be adopted by all researchers in India (Sengupta & Honavar, 2017). Bain, Ebuenyi, & Noubiap (2022) in their study concluded that over 41.7% of the respondents had ever conducted a study involving human research subjects without prior ethical approval. Major challenges in obtaining ethical approval were: too much bureaucracy, ethical approval application cost and unduly long review turnaround in receiving feedback and decisions.

Publication of Post hoc Analyses without Declaring it

The F test used in analysis of variance (ANOVA) is called an omnibus test because it can detect only the presence or the absence of a global effect of the independent variable on the dependent variable (Williams & Abdi, 2010). The results of F-test are indicative of statistically significant results among the four groups. Exactly what groups are different or where the statistically significant differences lies are not explained in ANOVA results. Further analysis is necessary (Balkin, 2008). Post hoc analyses are the statistical tests conducted to indicate exactly where statistically significant differences exist. They are only conducted when ANOVA results indicated statistical significance i.e. post hoc analysis is conducted with the declaration of rejecting the null hypothesis. The researcher would declare that at least one population mean differed but did not specify how so. Publishing post hoc analysis without declaring the hypothesis will considered as unethical practice in conducting reasonable research.

Authorship Issues

Authorship is the process of deciding whose names belong on a research paper. In many cases, research evolves from collaboration and assistance between experts and colleagues. Some of this assistance will require acknowledgement and some will require joint authorship. Responsible authorship practices are an important part of research. Each person listed as an author on an article should have significantly contributed to both the research and writing (Marcovitch, 2007). In addition, all listed authors must be prepared to accept full responsibility for the content of the research article. Authorship in research publication means the one who has produced considerable intellectual contribution to the published work (Elsevier, 2017). It creates a serious issue when the researcher approach credit to someone who is not contributed or qualified as an author or not giving credit or removing someone deserving form the authorship (Bebeau, & Monson, 2011).

Bain, Ebuenyi, & Noubiap (2022) concluded that the practices of research team to include authors with no or limited significant contribution to the research work is frequent in health and life sciences.

Four criteria must all be met to be credited as an author:

1. Substantial contribution to the study conception and design, data acquisition, analysis, and interpretation
2. Drafting or revising the article for intellectual content
3. Approval of the final version
4. Agreement to be accountable for all aspects of the work related to the accuracy or integrity of any part of the work

Guest Authorship

The author has not contributed to research or writing but his/her credential can increase the credibility of the published work. The most common unethical practice is to include the name of the Ph.D. Advisor or Head of the department as an author (Harvey, 2018). It is the expectation and hope of the researcher that guest authorship will increase the impact and liability of the publication (Harvey, 2018). Guest authors are often senior or prestigious scholars whose names are added for multiple purposes such as increasing the likelihood of publication or giving the article a greater impact (Pan, et al., 2020).

Gift Authorship

The author may have an association with the research or the manuscript, but does not qualify the criteria defined by the ICMJE. The most common unethical practice is to include the name of the Ph.D. Advisor or Head of the department as an author. Young researcher use gift authorship to get beneficial from their superior in terms of acquiring grants, funds and other academic promotions. Authorships are more often gifted to colleagues with lower academic rank or to those with fewer publications in last few years, to the departmental head (Eisenberg, et al., 2011) and to those performing various non-author tasks such as reviewing or approving manuscript before submission, providing care, recruiting study subjects, supervising or recruiting co-authors, and contributing illustrations (Bavdekar, 2012).

Ghost Authorship

Ghost authorship occurs when someone is being excluded from the author or disclosed in the acknowledgement despite having a significant contribution to the research work (Marcovitch, 2007). The author should have been recognized as the author according to the ICMJE guidelines, but is excluded from the list. In some cases, senior designation person asking to a junior to write and prepare a manuscript, but all benefits and credit goes to senior author not the junior. If anyone who is not involved in writing and preparing any part of the manuscript and authors pay someone to write down the article is considered ghost writing.

Redundant Publication

Redundant publications constitute a special type of plagiarism. The ICMJE defines redundant publication as “Redundant or duplicate publication is publication of a paper that overlaps substantially with one already published without giving proper credit to the previous publication.” In practice due to the availability of the electronic gadgets, lack of time, insufficient research integrity and it is mainly due to the race for publishing a large number of articles in a short span for academic purposes make an author resort to this unethical act (Jawad, 2022). Duplicate submission/publication is the practice of submitting the same study to two journals or publishing similar contents from the same study in two journals (Marcovitch, 2007). Authors indulging in these unethical acts do not anticipate the risks they are undertaking. Detection of such falsified acts, which is very easy, will spoil their reputation, as the matter will be reported to the head of the institution. If the article is published and later retracted due to being a redundant/duplicate publication, the fact will not remain hidden. Different criteria have been used to

Not Disclosing a Conflict of Interest (COI)

Conflict of interest in research exists when an individual give prior preference to his/her personal interest and liability over his/her duties and responsibilities as a researcher to gain some financial benefits from the research work (AAMC, 1990). In other words conflict of interest refers to the situation in which financial or other professional consideration may compromise an investigator's professional judgement in conducting or reporting research. COI is such a situation in which the researcher has interest in the outcome of research that may lead to a professional and financial benefit and that might compromise the integrity of research (US National Academies of Science, Integrity in Scientific Research, 2002).

All types of submissions to a journal, such as original research articles, review articles, opinion pieces, and editorials, should be accompanied by a conflict of interest disclosure statement. Here are the major types of conflicts of interest to look out for:

Financial/Tangible

The most common conflict of interest in research is financial ties, such as sources of funds/grants for the research conducted, receipt of a consulting fee from a company manufacturing the drugs/equipment used in the research, stocks in such a company, or other financial connections that might influence an individual's thinking and affect the research outcome. Some journals may require authors to declare not just any competing financial connections they may have individually, but also any that their immediate family members (spouse, parent, or child) may have, since these may also pose indirect conflicts of interest.

Non-financial/Intangible

The most common non-financial conflicts of interest in research are personal relationships or professional affiliations. For example, a conflict of interest would exist if an author is the spouse/sibling/child of the editor of the journal to which they submit a manuscript or if the editor is, or was until recently, a supervisor who the author reported to. Some of the more complicated conflicts of interest in research are private or publicly held beliefs and ideologies that can give rise to potential biases in a researcher's work. For example, it is a conflict of interest if the author has a strongly held religious belief or political opinion related to the topic of research, which can influence how the research was conducted and the results presented.

Not only can conflicts of interest exist for authors but also others involved in academic publishing, such as peer reviewers, journal editorial staff, and publishers. Strong professional rivalries among individuals working in the same specialization can also constitute conflicts of interest in research, especially at the peer review or editorial decision-making stages. In such cases too, individuals are expected to declare these competing conflicts and ideally consider recusing themselves from being involved in evaluating an author's manuscript.

Individuals assessing a manuscript and those who read the published manuscript should have all the information they need to judge the quality of the research. Therefore, it is an ethical obligation to be upfront and disclose any potential conflicts of interest in research.

Here is how you can identify and appropriately declare conflicts of interest in research:

- List down all sources of financial support you and your co-authors receive that may be considered as posing a conflict to your research objectives. These need not be just the support you receive for the research you are trying to publish now but any other grants/funds that you receive for other projects.
- List down any social or personal activities/interests that may be considered to influence how you conduct your research.
- Review any institutional ties you may have in the present or have had in the recent past (where you worked/volunteered, etc.) that can be said to affect your objectivity in your work.
- Review and comply with all the guidelines provided by your target journal on what they define as conflicts of interest and how they want authors to disclose them. Some journals provide form templates to declare conflicts of interest, which need to be filled out and signed by all co-authors.
- Potential for conflicts and ways to deal with them are constantly evolving. Keep yourself updated and seek out new information.

Not Attempting to Publish Complete Research/ Salami Slicing

In contrast to redundant or duplicate publication, salami slicing is publishing two or more papers by segmenting or breaking up a large study into small parts (Elsevier, 2017; Smolcic, 2013). This segment is called 'slice' of the study. Authors try to slice the study by sharing the hypotheses, methodology and population in different small papers which is not acceptable in scientific research. Different articles are published by the author by segmenting the whole data collected for a single study (Smolcic, 2013). The reader will find the similarity in hypotheses, methodology and results but vary in text. This type of research misconduct not only escalates the scientific database but also create repetition which waste the time of reader as well as the time of editor and reviewer. It unfairly expands the citation record of the authors.

There is no software to detect this type of unethical practices in research. It is very complex to identify such publication misconduct because it is often rare to find self plagiarism in salami publication. Only under the circumstances of confronting both the original and salami publication editors or reviewers can suspect this misconduct by comparing the identical hypothesis, methodology, sample size and very often have the same authors (Elm, Poggia, Walder & Tramer, 2004; Smolcic, 2013).

Conclusion

The prime responsibility of the researcher is to maintain the honesty and integrity while conducting research work. If researchers conduct their research in an unethical manner, it will not only stigmatize the research process but it will also influence the development of the collective knowledge. This would lead to an underdevelopment in human knowledge, leading to a slowing of development, and even possibly, in the most extreme scenario, the stagnation of human development in total. Despite the ethical guidelines recommended by different organizations it is found prevalent research misconducts among researcher across disciplines. More initiatives should be taken by the government and different organizing bodies, particularly in the institutional levels to shrink the research misconduct among researchers.

Recommendations for Further Study/ Thrusts for Further Study/Research Gaps

- Most of the studies related to **research integrity** focused on the Falsification, Fabrication and Plagiarism (FFP) (Raj, Venkatachalam & Amaravati, 2022; Kaiser, et al. 2021; Alzahrani, Ingle and Assery, 2020; Varghese & Jacob 2015; Okonta and Rossouwa 2013; Boskovic, Djokovic & Grubor, 2013; Ahmad & Ullah, 2011; Brown & Howell 2001) and sidelined the other areas of research misconduct i.e. **research and publication ethics** (Awasthi & Ranjan, 2019; Anderson, et al. 2013; Dhingra and Mishra, 2014).
- Research studies relating to **research integrity** shed light on awareness of research misconduct among researchers quantitatively by using self made tools (Hofmann, Jensen, Eriksen, Helgesson, Juth & Holm, 2020; Alzahrani, Ingle and Assery 2020; Poduthase, Garza, and Wood 2018; Felaefel, Salem, Jaafar, Jassim, Edwards, Doubell, Yousri, Ali & Silverman 2017; Okonta and Rossouw 2014). Thus to understand the **phenomena comprehensively**, further studies are required from **mixed method research strategies**.
- As UGC has introduced “**Research and Publication Ethics**” course for the awareness of research misconduct among research scholars. Studies may be conducted to know its impact on knowledge, attitude and perception of the young research scholars.

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