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**The American University in Cairo
School of Global Affairs and Public Policy**

**CURBING THE PRACTICES OF RESEARCH MISCONDUCT: A
QUALITATIVE STUDY ON THE PERCEPTIONS OF
RESEARCHERS AT EGYPTIAN PUBLIC INSTITUTIONS**

**A Thesis Submitted to the
Public Policy and Administration Department
in partial fulfillment of the requirements for the degree of
Master of Public Administration**

By

Passant Elwy Ibrahim Moustafa

Spring 19

Acknowledgements

After an intensive period of more than two years, I would like to write these words of appreciation as the finishing touch of my thesis. Indeed, it has been a journey of intense learning for me, not only at the scientific level, but also at a personal level. I wish to extend my deep gratitude through reflecting on the people who have helped and supported me endlessly throughout this period.

First, I would like to thank Dr. Ghada Barsoum, associate professor and the Chair of the Public Policy and Administration Department, who has always put me on the right track, and whose knowledge, guidance, sincerity and dynamism have deeply inspired me all the way. She has been a role model, tremendous supervisor and great mentor for me. I owe a debt of gratefulness for her precious time and careful attention to detail. Her office was always open whenever I ran into trouble or had inquiries about my research. Words cannot express how grateful I am to her as she has taught me more than I could ever give her credit for here. Indeed, it was a great honor and privilege for me to work under her guidance and I believe that without her help and guidance, I would not have been able to complete my dissertation.

I would like to express my deep gratitude to Dr. Laila El Baradei, professor of public policy and administration, and Dr. Hamid Ali, associate professor of public policy and administration, for the time they spared during revising the thesis. Indeed, they have enriched my background during my master's journey, and I am really lucky to take with them different valuable courses and to be one of their students.

I would like to thank all the researchers, who are working in the public academic and research institutions for their assistance, hospitality and the time they allocated for the interviews to produce this research in the best shape.

Last but not least, I would like to express my deep gratefulness to my family. I would like to thank my beloved mother and brother. I cannot find words to express my gratefulness to them. they always encourage me to achieve my goals and be a better person. Without their continuous support, resilience and encouragement, I would not have been able to make this accomplishment. I would also like to express my heartfelt appreciation to my dear father for his continuous efforts and support. He sincerely helped, supported and encouraged me over the years of completing this master's degree. He always inspires me by saying "Leave your comfort zone and keep learning new things." Words cannot describe how lucky I am to have all of you in my life.

Passant Elwy Ibrahim Moustafa

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Passant Elwy Ibrahim Moustafa

Supervised by Professor Ghada Barsoum

ABSTRACT

Many Egyptian public academic and research institutions are facing challenges due to the rise of the practices research misconduct. These practices are data fabrication, data falsification and plagiarism. In moderately or poorly developed nations, there is a dearth of information about research misconduct. Fabrication, falsification and plagiarism are threatening the integrity of scientific research as they have become part of the research culture. Based on that, the main objectives of this study are to determine the intertwined risk factors that contribute to the occurrence of research misconduct in Egypt, and in turn, examine the perceptions and attitude of Egyptian researchers towards the practices of research misconduct. In order to fulfill these objectives, semi-structured interviews were conducted with graduate students studying in Egyptian public universities, alumni of Egyptian public universities and academic faculty members working in different Egyptian public academic or research institutions. The data analysis of the current study is most relevant to the higher education system of Egypt. The findings of the current investigation showed that although the absence of awareness is a key factor that lead to the occurrence of the practices of research misconduct in Egyptian public universities and research institutions, there are many other intertwined factors that can result in this multifaceted phenomenon. Therefore, a clear way is paved for institutions to set up mechanisms and sustainable solutions to reduce research misconduct practices in Egypt.

Keywords: Research misconduct; data fabrication; data falsification; plagiarism, Egyptian public academic and research institutions.

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List of Acronyms

BA	Bibliotheca Alexandria
CAPMAS	Central Agency for Public Mobilization and Statistics
CFR	Code of Federal Regulations
NAS	National Academy of Sciences
TWAS	The World Academy of Science
TWAS ARO	The World Academy of Science Arab Regional Office
QS	Quacquarelli Symonds

Chapter One: Introduction

Research misconduct practices are as bad as deception or theft as they degrade trust in scientific research and result in real-world serious problems (DuBois et al., 2013). Similarly, these practices are threatening science since they became part of the research culture among researchers (Breen, 2003). Fabrication and falsification infect scientific literature with wrong data and, in turn, waste funds allocated for research and result in serious risks to patients and consumers (DuBois et al., 2013), whereas plagiarism deprives original authors of credit for their work (Das & Panjabi, 2011). Accordingly, it is obvious that these detrimental big three research practices tarnish the credibility and reputation of research institutions and have the potential to reduce the reliability of whole research enterprise (Okonta & Rossouw, 2013; El-Shinawi et al., 2016).

The concern of integrity within the world of scientific research is vital as the work of academia is recognized as noble or sacred (Talib et al., 2013). The information it produces and disseminates help in making an essential contribution to the quality of the existence of citizens (Talib et al., 2013). In addition, scientific research is progressively perceived as a crucial catalyst and vital index for national development (Al-Adawi et al., 2016). In many nations, it is scientific research, rather than rich natural assets, that has a prompt effect on economy and development (DuBois et al., 2013). Notably, fairness, honesty and respect for the truth are counted as the keystones of scientific and medical research and top-notch scientific writing (Noè & Batten, 2006; Shaw & Satakar, 2018). On this basis, the argument on the value of honesty and integrity in the world of research continues, shedding the light on several challenges and issues that the world of scientific research is facing, and addressing various recommendations and initiatives to curb the forthcoming problems (Talib et al., 2013).

Research misconduct comprises a silent epidemic or simply an illness for modern science (Al-Adawi et al., 2016). Notably, new instances of research misconduct emerge every year and there is presently high public awareness of the detrimental big three unethical practices (DuBois et al., 2013). Research misconduct is the infringement of the standard codes of ethical and moral behavior in scientific research (Yacout et al., 2018). There are three main facets of research misconduct, which are fabrication, falsification and plagiarism (Sabir et al., 2015). According to DuBois et al. (2013), “Falsification and fabrication of data constitute a form of lying and plagiarism a kind of stealing” (p. 321). Data fabrication encompasses generating new records of data or results (El-Shinawi et al., 2016). Data falsification means deliberate manipulation of existing records through omission or alteration of undesired data (Pupovac & Fanelli, 2015). Plagiarism takes place when one claims that a thought or an expression of it, is his own when in reality it is somebody else’s (DuBois et al., 2013). It is the use of another author’s thoughts, language or expression and/ or the representation of them as one’s own without crediting the original source (Felaefel, 2015). It is obvious that research misconduct is a global problem as no country is immune from its main big three practices (Pupovac & Fanelli, 2015). Notably, the characteristics of research misconduct have widely been studied throughout the past several decades (DuBois et al., 2013). However, research misconduct has mainly been studied in developed countries, such as the United States, Canada and Western European (Fanelli, 2009). In developing nations, studies on research malpractices are still novel in spite of the fact that they have a significantly higher rate of research violation cases than the developed countries (Okonta & Rossouw, 2013). In addition to the differences regarding the number of studies conducted on research misconduct in highly developed versus moderately developed and poorly developed nations, there is also a substantial difference in the systems that prevent and manage research

misconduct (DuBois et al., 2013). For instance, in highly developed countries, the three different forms of research misconduct practices and how they are managed are clearly defined in several legal documents and guidelines at several levels (Yacout et al., 2018). On the other hand, most of the developing countries do not have any national or institutional systems to combat research misconduct (Felaefel, 2015). For instance, in Egypt, the vast majority of the public academic and research institutions are experiencing a dearth of rules and clear guidelines that ensure the application of the principles of responsible science in all the steps of scientific research (Yacout et al., 2018). In addition, there are no effective evaluation criteria for the assessment the scientific output of Egyptian researchers (Al-Adawi et al., 2016).

Within the last few years up scaling efforts were directed to promote appropriate practices of responsible conduct of science in Egypt. These efforts include the International Capacity Building Institute for Teaching Responsible Science in the MENA region executed in partnership between the National Academy of Sciences (NAS)¹, Bibliotheca Alexandria (BA)² and The World Academy of Science (TWAS)³ in 2012 as well as the First and Second Egyptian institutes for Teaching Responsible Science in Egypt a joint US-Egypt training in 2015 (NAS, 2013). These initiatives aimed at developing a network of Egyptian faculty members, who are knowledgeable about responsible science and can educate others using active didactic techniques (NAS, 2013). Afterwards, NAS implemented the Leadership Institute in Egypt as a follow-on effort to the two Educational Institutes on Responsible Science in Egypt in 2017 aiming at integrating responsible science education within the Egyptian higher education system (NAS, 2013). In the same context,

¹ **The National Academy of Sciences (NAS)** is a private, nonprofit organization of the country's leading researchers.

² **Bibliotheca Alexandria (BA)** is a major library and cultural center located on the shore of the Mediterranean Sea in the Egyptian city of Alexandria.

³ **The World Academy of Science (TWAS)** is a *global science academy* based in Trieste, Italy, working to advance *science* and engineering for sustainable prosperity in the developing *world*. Its mission is to promote scientific excellence and scientific capacity in developing countries, for science-based sustainable development.

several initiatives were executed to spread the needed awareness about the big three practices of research misconduct among researchers and academics in various Egyptian institutions, universities and research centers (Yacout et al., 2018). For instance, the joint training programs among Damanhur and Alexandria universities that were conducted in 2015 and 2016 aiming at promoting the appropriate practices of responsible science among Egyptian researchers and faculty members. In addition, the TWAS Arab Regional Office (TWAS-ARO)⁴ held young scientists round table discussion on ethics in life sciences that aimed at bringing together eminent scientists, policy makers along with Arab scientists to discuss pressing topics related to the big three practices of research misconduct and the means to develop a mechanism that ensures integrity in the research process (Yacout et al., 2018). These interactive workshops revealed the lack of awareness of the big three practices of research misconduct among Egyptian researchers as well as the pressing need of teaching the principles of responsible science to all graduate students at the beginning of their research professions (NAS, 2013).

1.1. Higher education in Egypt

Notably, higher education in Egypt witnessed an advancement throughout the decade of the 1970s till the middle of 1980s, when numerous reforms were introduced (Annan, 1987). Irrespective of the great progress that Egypt witnessed in higher education, Nasser's reform strategy that was initiated resulted in poor quality of education in Egyptian public universities (Annan, 1987). This strategy aimed at creating equitable society and free access to higher education that finally led poor quality of education in public academic institutions (Annan, 1987).

⁴ **The World Academy of Science Arab Regional Office (TWAS ARO)** is managed within the Bibliotheca Alexandrina, through the Center for Special Studies and Programs-one of its Academic research Centers.

According to the Central Agency for Public Mobilization and Statistics (CAPMAS)⁵, Egypt is counted as one of the most populated nations in the Middle East, with an expanding population that surpasses 96.2 million person (CAPMAS, 2017). It is additionally viewed as the main exporter of talented workers and scientists in the Middle East (USAID, 2017). In order to fulfill the scaling up necessity for training and talented labor, the higher education system has been growing (CAPMAS, 2017). The system comprises 13 technical colleges, twenty-four public universities and sixteen private universities, with approximately 1.92 million students and 95,627 academic staff members (CAPMAS, 2017). Regarding the research society, the World Bank⁶ assessed the number of Egyptian scientists in 2015 to be 680 researchers for every million occupants that is a sum of 59,232 researchers which is an underestimation of the real number (The World Bank, 2015).

According to World Bank Report (2010), higher education in Egypt is facing three main challenges including: limited opportunities for researchers, poor quality of education and under-developed universities. The Quacquarelli Symonds' (QS)⁷ ranking (2017) placed The American University in Cairo as the 365th best university globally, directly after The George Washington University, Northeastern University and Virginia Tech, three respected and prestigious U.S. On the other hand, the 2019 QS World University Rankings showed that Egyptian universities dropped in terms of academic reputation, and global research impact(Quacquarelli Symonds' (QS), 2019). Among 916 universities, Cairo University was ranked in 521 band while Ain Shams,

⁵ **The Central Agency for Public Mobilization and Statistics (CAPMAS)** is the official statistical agency of Egypt that collects, processes, analyzes, and disseminates statistical data and conducts the census.

⁶ **The World Bank** is an international financial institution that provides loans to countries of the world for capital projects.

⁷ **Quacquarelli Symonds' (QS)** is a leading global higher education company, with over 250 employees across 5 continents speaking over 25 languages. QS is best known for publishing the QS World University Rankings – one of the world's most popular university ranking systems.

Alexandria and Al-Azhar universities were ranked in 701 band. According to head of the QS intelligence unit, Egypt lacks good infrastructure, effective national research strategy and adequate funding for scientific research (Quacquarelli Symonds' (QS), 2019).

1.2. Research problem

Even though Egypt has many public academic and research institutions, they are now deteriorating (Holmes, 2008; El-Dessouky et al., 2011). Regrettably, the rise of the big three practices of research misconduct is considered to be one of the main reasons for the deterioration of the quality of scientific research and Egyptian universities and research institutes (Mohammed et al., 2015). Notably, Egypt is facing challenges regarding the increased number of research misconduct cases (Pupovac & Fanelli, 2015; El-Shinawi et al., 2016). However, cases of research misconduct are still reluctantly discussed and the few known cases that do appear represent only the “tip-of-the-iceberg” (Fanelli, 2009). According to the head of Egypt’s Academy of Scientific Research and Technology, Egypt has the highest rates of research plagiarism because of the lack of modern fraud detection programs (Al-Adawi et al., 2016). In order to combat these unethical research practices, professor Mahmoud Sakr asserted that it is very important to provide all the Egyptian researchers as well as the post graduate students with mandatory training on research ethics and referencing. He argued that the academy provided all the Egyptian public universities and research institutions with “IThintcate”, a new plagiarism checker software that should be used before accrediting any future scientific degrees or publications (Al-Masry Al Youm, 2015).

1.3 Research objectives

Although the inadequate knowledge of research misconduct big three practices is counted as an important factor that contribute to the rise of violation of research ethics problem in Egypt, there are many other intertwined factors that can lead to this complex phenomenon (El-Dessouky

et al., 2011; Kandeel et al., 2011; Mohammed et al., 2015). Based on that, this instrumental study has two main objectives. First, this research aims at filling the gap that was found in the literature about the intertwined risk factors that contribute to the occurrence of research misconduct in Egyptian public academic and research institutions. Second, this study aims at examining the perceptions and attitudes of Egyptian researchers towards the big three unethical practices of research misconduct. Filling these gaps will prevent the emerging of new instances of research misconduct in Egyptian public academic and research institutions, emphasize the learned lesson of the earlier trials and will give a chance for institutions to set up possible mechanisms and sustainable solutions to solve this problem.

1.4. Main research question and specific research questions

1.4.1. Main research question

Based on the above-mentioned objectives, the main research question which is proposed in this study could be formulated as follows:

What are the reasons behind research misconduct in Egyptian public academic and research institutions?

This question involves examining the reasons that might lead to the existence of the three deleterious practices of research misconduct in public academic and research institutions in Egypt.

1.4.2. Specific research questions

- What are the risk factors that contribute to research misconduct problem in Egyptian public institutions?
- What is the perception of Egyptian researchers towards the terminology “research misconduct”?

- What are the possible solutions for solving research misconduct problem in Egypt?

The answers to these questions give significant contributions to understand research misconduct phenomenon in public academic and research institutions in Egypt. They disclose the factors that leads to the rise of the big three practices of research misconduct in Egypt as well as the possible solutions that can be done to resolve this problem in Egypt. The analysis and findings of the current study are most relevant to moderately or poorly developed countries, where there is a dearth of information about the big three practices of research misconduct.

1.5. Research outline

The present study is divided into five chapters. Chapter one contains the introduction that gives a glance about research misconduct phenomenon in Egyptian public academic and research institutions. This is followed by the research approach, which shows the importance and objectives of the current investigation, and the research questions. Chapter two the literature review which tackles the main risk factors that contribute to the occurrence of research misconduct in Egyptian public academic and research institutions. The final part of the literature review delivers in details the perception and attitudes of Egyptian researchers' regarding the big three practices of research misconduct. Chapter three includes the methodology and the conceptual framework of the current study. Chapter four presents data analysis and discussion of the research. Finally, chapter five provides a brief conclusion of the current investigation and some possible solutions to reduce research misconduct problem in Egyptian public academic and research institutes.

Chapter Two: Literature Review

In any field of research, the public trust and reliability are based on the idea that scientific study is conducted appropriately and with integrity through complying to a clear and well-defined set of principles (Fierz et al., 2014). Ignoring research integrity principles results in commitment to research misconduct (Pupovac & Fanelli, 2015). Although considerable academic literature has explored the risk factors of the big three practices of research misconduct, a noticeable knowledge gap is evident regarding the main risk factors that contribute to the occurrence of this problem in Egyptian public academic and research institutions. Additionally, Egyptian researchers' perceptions and attitudes regarding the big three practices of research misconduct need to be studied. The present review is divided into two main themes. First, the intertwined risk factors of the big three practices of research misconduct. This theme describes the main reasons that can lead to the occurrence of research misconduct in academic and research institutions. Second, the perceptions and attitudes of researchers regarding the big three practices of research misconduct. This theme elucidates how researchers perceive the terminology "research misconduct". In addition, it explains the attitudes of researchers towards the acceptability of the three different forms of research misconduct.

2.1. The risk factors of the big three practices of research misconduct

There has been a number of hypotheses about the reasons for research misconduct (Davis et al., 2007). Since research on research integrity is still in its early stages, the ultimate answers on what causes serious departures from science's standards are not yet accessible (DuBois et al., 2013). The literature, however, is loaded with possible clarifications. These can be roughly broken out as [a] peril of publish or perish, [b] lack of awareness about the big three practices of research misconduct, [c] ineffective supervision and weak regulations, [d] ease of cooking data and

immature writing skills and [e] unethical environment and attitude of tolerance towards research misconduct.

2.1.1. Peril of publish or perish

Publishing manuscripts is counted as the only means by which researchers can communicate with each other and get credit for the work they have done (Sengupta et al., 2014). In spite of the fact that causality is famously hard to demonstrate in the logic of science, Richard et al. (2015) consider the connection between positive motivators to publish (i.e., perceived organizational support) and negative motivators to publish (i.e., publish or perish). The authors recognized that organizational support cannot be considered enough motivator for researchers to publish in top-tier journals but is likely to increase well-being (Ana et al., 2013). On the contrary, a publish or perish approach that at its center is penalty based may negatively impact researchers' quality of life, decrease their fulfillment and undermining their inventiveness (Ana et al., 2013). It might even drive them away from integrity because of the pressure and burnout as the opportunity window at the top-tier journals has narrowed with the current wide-reaching competitive research environment (Richard, 2015). In the same context, Al-Adawi et al., (2016) argued that in developing countries such as Egypt, increased research productivity could possibly be joined with an exponential increment in research misconduct. In addition, Neill (2008) clarified that the big three practices of research misconduct might creep in if the ultimate goal of the researchers is to publish many scientific articles regardless of focusing on producing scientific discovery. Correspondingly, Liu (2006) pinpointed that the massive pressure on researchers to have many publications leads to the production of more cheaters rather than pioneers. In other words, since publications define promotions and prestige, irresponsible researchers are expected to take the

short cuts and may indulge in plagiarism as well as data fabrication and data falsification (Breen, 2003; Breen, 2016).

Publications in top-tier journals are now obligatory for the advancement within academia as many universities and even nations endeavor to utilize publications in top-tier journals to improve their image (Richard et al., 2015). Indeed, even in universities that do not have a research culture (regularly called “teaching” universities to appear differently in relation to more research centered “research” schools) where substantial teaching load are the standard, requirements of publications are included despite the fact that there is no institutional help for research (DuBois et al., 2013). It is becoming progressively normal, that publications are the most essential component for academic advancements and promotions (Neill, 2008). Scientists in research institutions are usually judged by the quantity of their published scientific papers and abstracts (Davis et al., 2007). Those, who have a low number of publications often lose their prospect of a stable position (Davis et al., 2007). In addition, failing to publish can, likewise, lower their chances for securing suitable funding for their research (Davis et al., 2007). Notably, academic promotion policies of the macro level creates pressure on both universities and investigators to produce a large number of research studies regardless of their quality (Martinson, 2007). In addition, in almost all universities and research institutions, the only way for researchers to prove academic competency is to publish many research articles in top-tier journals (Neill, 2008). Moreover, academics are increasingly being evaluated according to the quantity of publications they produce and how often they are cited regardless of their research skills and capabilities (Habibzadeh and Winker, 2009; Fanelli, 2012). In addition, some universities reward researchers, who can make high profile publications but are not qualified to perform truthfully ground-breaking research (Pupovac & Fanelli, 2015). In Egyptian public universities, faculty members, including assistant and associate professors need

to publish research papers in order to get promoted. The number of publications is not a question of tenure as all the faculty members working in public academic and research institutions are tenured (Supreme Council of Universities, 2019). On the other hand, in western universities, publishing research papers is mandatory for faculty with the rank of assistant and associate professor in order to get tenured (Sengupta et al., 2014).

This competitive research atmosphere has led to the rise of pay-to-publish journals that publish nearly anything for anybody as long as they pay money (Richard et al., 2015; Herndon, 2016). These predatory journals encourage irresponsible researchers to publish spurious scientific papers as acceptance is guaranteed upon payment (Herndon, 2016). Regardless of cautions and advice to avoid these “questionable outlets for research”, many supervisors are encouraging their students to publish in these outlets: This phenomena is predominant in many developing nations (Noe & Batten, 2006). Unfortunately, the articles published in these journals do not reflect credit upon the researchers, supervisors, institutions or the country nevertheless, they mislead other researchers and policy makers with erroneous data (Al-Adawi et al., 2016; Grimes et al., 2018). This will lead to the breaching of the ethical standards that are anticipated from researchers and threaten the integrity of scientific journals (Noe & Batten, 2006). Consequently, the phenomenon of “crises of confidence” of the public in the trustworthiness of scientific research rise up and breaking the important obligations for integrity in science become a norm (Noe & Batten, 2006).

2.1.2. Lack of awareness about the big three practices of research misconduct

Another important factor that contributes to the rise of research misconduct problem in many developing countries is the inadequate knowledge about its practices (El-Dessouky et al., 2011; Kandeel et al., 2011; Mohammed et al., 2015; Breen, 2016). It is noted that, formal training in conceptualizing the ethical features of scientific research is lacking in most of the graduate

schools across the globe (Rathore et al., 2018). Although there are well-known guidelines and codes of conduct regarding scientific misconduct, which have been adopted by many universities worldwide, many researchers are still unaware and perform unethical practices (El-Dessouky et al., 2011). Many researchers believe that it is acceptable to copy statements verbatim from scientific papers as long as they include in-text citation and references at the end (Al-Adawi et al., 2016). Notably, the outcome of this unethical behavior will be another article having significant parts in the “copy-cut-paste” style, which is considered copywrite infringement (Al-Adawi et al., 2016). In the same context, Deshmukh et al. (2017) showed that some researchers accept falsification of data to increase the credibility of their publications. A study was conducted in the Middle East showed that there are 11.2% researchers believe that it is permissible to fabricate data to improve the result of their research as long as patients are not harmed (El-Dessouky et al., 2011). In the same manner, another research study was conducted in Malaysia showed that lack of awareness about research misconduct practices among Malaysian researchers leads to the occurrence of the big three practices of research misconduct (Olesen et al., 2017).

Since it is not easy and is costly to identify and report scientific misconduct, the most ideal approach to diminish wrongdoing is preventing it in advance (Lee, 2011). Education and interactive training are the basic factors in counteracting future misconduct (Lee, 2011). As Anderson et al., (1994) stated, “it is the graduate school where students learn, formally and informally, what behaviors are expected and rewarded in academic research and what constitutes unacceptable deviation from shared norms of conduct” (p.331). Nowadays, Egypt is experiencing a noteworthy issue in the field of research due to the lack of awareness and wrong legacies that are transmitted from one generation to another among scientists (Yacout et al., 2018). There is no defined formal program or curriculum for ethical research practices in the majority of public

academic institutions (Felaefel, 2015). Besides, the lack of understanding of the unethical nature of research misconduct practices is counted as a pressing problem among academics and researchers (Mohammed et al., 2015). In Egypt, both research and academic communities suffer from research misconduct problems (Yacout et al., 2018). Lack of awareness about responsible conduct of research principles is one of the major challenges facing the development of the national research community (Yacout et al., 2018). Based on El-Shinawi et al. (2015), Egyptian medical students are not acquainted with the elementary principles of responsible conduct of research. In addition, Reddy et al. (2013) argued that researchers at Cairo University are not familiar with the principle of responsible conduct of research as they are not receiving formal courses about research ethics. Additionally, Felaefel (2015) stated that unintentional plagiarism is a growing problem in Egyptian public universities and research institutions that results from the lack of awareness of the limits of copying wordings from other sources. Even faculty members are often uncertain about the consequences of indulging either unintentional or deliberate plagiarism and are unable to guide their students on how to avoid plagiarism (Felaefel, 2015).

It is noted that, awareness level of researchers has a substantial effect on their involvement in unethical research practices (Idiegbeyan-Ose et al., 2016). Pupovac & Fanelli (2015) and Risal (2015) showed that research misconduct practices could be diminished by effective measures like increasing awareness through interactive workshops and training. Raising awareness about research misconduct reduces the occurrence of its big three practices among researchers (Adeleye & Adebamowo, 2012; Gross, 2016).

2.1.3. Ineffective supervision and weak regulations

Research supervision is considered a central component of the overall effectiveness of scientific research (Abiddin et al., 2009). It can be claimed that research supervision is a

requirement for quality research, since it incorporates contextualization components of assessments and recommendations (Severinsson, 2015). According to DuBois et al. (2013), there are four main ethical concepts that portray the values of supervisors, which are caring, self-respect, accountability and virtue. It can be argued that mentors are the essential source of guidance for early career researchers (DuBois et al., 2013). They have the major impact in lessening the occurrence of violation of research integrity through educating their junior students to uphold the principles of responsible conduct of science (DuBois et al., 2013). In the same manner, it worth noting that novice researchers need feedback from their supervisors, which can be provided by means of guidance, evaluations and counterstatements (Vehviläinen, 2009). According to Severinsson (2015), the relationship between the supervisor and postgraduate students is crucial for the accomplishment of the latter's master and/ or PhD thesis without committing any of the three forms of research misconduct. Fuchs & Westervelt (1996) pinpointed that the closeness of the relationship between the supervisor and junior researcher is crucial with regard to research honesty. Problems in such relationship, which may take the form of lack of supervision, inadequate mentoring or dissatisfaction of the postgraduate students with the feedback of their mentors on their manuscripts could negatively influence the features of ethical decision making (Davis et al., 2007).

According to Fanelli (2009), it is easy for unethical scientists to publish fabricated data in most prestigious journals. A prominent view proliferated by the media and by numerous researchers considers unethical researchers as just a “ few bad apples” (Lafollette, 2016). This pristine picture of science depends on the hypothesis that the scientific community is guided by standards, including fairmindedness and skepticism, which are contradictory with wrongdoing (Sismondo, 2006). Increasing evidence, nonetheless, proposes that frauds are simply a "tip of the

iceberg", and that numerous cases are never found (Fanelli, 2009). Inadequate oversight in Egyptian public universities and research institutions can encourage fraudsters to perform any of the big three forms of research misconduct (Al-Adawi et al., 2016). In the same context, another research study has been conducted in Egypt revealed that scarce research supervision of inexperienced researchers could negatively impact the quality of data produced and leads to scientific fraud (Felaefel, 2015). This can result in impeding the quality of the research generated and cause misuse of human and financial resources and might represent a hazard to human health (Fang et al., 2012).

In addition to supervision, effective laws and regulations are counted as main pillars for the overall effectiveness of scientific research (Abiddin et al., 2009). Moreover, independence and academic freedom are counted as focal features of the research profession (Lee, 2011). These benefits were given and bolstered based on the presumption of self-control (Lee, 2011). In other words, the general public believe that the academic community is capable and prepared to manage its own individuals' misbehaviors (Pupovac & Fanelli, 2015). Researchers, likewise, tend to believe that research misconduct is exceptionally uncommon, and it can be self-regulated (Fanelli, 2009). Even if an unethical researcher published innovative data outcomes and committed to research fraud, her/his unfortunate behavior would be detected by different researchers, who became doubtful and investigated the data (Steneck, 2006). Nevertheless, this long-held belief was challenged after the rise up of research misconduct practices in many developing countries and the prevalence of many cases of research misconduct that were revealed in 1980 (Lee, 2011; El-Shinawi et al., 2016). Disclosure of these cases raises a requirement for setting clear laws that forbid any violation of the standard codes of scholarly conduct and ethical behavior of scientific research (El-Shinawi et al., 2016). According to Martinson et al. (2013), formulating laws and

rules at the national levels as well as institutional policies that direct the process of scientific research at universities could lower the occurrence of research misconduct practices. Being very much aware of institutional policies keeps scientists away from involving themselves in misconduct and urges them to report suspected wrongdoing (Lee, 2011). As for Al-Adawi et al. (2016), there is a need to build up a regulatory system, at both the national and institutional level, that direct the research process and guarantee the commitment of good ethical and scientific standards by Egyptian researchers. Moreover, it is very important for the Egyptian public academic institutions to have rubrics that comprise the potential penalties, which can be imposed on wrongdoers (Riis, 2000; Felaefel, 2015). These rubrics, likewise, should mandate all academic institutions to offer compulsory courses about responsible science for graduate students before start working on their research projects and/or theses (Riis, 2000). Most importantly, informative documents dedicated exclusively to responsible science should be available in all Egyptian public academic and research institutions (Felaefel, 2015).

2.1.4. Ease of cooking data and immature writing skills

Fabrication and falsification are described by Bedeian (2010) as “cooking data” throughout the phase of data analysis and interpretation. Noteworthy, it is easy for unethical researchers to create or manipulate data to support the hypothesis of their research studies (Bedeian, 2010). Selfish investigators, who aim at being “superstars” in their fields can easily make spurious research studies through creating data suitable for the hypothesis of their research. Notably, accessible information shows rising levels of falsification and fabrication that are alarming in spite of the presence of rules and regulations in many high-income countries (Felaefel, 2015). For instance, a study performed by Fanelli, who did meta-analysis and systemic review of quantitative survey showed that up to 14% of researchers in developed countries have been seen to engage in

data fabrication and falsification (Fanelli, 2012). The reason behind that is the ease of data fabrication and falsification (Kandeel et al., 2011). Doing research backwards through starting with a hypothesis and creating or modifying the available data to support it is a shortcut to get significant data and publish in reputable journals (Fanelli, 2009; El-Dessouky et al., 2011). In the same manner, high profile cases of data fabrication and falsification in developing countries, such as Egypt, are on the rise as well, yet information regarding the amount of misconduct occurring stays rare (Kandeel et al., 2011; Felaefel, 2015).

In recent years, the worldwide academic community has been shaken by a number of serious instances of research wrongdoing (Bornmann, 2013). Renowned cases include Woo Suk Hwang, a Korean professor in biotechnology, who falsified stem cell data (Johnson & Ecklund, 2016). Hwang published two articles with cutting-edge results in *Science* in 2004 and 2005 (Bornmann, 2013). Both research articles were later revealed to have fabricated data (Johnson & Ecklund, 2016). “They [papers] have turned out to be complete and deliberate fakes” (Bornmann, 2013, pp. 88). Other cases of data fabrication, which attracted the attention of the general media, especially in Germany, over the most recent years are those of the cancer researchers Friedhelm Herrmann and Marion Brach (Bornmann, 2013), the physicist Jan Hendrik Schön, who fabricated nanotechnology data (Service, 2003), the anesthesiologist Joachim Boldt (Antonelli & Sandroni, 2013) and the psychologist Diederik Stapel (Callaway, 2011). According to Bornmann (2013), “Research results were massaged, images in scientific papers faked and research proposals from colleagues recommended for rejection and subsequently submitted as the wrongdoer’s own” (p. 88). Another former high profile faculty member at Cornell university, Brian Wansink, found to be implicated in data fabrication in 2018 (Mandal, 2018). Wansink has been known as a “world-renowned eating behavior expert” was accused for committing research misconduct through

misreporting data, using faulty statistics. These cases resulted in misusing the time and research funds by different researchers until the misrepresentation was at last identified (Mandal, 2018). The more the degree of the deception and misleading, the less likely it appeared that science would have the capacity to work in an environment of trust (Service, 2003).

Similarly, plagiarism is a habitual problem in higher education (Šprajc, Urh, Jerebic, & Trivan, 2017). It takes place when researchers pass off someone else's ideas or information as one's own accomplishment without giving the proper credit to the original source (Bornmann, 2013). Mainly in the era of the Internet, this type of misconduct is gaining an extraordinary significance (Fanelli, 2012). According to Bornmann (2013), "There is now an enormous amount of information available via the Internet; text is very easy to copy and paste, and ideas can be gleaned from a multitude of sources" (p. 90). Plagiarism is a serious, yet prevalent type of research misconduct, and is regularly neglected in developing nations (Carnero et al., 2017). Although it is counted as a worldwide problem, evidence of its existence comes particularly from developed countries (Ana et al., 2013). Therefore, studies for exploring plagiarism in developing countries, including Egypt, are critically needed (El-Dessouky et al., 2011b). One of the most serious factors that can enable plagiarism in Egypt is the poor development of writing skills (El-Shinawi et al., 2016). Notably, scientific writing is a skill that undergoes development with time (Holt, 2012). Untrained researchers, who lack the confidence in their writing abilities are more susceptible to commit plagiarism (McCabe & Donald L., 2005; Ma et al., 2007). A study performed in Egypt revealed that many Egyptian researchers do not have the skills of taking notes, quoting, citing previous published articles properly, and forming reference lists (Al-Adawi et al., 2016).

One of the most egregious plagiarism cases that had the utmost media impact is the doctoral thesis written by the German Defense Minister Karl-Theodor Zu Guttenberg, who received his

doctorate from Faculty of Law from University of Bayreuth (Ruipérez & García-Cabrero, 2016). The scandal became renowned through a report published on 16 February 2011 by Süddeutsche Zeitung, declaring the possibility that the German Defense Minister may have committed plagiarism in his doctoral thesis (Ruipérez & García-Cabrero, 2016). Fischer-Lescano, a Professor of Public Law at University of Bremen, showed in his review of Guttenberg's thesis that was published in the magazine Kritische Justiz that there are twenty-three long paragraphs not in quotation marks were copied literally from other research papers (Guttenberg, 2009). On 23 February 2011, the University of Bayreuth took out Guttenberg's doctorate as it came to the conclusion that he had engaged in intentional plagiarism and had violated the codes of research integrity (Ruipérez & García-Cabrero, 2016). In addition, on March 2011, Guttenberg declared his resignation as Minister of Defense (Guttenberg, 2009).

2.1.5. Unethical environment and attitude of tolerance towards research misconduct

Unethical environment is regarded as one of the main factors that leads to research wrongdoing (Fang et al., 2012). According to Lee (2011), the moral atmosphere of an organization influences ethical practices of its individuals. In spite of the fact that there is unfortunately a little empirical evidence demonstrating how the detrimental practices of scientific research are initiated, it is essential to note that most of the wrongdoers work in a moral grey zone, where it is not always clear what establishes fair and deceptive conduct (Redman & Caplan, 2017). Noteworthy, supportive environments decrease temptations to cut corners, outline obvious borders between right and wrong, inspire peer monitoring, and help individuals to remember their moral qualities (Redman & Caplan, 2017). On the other hand, environments that lack research ethics can negatively impact researchers by engaging them in unethical practices or influencing their attitudes towards the different forms of research misconduct (DuBois et al., 2013). Therefore, being placed

in an unethical environment is sufficient to encourage researchers to violate research integrity (Shu et al., 2011). In contrary, Redman & Caplan (2017) stated that increasing moral saliency by having researchers, who respect the scientific code of conduct essentially, lessens untrustworthy practices and prevents moral disengagement. It is worth noting that individuals may not intentionally choose to do questionable research practices (Welsh et al., 2015). Indeed, even without understanding that they have changed their moral norms, seeing others acting in deceptive ways, researchers can drift into unethical research practices (Welsh et al., 2015). In the same manner, series of small infringements that progressively grow over time may encourage somebody's affinity to morally disengage (Rosenbaum et al., 2014). Such a slippery slope can be hindered through enforcing clear standards of responsible conduct of research with cautions and negative sanctions (Welsh et al., 2015).

It is worth noting that proper dealing with data is a research imperative (Luce et al., 2012). According to Mumford et al. (2007), corrupt environment affects ethical behavior and ethical decision making. For instance, a qualitative study conducted by Jasanoff (1993) showed that poor role modeling, negligence of standard laboratory procedures play an important role in breaching scientific integrity. In another study, Goldberg & Greenberg (1994) asked one thousand five hundred experts working in different fields, including biological, health and social sciences to demonstrate whether they had observed research misconduct practices, such fabrication, falsification and/or plagiarism. Then, they asked these professionals to indicate the factors that might contribute to the occurrence of research misconduct. The authors found that unethical environment and ineffectual collegial exchange were frequently held to be causes of research misconduct (Luce et al., 2012). Another study conducted in Egypt showed that there is a significant correlation between observing colleagues violating research integrity and engaging in research

misconduct (Felaefel, 2015). The author noted that the culture, which accepts violation of code of conduct, could possibly create a negative pressure towards doing things morally, as researchers who wish to abide by ethical standards can never be taking equivalent or fair chances in an organization that is not ethical (Al-Adawi et al., 2016).

In the same context, attitude of tolerance among investigators appears to be one of the most important reasons for research misconduct (Luther, 2008; Rajah-Kanagasabai & Roberts, 2015). It is worthy to mention that integrity needs to go through each bit of research, and should be rooted in the behaviors and attitudes of researchers (DuBois et al., 2013). Indeed, mentors, supervisors and research pioneers have a genuine effect on reducing the attitude of tolerance towards research misconduct practices (Al-Adawi et al., 2016). Their attitudes towards research respectability and integrity and the manner in which their students see them conduct their research, will significantly affect the practices and attitudes of future researchers (Al-Adawi et al., 2016). Furthermore, understanding the attitudes of researchers towards research dishonesty could help in preventing unethical research practices (El-Shinawi et al., 2016). Unfortunately, in most of the developing countries, deviant research behaviors became an integral part of research culture as some researchers have positive and acceptable attitudes towards the “three big” practices of research misconduct (DuBois et al., 2013; Pupovac & Fanelli, 2015). In addition, many researchers, who value a professional protocol, a belief that workmates should not attack or criticize another’s reputation, would not report their colleagues’ unfortunate behavior (Lee, 2011).

Besides, many research studies shed the light on the fact that many researchers have questionable attitude towards the big three practices of research misconduct (El-Dessouky et al., 2011b; Kandeel et al., 201; Felaefel, 2015). A study conducted in the Middle East showed that the attitudes of researchers towards research misconduct is less than optimal (El-Dessouky et al.,

2011). In addition, another study conducted in Egypt revealed that some researchers have positive attitudes towards research misconduct practices (Kandeel et al., 2011). In the same context, two studies conducted in India expounds that there is a positive attitude among post graduate students and faculty members towards plagiarism (Reddy et al., 2013; S. Gomez, L., & B.K, 2014). The authors, likewise, stated that the attitude of both faculty members and postgraduate students reflect on unsatisfactory level of seriousness with research misconduct practices (S. Gomez et al., 2014). In addition, they stated that attitude of tolerance towards such practices might lead to a mere repetition of previous research studies and lack of originality (Nagilla & Reddy, 2014). In addition, a study conducted in Croatia showed approval and acceptance of plagiarism among postgraduate students (Pupovac et al., 2010). Besides, the authors argued that there is a noticeable level of *Machiavellianism*⁸ among Croatian students as some of them defend research misconduct practices when done by themselves but would treat their colleagues more harshly if they do the same. This personality trait is found to be a risk factor especially for biomedical students (Pupovac et al., 2010). Moreover, another study conducted in the same country disclosed that around sixty five percent of biomedical students consider self-plagiarism an acceptable and justifiable behavior (Pupovac et al., 2017). Notably, this problem is growing due to the lack of awareness about the consequences of the big three practices of research misconduct among researchers (Rhodes, 2007).

2.2. The perceptions and attitudes of Egyptian researchers regarding the big three practices of research misconduct

Scientific research has been viewed as the researchers' behavior of pursuing the reality and should be conducted following the principles of responsible conduct of research (Yi et al., 2018).

⁸ **Machiavellianism** in psychology refers to a personality trait which sees a person so focused on their own interests they will manipulate, deceive, and exploit others to achieve their goals.

However, as indicated by various reports in the previous decades, this principle is not constantly pursued, thus probably deterring scientific advancement all through the world (Fanelli, 2009; Pupovac et al., 2010; Fang et al., 2012). Nowadays, Egypt experiences a noteworthy issue in the field of scientific research as many researchers do not have the right perception about responsible conduct of research. In addition, the observation among numerous Egyptian researchers is that cases of research misconduct are moderately uncommon when held up against the sheer amount of scientific yield. However, evidence suggests that research misconduct might be a more concerning issue than numerous researchers think (Yacout et al., 2018). Similarly, the attitudes regarding the acceptability of the big three practices of research misconduct varies among Egyptian researchers (El-Dessouky et al., 2011; Felaefel, 2015). Consequently, cases of scientific misconduct have gone to the fore resulting in inflicting damage on researchers, scientific research, institutions and society (Felaefel, 2015).

2.2.1 Researchers' perceptions regarding unethical practices of research misconduct worldwide

Perception on ethical research can be described as how researchers conceptualize what they recognize as ethical situations in pursuing scientific research (Talib et al., 2013). Each individual has different degree of preparedness to respond to people, events and objects (Buchanan & Huczynski, 2004). In this context, the degree of acceptability and sensitivity to the big three practices of research misconduct varies across researchers (Dawson, 1995). Notably, numerous articles that include integrity in their titles are focusing on integrity, instead of misconduct itself (Titus et al., 2008); all instances of misconduct include breaches of integrity; however, integrity is regularly observed as being more than just staying away from practices formally considered as misconduct (Marusic et al., 2016). Besides, even articles that aim at conceptual elucidation

occasionally use scientific integrity and research integrity reciprocally, in spite of potential difference between them (Buljan et al., 2018). Science has a broader sphere than research as it includes both the research attempt itself and the body of scientific information produced by preceding research (Horbach & Halffman, 2017). As such, scientific integrity covers a broader domain than research integrity (Shaw & Satalkar, 2018). In addition, research misconduct can harm scientific integrity through contaminating the authentic knowledge produced with fabricated and falsified data (Shaw & Satalkar, 2018). In the same context, Penders and colleagues have mentioned helpful observation that research integrity can refer to different subjects: "integrity has been viewed as a property of four unique things: 1) research data, 2) researchers, 3) research institutions, 4) science as a social framework" (Penders et al., 2009). In addition, the authors pointed out that for the investigator her-or himself, integrity found in "coherence between one's set of values" and "coherence between one's values and action." (Penders et al., 2009).

Regarding researchers' perceptions about unethical practices of research misconduct, Shaw & Satalkar (2018) showed that most researchers define research integrity in terms of morality, transparency and objectivity. The authors, likewise, explained that some researchers perceive the terminology of research integrity as the ability of researchers to adhere to the research question (Shaw & Satalkar, 2018). However, a limited number of researchers equated the concept of research integrity with the mere absence of the big three practices of research misconduct (Krstić, 2015). Another research study, conducted within the European Council of Doctoral Candidates and Junior Researchers, indicated discrepancy in the perception of research misconduct practices among researchers working at the same institution (Krstić, 2015). In the same manner, Shaw & Satalkar, (2018) pointed that there is a lack of distinct clarity about the concepts "research integrity," "scientific integrity," "research misconduct," "scientific misconduct" and "research

ethics” among researchers as most of them use these terms interchangeably. In addition, Horbach & Halffman (2017) argued that some researchers use the terms “research integrity” and “research ethics” as synonyms despite conceptual distinction. Research ethics generally focus on systems intended to protect participants in research before the study begins (Horbach & Halffman 2017)(Horbach & Halffman, 2017a). On the other hand, research integrity systems emphasize on what goes right, or wrong once research have started (Shaw & Satalkar, 2018). Thus, distinguishing between these concepts is very important for addressing research misconduct problem in Egyptian academic and research institutions (Yacout et al., 2018).

2.2.2. Researchers’ attitude towards the “big three practices” of research misconduct

Research misconduct can extremely harm people’s life and health; therefore, it needs a great accountability (Pupovac et al., 2010). Understanding researchers’ attitudes toward the big three practices of research misconduct provides better clarification of ethical issues and infringement in research (DuBois et al., 2013). Their attitudes represent either positive or negative beliefs toward certain behavior and its consequences (Rajah-Kanagasabai & Roberts, 2015). According to Sabir et al. (2015), positive attitude of researchers towards unethical practices of research is counted as one of the major explanations why the big three unethical practices are going to the fore. Accordingly, there is an earnest need to identify the attitudes of researchers towards the big three of research misconduct (Mansour, Abusaad, El Dessouky, & Ibrahim, 2017; Woith et al., 2012).

Many research studies were conducted to cast the light on the attitude of researchers towards the big three practices of research misconducted (El-Dessouky et al., 2011; Felaefer, 2015; Mansour et al., 2017). Based on Kirthi et al. (2013) study that was conducted in an academic institution in India, around half of the post-graduate students and staff members have positive

attitude toward using other author statements without citing the original source. Similarly, Park et al. (2013) said in their study that about half of Korean nursing students believe that there is no problem with copying some statement verbatim from other sources without citing the original author in the article. In addition, Gomez et al. (2014) argued that many Croatian medical students are aware of the big three practices of research misconduct; however, they vindicate and support these practices though they know that they are violating research integrity. In the same context, several studies were conducted in Egypt threw the light upon the attitudes of Egyptian researchers towards fabrication, falsification and plagiarism (El-Dessouky et al., 2011; Felaefel, 2015; Kandeel et al., 2011; Mansour et al., 2017). A study conducted by Mansour et al. (2017) showed that many Egyptian researchers agreed that self-plagiarism is not considered violation of research integrity and should not be punishable in the same way as the big three practices of research misconduct. Another study conducted in Egypt showed that Egyptian medical students are not aware of the unethical practices of research misconduct and therefore, they believe that there is no problem with manipulating data or copying something verbatim from other research study (El-Shinawi et al., 2016). In the same manner, several studies revealed that there is a positive attitude among post graduate students and faculty members towards the big three practices of research misconduct (El-Dessouky et al., 2011; Felaefel, 2015; Yacout et al., 2018). Based on that, Gomes et al. (2013) argued that effective mentoring is crucial for promoting positive attitude and conceptualization of responsible conduct of research.

Drawing on this review, in any field of research, the public trust and reliability are based on the notion that scientific investigation is conducted properly and with integrity through abiding by a clear and well-defined set of principles (Fierz et al., 2014). It is obvious that research misconduct is a worldwide problem as no country is immune from its main practices (Pupovac &

Fanelli, 2015). Many Egyptian public academic institutions are unquestionably facing challenges due to the rise of the practices of research misconduct. These practices include: data fabrication, data falsification and plagiarism (El-Shinawi et al., 2016). It is obvious that the practices of research misconduct tarnish the credibility, integrity and reputation of scientific research (DuBois et al., 2013). In addition, these unethical practices weaken the advance of knowledge, discredit the outcomes of scientific research in the eyes of public and waste funding (Johnson & Ecklund, 2016). Notably, there are many intertwined risk factors that can contribute to the occurrence of the big three practices of research misconduct (Fierz et al., 2014). These factors are peril of publish or perish, lack of awareness about the big three practices of research misconduct, ineffective supervision and weak regulations, ease of cooking data and immature writing skills and unethical environment and attitude of tolerance towards research misconduct. In addition, these days, Egypt is experiencing a remarkable issue in the field of scientific research as many Egyptian researchers do not have the right perception of responsible conduct of research (DuBois et al., 2013). In addition, the attitudes regarding the acceptability of the unethical practices of research misconduct varies among Egyptian researchers (El-Dessouky et al., 2011).

Chapter Three: Conceptual Framework & Methodology

3.1. Conceptual Framework

It is worth noting that research integrity is not synonymous of scientific integrity (Shaw, 2018). Science has a wider domain than research as it comprises both the research trail itself and the body of scientific knowledge provided by foregoing research studies (Horbach & Halfman, 2017). Therefore, scientific integrity covers a broader domain than research integrity (Shaw & Satalkar, 2018). In addition, violation of research integrity (which is called scientific misconduct or research misconduct) can negatively impact scientific integrity through infecting the authentic knowledge produced with fabricated and falsified results (Horbach & Halfman, 2017).

In the current investigation, the researcher adopted the US code of Federal Regulations (CFR)⁹ Title 42 Part 93 definition for analyzing and interpreting the data that were produced. According to this definition, research misconduct is the “fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results” (NAS, 2013; Pascal, 2005). The code of Federal Regulations defined the three main elements of research misconduct as follows:

- Fabrication is making up (creating) results and reporting them in scientific research studies (NAS, 2013; Pascal, 2005).
- Falsification is manipulating (altering) equipment, changing or removing data so that the research is not presenting precisely in the published research record (NAS, 2013; Pascal, 2005).

⁹ **The Code of Federal Regulations (CFR)** is the codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the federal government of the United States.

- Plagiarism is the inappropriate use of other researchers' notions, words, data (NAS, 2013; Pascal, 2005).

The big three practices of research misconduct are regarded as the most serious infringements of research integrity and hence they are more commonly addressed in literature than the other detrimental research practices (DuBois et al., 2013; Shaw, 2018). Notably, fabrication and falsification constitute a breach of scientific integrity (Shaw & Satalkar, 2018). They take place during the interpretation and analysis of results (Shaw & Satalkar, 2018). Both fabrication and falsification, including alteration of images, are counted as serious types of research misconduct. They happen through abusing the scientific method to generate false results, either manufactured or manipulated (Shaw, 2018). Researchers, who perform fabrication or falsification, may not totally generate data from scratch, they could change results through adding a value, omitting outliers, or performing statistical analysis in a deceitful manner (Shaw, 2018). These acts do not only indicate dishonesty of researchers, but it also compromises the spurious knowledge produced and thus jeopardizes the integrity of research (Shaw, 2018).

Plagiarism is considered the third main element of research misconduct (Adeleye & Adebamowo, 2012). It takes place during the writing phase of research studies (Shaw, 2018).

There are two common forms of plagiarism, including:

- Deliberate plagiarism that involves intentional copying other researchers' work and presenting it as one's own original creation without appropriate citation (Das & Panjabi, 2011).
- Inadvertent (unintentional) plagiarism that occurs due to the lack of awareness about how to use other sources without copying the same pieces of writing (Freckelton, 2010).

Besides, according to Mohammed et al. (2015), plagiarism can occur in many types such as including plagiarism of ideas, text, designs, collusion, self-plagiarism, patchwriting (differences are summarized in Table 1).

Table 1: Types of Plagiarism

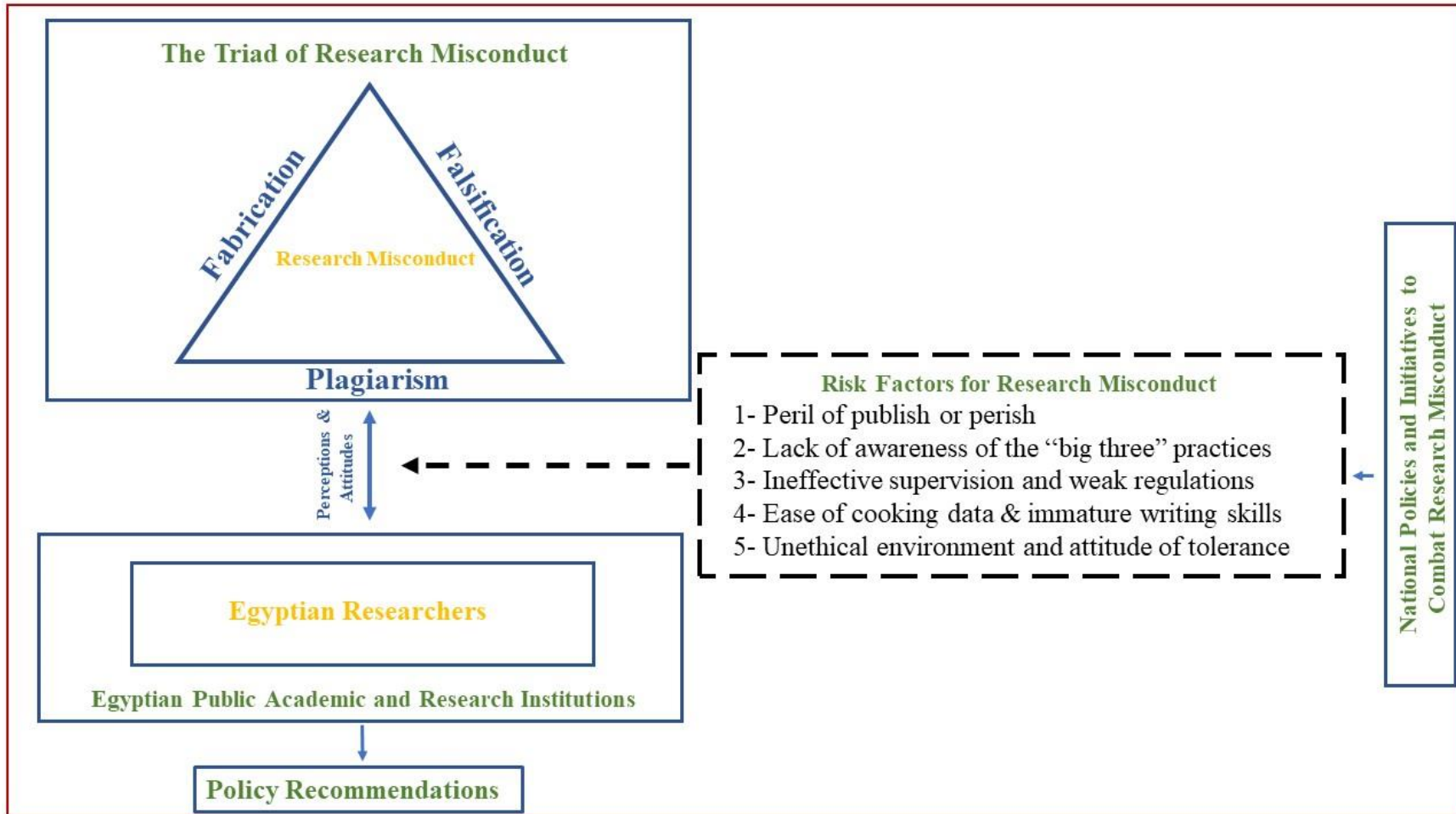
Types of Plagiarism	Description
Plagiarism of ideas	Robbery of another thought or a hypothesis presented anywhere. The plagiarist at that point conducts research by being dependent on this thought/ hypothesis and presents it as if it is his/her claim without acknowledgement of the source.
Plagiarism of text	This form is also called "copy-paste" or "word-to-word" writing. This happens when a scientist takes a whole section from another source and incorporates it in her or his very own research writing.
Self-plagiarism	This happens when a researcher uses considerable pieces of his research in two distinctive publications utilizing the equivalent data without referring to it.
Collusion	Asking another person to write a piece of work for the infringer who at that point presents it as though it is his own.
Patchwriting	Duplicating portions of another work and changing a couple of words or the order of words to make it appear as if it is original.

Source: Author's conceptualization based on (Al-Adawi et al., 2016).

While plagiarism is considered a type of fraud as it involves generating false claims, the falsehood here does not impact the science in the same way as fabrication and falsification do (Shaw & Satalkar, 2018). In other words, the plagiarist is dishonest about who performed the research work, not about the generated data of the work. In this context, plagiarism does not infect scientific integrity in the same manner as the other two elements do. Therefore, this type of misconduct is more about stealing others' work rather than damaging science and thus it is considered a breach of research integrity and not scientific integrity (Shaw & Satalkar, 2018).

Based on the literature review, there are many factors that can contribute to the occurrence of research misconduct in Egyptian public academic institutions (Felaefel 2015; El-Shinawi et al., 2016). These factors are: [1] peril of publish in reputable journals, [2] lack of awareness of the big three practices of research misconduct, [3] ineffective supervision and weak regulations, [4] ease of cooking data and immature writing skills and [5] unethical environment and attitude of tolerance towards research misconduct.

Figure (1): Risk factors that lead Egyptian researchers to commit research misconduct



Source: Author’s conceptualization based on the literature review and the US code of Federal Regulations

3.2. Methodology

3.2.1. Design

For better understanding of research misconduct problem in Egyptian public academic and research institutions, this explanatory research is designed to examine the independent risk factors that can contribute to the occurrence of such practices in public universities and research institutions in Egypt. In addition, this research study is designed to determine the extent to which the Egyptian researchers are accepting the big three unethical practices of research misconduct. Notably, the researcher already pursued her PhD in pharmaceutical sciences at one of the largest Egyptian public universities in Egypt. She, likewise, participated in several workshops and conferences initiated by NAS in different countries that aimed at fostering responsible conduct of research in Egypt. Similarly, she received several grants from NAS to implement several workshops about research integrity in different Egyptian public academic and research institutions. Therefore, a strong contact was already established with various alumni, who pursued their graduate studies in public universities and academic faculty members working in different public universities and research institutions in Egypt. Thus, data collection was expected to be easier and more wide-ranging.

3.2.2. Methods

The qualitative approach aims at gathering in-depth understanding of social behavior as well as the causes of such behavior (King et al., 1994). As research misconduct is considered a collective social behavior, data gathering depended mainly on qualitative research method. Eleven semi-structured in-depth interviews were conducted with researchers with different backgrounds and at diverse career levels, who are either working as an academic faculty member, studied or currently studying their post graduate studies at different Egyptian academic or research

institutions. The interviews were audio-recorded after taking the permission from each informant. Additionally, the interviews were mainly based on interview guide that was prepared to revolve around the two research questions of the study. The interview transcripts were transcribed and coded by the researcher.

3.2.3. Sampling

A purposeful sampling strategy was pursued in choosing the respondents; preliminary criteria relevant to the objectives of the research study were predetermined to guide the selection process. This selection criteria enclosed: All respondents should be either doing post-graduate studies, alumni of Egyptian public universities or working as an academic faculty member at any Egyptian academic or research institution. Diversity in positions and educational background were taken into consideration as much as possible. Additionally, this research involved triangulation in data collection as it will employ multiple sampling strategies, including typical case, intensity sampling and confirming and disconfirming cases (Marshall & Rossman, 2006). The respondents' number is not fixed before data collection and the number of interviews were decided upon during the process of data collection on the basis of theoretical saturation. The researcher stopped conducting interviews once she felt that new data were not bringing additional insights to the research questions.

3.2.4. Interviews

In-depth interviews are considered to be the most common and effectual qualitative method for allowing the participants to discuss their opinions, experiences and personal encounters (Mack et al., 2005). In turn, eleven in-depth interviews were conducted with post-graduate students, who are currently pursuing their graduate studies in public universities in Egypt, alumni, who pursued their graduate studies in public universities in Egypt and academic faculty members working at

different public academic or research institution in Egypt. Moreover, all the informants of the current study are of different educational levels and backgrounds. For instance, some of the informants have pharmaceutical or medical backgrounds, others have veterinary or engineering backgrounds. Interview questions were designed to provide a vivid picture of the participants' perspectives on the research misconduct problem in Egyptian public academic or research institutions. The questions were prospectively semi-structured to enable respondents to talk without restrictions and probing questions were asked, when conversation skewed to unwanted track.

3.2.5. Data analysis

The in-depth interviews were conducted in Arabic and translated to English by the researcher. Thematic sorting was performed by the researcher and each interview transcript was divided into several sections. Throughout this process, thematic index was formed by the researcher and cross-checked by her colleague to assure the validity of codes and to guarantee that they have mutual understanding of the formed themes and illustrative quotes were selected. All data were coded according to the thematic index.

Table 2: Interviewees Profile

Interviewees	Title	Specialization	Age	Gender	Working sector
First participant	Professor	Pharmacology	65-70	Male	Public research institution
Second participant	Professor	Toxicology	65-70	Female	Public research institution
Third participant	Associate professor	Veterinary medicine	35-40	Female	Public university
Fourth participant	Associate professor	Clinical pharmacology	35-40	Male	Public university
Fifth participant	Associate professor	Pharmacology	35-40	Female	Public research institution
Sixth participant	Researcher	Pharmacology	30-35	Female	Public research institution
Seventh participant	Lecturer	Construction Engineering	30-35	Male	Public university
Eighth participant	Research assistant	Veterinary medicine	30-35	Male	Public research institution
Ninth participant	Research assistant	Pharmacology	30-35	Male	Public research institution
Tenth participant	Teaching assistant	Clinical pharmacy	25-30	Female	Public university
Eleventh participant	Teaching assistant	Internal medicine	25-30	Male	Public university

Profile of interviewed participants (Source: the researcher)**3.2.6. Ethical considerations**

All the interviews were held in a period between February and March 2019 after the IRB approval. Before starting the interviews, all the participants were notified about the nature and the purpose of the research through an informed consent (Babbie, 2007). Participation in this research was voluntary and informants, who refuse to continue the interview, were free to leave. In addition, the researcher obtained permission from each participant to record the conversation. All the interviews' transcripts and recordings were kept confidential and results were analyzed and interpreted by the researcher. Participants' confidentiality and anonymity is assured in order not to cause any harm to the participants. Therefore, pseudonyms were used. All the informed consents

for participations were either signed by the participants or communicated verbally and recorded to ensure voluntary participation.

3.2.7. Limitations of the study

Limitations of the current investigation relate to the fact that some participants, who were committed to research misconduct were reluctant to admit their fraud though they were notified that the researcher will use pseudonyms in her research. Similarly, some participants were hesitant to report their professors or colleagues though they were informed that the interviews' transcripts will be kept confidential. Interviews were limited to 30 to 45 minutes due to the fact that some researchers had other duties to perform, such as performing ongoing experimental studies or delivering lectures to students. From a logistical point of view, another limitation of the current study relates to the interviews' location. Most of the interviews were conducted either in the laboratories or in lecture halls, which were not suitable for the interviews as they include a great number of graduate students and most of the participants of this research were extremely busy with their experimental and academic work.

3.2.8. Delimitations of the study

The data of the current study were collected only from a limited number of Egyptian public academic and research institutions for natural sciences and therefore they cannot be generalized to all Egyptian public universities and research institutes.

Chapter Four: Findings and Discussion

The big three practices of research misconduct constitute a threat to scientific research as they are becoming a culture among researchers (DuBois et al., 2013). In Egypt, universities and research institutions are now deteriorating due to the rise of the big three practices of research misconduct practices among researchers (Al-Adawi et al., 2016). In doing along these lines, the research held two main objectives. First, to determine the intertwined risk factors that contribute to the occurrence of research misconduct in Egypt. Second, to examine the extent to which the Egyptian researchers are accepting the big three practices of research misconduct. Based on the eleven in-depth interviews that were conducted with the participants of the current study, the data analysis section is divided into two main themes: First, the intertwined risk factors that contribute to the occurrence of the big three practices of research misconduct. This theme is divided into five sub-themes, which are: **[a]** pressure to publish in reputable journals, **[b]** lack of awareness and conceptual confusion, **[c]** ineffective oversight and weak regulations, **[d]** ease of cooking data and immature writing skills and **[e]** unethical environment and attitude of tolerance towards research misconduct. Second, risk factors for research misconduct related to the Egyptian context. This theme is divided into three sub-themes including: **[a]** low salaries of Egyptian researchers and underdeveloped laboratories, **[b]** lack of attention paid by the Egyptian public academic and research institutions and **[c]** unsuccessful role of the Egyptian government in combating research misconduct.

4.1. The intertwined risk factors that contribute to the occurrence of the big three practices of research misconduct

4.1.1. Pressure to publish in reputable journals

It is worth noting that the threat of publish or perish is counted as one of the most important factors that leads to the rise of research misconduct malpractices (Rawat & Meena, 2014). Researchers from public universities highlighted the fact that exaggerated emphasis on producing “publishable” data may push down the quality of research and jeopardize research integrity. Hosny, a research assistant and a PhD student, who works at one of the biggest research institutions in Egypt pointed out that the pressure of publish or perish leads to the rise of the big three practices of research misconduct as it makes researchers fabricate data in order to produce high quantity of research papers. He stated:

“We are forced to manipulate data as we have to finish our degrees and publish our papers in reputable journals as soon as possible in order to get promoted (...) I know a colleague, who has a very good experience in data falsification. He finished his PhD on time and received a financial reward and I also know a professor in my department, who performed most of his research studies in his office without visiting the lab. He used to download several papers from google scholar and fabricate results to publish many research papers and get financial rewards.”

(Hosny, research assistant and a PhD student, March 2019).

Hosny’s remarks shed the light on the fact that violation of research integrity takes place among different researchers with different career levels in one of the biggest Egyptian research institutions. He pinpointed that his colleague and his professor are performing research misconduct practices in order to publish many research papers and get financial incentives. His statement clarifies that the pressure of publish or perish is regarded as one of the pressing issues for scientists. In addition, his comment casts light on a serious problem as some researchers working at the same research institute are justifying their acceptance of these unethical practices as they feel that they

are forced to publish many papers or finish their degrees in order to get promoted. Evidence from literature showed that irresponsible investigators might violate the rules of research integrity in order to publish many papers and justify their actions in the framework of “publish or perish” pressure (Pupovac et al., 2017).

Similarly, Sara, a researcher, who works in one of the biggest research institutes and completed her PhD in one of the reputable universities in the US notes that the pressure in academia to rapidly and frequently publish academic work leads to the rise of questionable research practices. She stated:

“The threat of publish or perish can be considered an important factor that leads to the rise of the research misconduct malpractices. Researchers have to publish nine papers or more in reputable journals in only five years in order to get promoted (...) this pressure encourages unethical researchers to take the short cuts and commit research misconduct to save their jobs.”

(Sara, researcher, March 2019).

Sara’s statement shows that the only way for researchers to get promoted and prove academic competency is to publish many research articles in a short period of time. This academic promotion polices constitutes pressure for researchers to produce a large number of publications regardless of their quality. In addition, this pressure results in producing cheaters than innovators and encourages irresponsible researchers to take the easiest route and commit research misconduct in order to get prompted. The finding is in line with Breen, (2016), who argued that since publishing manuscripts is the only means for researchers to get credit for their work, many unethical researchers do different forms of research misconduct to publish many papers rather than focusing on a scientific discovery.

In the same manner, Fayed, a lecturer in one of the biggest public universities in Egypt sheds the light on a serious problem, which threatens scientific research. He clarified that many of his students are not interested in scientific research and some of them are performing research

misconduct practices in order to finish their graduate studies quickly and get promoted. He mentions:

“Some of my students are not interested in scientific research they pick up the easiest topic and they call it the “granted topic” to finish their degrees quickly, publish scientific papers and get promoted. In my opinion, research misconduct practices are very common among this type of students (...) I know a student, who was not interested in scientific research. She plagiarized most of her thesis because she wanted to graduate quickly and get promoted (...) These students consume their time, money and efforts in producing low quality research”

(Fayed, lecturer, March 2019).

Fayed’s comments reveal that some of the post-graduate students at his university are not looking for scientific discovery, but they are concerned more with holding a position in their institutions. He feels that unethical research practices are more common among this type of students as their main goal is to get their degrees and publish research papers as soon as possible in order to get promoted. This finding is consistent with Herndon (2016), who noted that violation of scientific integrity takes place when the ultimate goal of the researchers is to publish papers not to produce scientific discovery.

4.1.2. Lack of awareness and conceptual confusion

In Egyptian academic institutions, lack of awareness about research misconduct, its different forms and implications are a widespread problem among researchers (El-Dessouky et al., 2011). Interviews with researchers from different Egyptian public universities and research institutions showed a lack of knowledge and awareness about the big three practices of research misconduct. Honsy thinks that copying and pasting paragraphs is an ethical practice as long as researchers are citing the original authors properly in their papers. He mentioned:

“For me, research misconduct is a passing fad and paraphrasing is non-sense because when researchers paraphrase paragraphs, they sometimes couldn’t deliver the meaning to the readers (...) what I need to say is that yes, it’s our right to copy and paste full paragraphs verbatim as long as we are doing proper citation in our papers.”

(Hosny, research assistant and a PhD student, March 2019).

Hosny’s comments show that he does not know the limits of using data and pieces of writing from previously published research papers. He unintentionally plagiarizes paragraphs and thinks that it is ethical as long as he is doing proper citation. He, likewise, thinks that research misconduct phraseology is non-sense and a new fashion that appeared among researchers recently and will last for a short period of time and this was very clear, when he said, *“research misconduct is a passing fad.”* Additionally, his remarks clarify that some researchers use the “copy and paste” tool because they have underdeveloped writing skills and language problems that need practice and time to be developed. This finding is in agreement with Al-Adawi et al. (2016), who mentioned that plagiarism is one of the most common pressing issues in Egyptian academic institutions that results from lack of awareness of using wordings from published studies.

Similarly, Shawkat, a teaching assistant of internal medicine at an Egyptian public university and a master’s student, who finished the premaster courses last year declared that the university he pursues his graduate studies is not offering any course related to research ethics. He mentioned:

“I do not know what the exact definition of research misconduct is. The first time I heard about this phraseology was when I found a professor complaining to me that his research was stolen by his colleague in the same institution. After that I googled about research misconduct and I understood that it is the violation of research integrity (...) regrettably, my university is not offering formal courses about responsible conduct of science though this problem is very common and growing in many Egyptian public academic and research institutes.”

(Shawkat, teaching assistant, March 2019).

Shawkat's statement reveals that some graduate students are unaware of responsible conduct of science principles and they unwittingly transgressed the borders of research integrity. Additionally, his remarks clarify that Egyptian public universities are failing to respond to this alarming problem adequately though the problem is very common and rising among Egyptian researchers. His comments, likewise, reveal that the university is not offering formal courses about research integrity. He feels that this problem could be addressed through including formal courses about responsible science to increase the awareness of junior researchers about the big three practices of research misconduct. This finding is in agreement with El-Shinawi et al. (2016), who mentioned that research misconduct problem should be addressed through offering formal courses and interactive workshops about responsible conduct of science to all the Egyptian graduate students and faculty members.

In the same context, Fayed noted that the Egyptian university he works for is offering research integrity courses for post-graduate students as a routine procedure to make them eligible for the dissertation phase. Additionally, most of the students do not know the importance of this course and they perceive it as a mandatory step for graduation. He mentioned:

“There is no specific curriculum for research misconduct. Every professor talks about this topic from her or his perspective and most of them are not fully aware of the different forms of research misconduct. The course offered by the university is not interesting, unstructured and ineffective. Also, most of the students do not understand its importance and consider it as a mandatory step for graduation (...) I mean most of the students, here, prefer to take this course directly before graduation and not before performing the experimental part of their theses and that's non-sense.”

(Fayed, lecturer, March 2019).

Fayed's remarks reveal that the research integrity course offered by the university is worthless as most of the students consider it as a tool for graduation and not for learning. Therefore, it is obvious that there is lack of awareness of research misconduct and its different forms among graduate students in Egyptian public universities. In addition, his comments shed the light on a

real problem, which is that the university is not obliging the post-graduate students to attend and pass this course before applying for any graduate program. This finding is in line with Riis (2000) and Al-Adawi et al. (2016) who stated that universities should offer formal courses and interactive workshops for graduate students to raise their awareness about the different forms of research misconduct before getting enrolled in any graduate program.

In the same context, Ahmed, a university professor, noted that he is not entirely convinced that researchers should paraphrase paragraphs while writing their research papers. He stated:

“With all due respect, I’m not with the idea of paraphrasing in scientific research. In my opinion, what was stated by previous scientists should be copied verbatim (...) I know some professors, who do not allow their students to paraphrase as they consider previous published articles sacred texts”

(Ahmed, professor, March 2019).

Professor Ahmed’s statement shows that many professors working in Egyptian public universities have different views of plagiarism. His comments caught my attention especially when he mentioned that many professors working at Egyptian public academic and research institutions forbid their students paraphrasing when they are writing their research studies as they consider previous published research articles as holy texts. In my opinion, his comments are very serious because as it shows that many Egyptian professors are inadvertently harming their students through transferring their erroneous beliefs to them. Regrettably, these false beliefs will be transferred from one generation to another and research misconduct problem will grow if it is not tackled properly. When probed further, professor Ahmed stated that he is extremely upset about the introduction of plagiarism detection software at public universities and research institutions. This was clear when he stated: *“using plagiarism detection software is a waste of time”*. This finding is in harmony with El-Dessouky et al. (2011), who stated that scientific research is deteriorating in Egypt due to

the lack of awareness about the unethical nature of research misconduct practices among academics.

Similarly, Rabab, who works as an associate professor mentioned shed the light upon some stand-alone programs in responsible science education launched by NAS that aimed at developing a network of Egyptian faculty members, who are knowledgeable about responsible science and, who can educate others using active didactic techniques. She stated:

“When I was performing my masters and PhD my perception about research misconduct was not right (...) till I joined the First Egyptian Educational on responsible science in Egypt that was held in Ain El Sokhna, Egypt from March 21-26, 2015. This institute was initiated by the National Academy of Sciences followed by another institute conducted in Egypt in February 21-26, 2016 and Leadership Institute conducted in May 14-17, 2016 aiming at increasing the awareness of Egyptian researchers about responsible science and enabling them to formulate sustainable strategies to tackle research misconduct problem within the Egyptian higher education system (...) actually I was lucky to be selected as a participant in these institutes (...) I received a grant from the National Academy of Sciences and I conducted a very successful workshop in my research institutions aiming at increasing the factual knowledge of research regarding responsible conduct of research.”

(Rabab, associate professor, February 2019).

Rabab’s statement reveals that most of the Egyptian public academic institutions are not offering courses to the graduate students about responsible conduct of research. It seems from her statement that she is convinced that responsible science should be an element of all courses so that it is perceived as central to research enterprise. In addition, she mentioned that organizations around the world such as NAS are launching stand-alone programs in responsible science and offering grants to researchers aiming at introducing responsible conduct of research education for researchers and graduate students as well as promoting research integrity in different public academic and research institutions in Egypt. This finding is in line with Idiegbeyan-Ose et al.

(2016), who mentioned that raising the awareness of researchers regarding responsible science has a substantial effect on reducing research misconduct.

On the same manner, Ghadeer, an associate professor, shed the light on the fact that most of her students do not have the right perception of the terminology “Research misconduct”. She stated:

“Most of my graduate students commit research misconduct. They do not know that manipulation of data is counted as one form of research misconduct (...) I usually exert with them tremendous efforts to teach them the ways that can help them to avoid plagiarism such as paraphrasing, citing, quoting and referencing.”

(Ghadeer, associate professor, March 2019).

Ghadeer’s quote reveal that there is a lack of understanding among Egyptian graduate students regarding the unethical nature of research misconduct practices. It seems from her statement that the problem of research misconduct is growing due to the wrong perception of researchers regarding the principles of responsible conduct of research. This data is in line with Kandeel et al. (2011), who mentioned that inadequate knowledge about research misconduct is counted as an important factor that contributes to the rise of research misconduct problem in Egyptian public academic and research institutions.

4.1.3. Ineffective oversight and weak regulations

Absence of regulations and lack of effective supervision are two important factors that could lead to the rise of different forms of research misconduct (Al-Adawi et al., 2016). Researchers from public universities underscore the importance of adequate oversight, clear rules and guidelines as well as institutional policies for research integrity in all public universities that ensure the application of the principles of responsible science in all steps of research. Hosny feels

that there is no effective monitoring system in the university, where he is currently doing his PhD. He stated that most of the supervisors meet up with their students after they finish the experimental part of their theses. He explained:

“My supervisor did not monitor me while I was performing the experimental part of my thesis. She met me after I finished writing the first draft. To be honest, I did not perform the whole experimental part. When I met my supervisor for the first time, she advised me to meet a technician, who works in a private lab (...) most of the professors and researchers, who work here know him. I met him on Mossadak Street in Dokki to give him my samples because he refused to meet me in his lab and I paid him sixteen thousand pounds¹⁰ (...) the time needed to complete this exhausting experimental work should be at least ten days but what happened is that he called me after six hours and gave me awesome data. I am not sure if he measured all the needed parameters or not, but I feel that this is not my responsibility as I paid a lot of money.”

(Hosny, research assistant and a PhD student, March 2019).

Hosny’s comments reveal that his supervisor encouraged him to take the easiest route and to ask a distrusted person to perform the experimental work of his thesis. I was surprised when he mentioned that this person is well known among professors and researchers, who work in the same institution. It seems that most of the graduate students deal with this person and pay him a lot of money to get publishable data and to save time and effort. His statement shows that he paid a lot of money to this irresponsible person, who most probably did not perform the experimental work and created data from scratch in a short period of time. Additionally, his remarks clarify that he will use this data in his thesis although he is not sure if they are authentic or not. This finding is in line with DuBois et al. (2013), who noted that responsible supervisors have an important role in decreasing the occurrence of research misconduct.

In the same context, Shawkat was extremely upset because he feels that his supervisor is not following up the progress of his experimental work as she has many students. He mentioned:

“My supervisor does not meet me on a regular basis. She does not care about how I performed the experiment. She just needs publishable results as soon as possible

¹⁰ Sixteen thousands Egyptian pounds are equivalent to nine hundred thirty-four US dollars

because she has many students and needs to get promoted (...) What I need to say is that lack of supervision in Egyptian universities can encourage irresponsible researchers to take the easiest route and commit research misconduct and I feel that many professors do not care how data were produced they only care about publishing papers”

(Shawkat, teaching assistant, March 2019).

Shawkat’s comments succinctly clarify that there is no effective monitoring system in the Egyptian public university for which he works. He noted that his supervisor is in charge of a great number of students and, therefore, she is unable to supervise the progress of their experimental work on a regular basis. He was extremely upset as he feels that his supervisor is only checking the results of his thesis to assure that they are publishable, and she does not care about how these data were obtained. This finding is in harmony with Al-Adawi et al. (2016), who stated that inadequate supervision in Egyptian public universities is a common phenomenon that could impede the quality of research generated.

Similarly, Sara pointed out that there is neither effective supervision nor institutional policies for research integrity in most of the Egyptian public universities. She briefly discussed through her studying experience in the US an effective monitoring system that monitors students while they are conducting their experiments in their labs. She stated:

“I pursued my master in one of the biggest public universities in Egypt and there was no effective supervision. Most of the supervisors are pushing their students to finish the experimental part quickly as their main concern is to publish many papers. During my research journey in the US, I noticed that most of the universities have clear guidelines about responsible conduct of research. In addition, everything is monitored through the internet-based administration system (...) through this system, all the graduate students sign in electronically before using any lab apparatus. Through this system, the supervisor gets a notification that her/his student is currently running the samples and she also receives a copy from the raw data. Therefore, there is no chance of data fabrication.

(Sara, researcher, March 2019).

Sara's statement shows that in the US most of the universities have clear guidelines about research integrity. Her comments, likewise, reveal that most of the universities are using the *internet-based administration system* to monitor their researchers, while working in the laboratories. This effective system does not allow any irresponsible researcher to fabricate data as everything is monitored by the supervisor.

4.1.4. Ease of cooking data and immature writing skills

It is worth noting that fabrication and falsification can take place during the phase of data analysis and interpretation (Bornmann, 2013). These unethical practices are more common in quantitative research as it is easy for unethical investigators to make up data or manipulate results to support the hypothesis of their research. Waleed, a research assistant, clarified that some supervisors encourage their students to do irresponsible research practices to produce positive results that support the hypothesis of their research. He explained:

"I know an assistant professor at my university, who encourages her candidates to manipulate data (...) she knows that she is doing unethical thing by advising her students to take the easiest route and falsify their data and she usually tells them please do not tell anyone that I told you this advice. "

(Waleed, research assistant, March 2019).

Waleed's remarks illustrate that there are some irresponsible supervisors, who encourage their students to perform unethical research practices by convincing them that these practices are acceptable and much easier than repeating the whole experiment. In addition, his statement reveals that fabrication and falsification are taking place not only among junior students, but also among senior researchers and professors. It is obvious from Waleed's statement that this assistant professor knows that she is doing something wrong. She is pushing her students to finish quickly and advises them to manipulate data they produce rather than repeating the experiment. This

finding is in consistent with Kandeel et al. (2011), who mentioned that cases of data fabrication and falsification are increasing in developing countries such as Egypt.

Unexpectedly, Hosny admitted that he fabricated his dissertation through saying:

“I fabricated the results of my thesis by using data of others because my topic has been repeated several times (...) To be realistic, I know that I am not the one, who will solve a national health problem, so I decided to take the easiest way to be a PhD holder and feed my children.”

(Hosny, research assistant and a PhD student, March 2019).

Hosny’s confession elucidates that data fabrication in quantitative research is easy. It obvious that data fabrication at the doctoral level means that the researcher is not interested in scientific research and what counts to him is getting the certificate. These findings are consistent with Resnik et al. (2015), who noted that fabrication and falsification are more common in quantitative research than qualitative research.

In the same manner, it is worth noting that immature scientific writing skills can contribute to acts of plagiarism (El-Shinawi et al., 2016). Sandy, an associate professor, who works in one of the largest public universities in Egypt feels that many of his students plagiarize because they do not trust their writing capabilities. She mentioned:

“Many students prefer to copy and paste statement verbatim because they face difficulties to deliver what they want to say when they paraphrase long paragraphs.”

(Sandy, associate professor, March 2019).

Sandy’s statement clarifies that many Egyptian researchers do not have the right skills of paraphrasing, taking notes, quoting and citing previous published scientific papers. It seems that some Egyptian researchers have poor writing skills that make them unable to paraphrase and deliver the meaning they want. In addition, most of them prefer to copy and paste statements verbatim instead of developing their writing capabilities. This finding is in agreement with Felaefel

(2015), who mentioned that plagiarism is a serious and prevalent problem in developing countries, including Egypt.

4.1.5. Attitude of tolerance and unethical environment

Fayed describes his attitude towards irresponsible researchers by mentioning that:

“If I saw a colleague doing irresponsible research practices, I will tell him this is a wrong practice (...) I will also offer my help. To be honest, I will not tell on him because I feel that he is a victim as all the system is corrupt.”

(Fayed, lecturer, February 2019).

Fayed’s remarks reveal that he will not take a positive action towards irresponsible investigators because he feels that they are “victims” and this problem should be addressed through formulating laws and rules at the national level as well as institutional policies that direct the process of scientific research at universities. This finding is not in agreement with Martinson (2007), who clarified that violation of research integrity should be addressed through a multi-level approach that should involve researchers, institutions and the entire scientific community.

Similarly, Sandy clarified her attitude if she found her students or her colleagues committ research misconduct. She stated:

“If I knew that one of my students performed data fabrication or data falsification, I will oblige her/or him to repeat the whole experiment (...) But if the same situation is repeated with a professor, my reaction will absolutely differ. What I will do is that I will not work with her/him again, but I cannot report my professor or tell her/him stop doing that.”

(Sandy, associate professor, March 2019).

Sandy’s comments show that she is ready to take serious actions towards her irresponsible students, who performed unethical research practices. On the other hand, her statement reveals that she will not take any serious action towards her professor, who is doing research misconduct as she

cannot expose her/him in an embarrassing situation. Instead, she decided to avoid doing collaborative scientific research with those irresponsible professors.

In the same manner, Hosny described his reaction if he saw his professor fabricate data by saying:

“If I saw a colleague or professor doing any form of research misconduct, I will not do anything because I do not want to put myself in troubles.”

(Hosny, research assistant and a PhD student, March 2019).

Hosny’s comment shows that he will not take any action towards wrongdoers. From his point of view, he is convinced that the best response to this situation is to avoid any conflicts with his colleagues.

It is worth noting that there is a significant correlation between unethical research environment and the prevalence of research misconduct (Felaefel, 2015). Rabab was extremely upset because she feels that research misconduct practices are becoming part of research culture in her institution. She mentions:

“Most of the researchers in my institution believe that the drug or compound they are testing on a certain disease should give positive results. So, if they get negative results, they do not accept them and manipulate data to support the aim of their research.”

(Rabab, associate professor, February 2019).

Rabab’s comments highlight the fact that the culture of the university, where she is currently doing her postgraduate studies plays an important role in the occurrence of research misconduct practices. Her comments clarify that research organizations have a responsibility for maintaining environment that adopts responsible science. In addition, Rabab’s statement reveals that the environment of the organization allows scholars to perform research misconduct practices without feeling ashamed. This finding is in harmony with Fang et al. (2012), who noted that unethical

environment can influence the attitude of researchers by making them neutral to the unethical research practices.

4.2. Risk factors for research misconduct related to the Egyptian context

Scrutinizing the reasons that make Egyptian investigators commit to the detrimental research practices is important as this perception informs the responses of research organizations and its stakeholders (El-Dessouky et al., 2011). Notably, the interview data provides some useful insights on why Egyptian scientists commit the big three practices of research misconduct and what conditions Egyptian researchers engage in damaging research practices. To the best of the researchers knowledge, the risk factors of research misconduct that are more related the Egyptian higher education system has not been yet investigated.

4.2.1. Low salaries of Egyptian researchers and underdeveloped laboratories

Based on the interview data, low salaries of Egyptian academics as well as the poor working conditions can be counted as important factors that contribute to the occurrence of the big three practices of research misconduct in Egyptian public academic and research institutions. Professor Walaa mentioned that low salaries of Egyptian investigators motivate irresponsible researchers to commit research misconduct. She stated:

“I think the main factor that contribute to the occurrence of research misconduct in Egyptian public academic and research institutions is the low salaries of researchers (...) some researchers publish a huge number of publications per year to get a financial reward. I usually ask myself how they can do that?”

(Walaa, Professor, February 2019).

Professor Walaa’s statement shows that low salaries of Egyptian researchers can be considered as one of the main factors that leads to research misconduct in Egyptian public academic and research institutions in Egypt. Her remarks shed the light on the fact that the main

goal of irresponsible researcher is to publish many papers in order to get a financial reward. Of course, those researchers do not care about the quality of the scientific articles produced. Instead, their goal is to publish many papers to increase their income and solve their financial problems. It is clear from the professor's quote that she is astonished by the huge number of publications produced each year by the irresponsible researchers working in her institutions. She stated that she usually asks herself how these researchers produce this huge number of publications in a short period of time. It seems from her question that she doubts that those researchers are applying the principles of responsible science in all the steps of their scientific research.

In the same manner, Ghadeer mentioned that her laboratory is not equipped with the latest instruments that allow researchers to discover break-through scientific findings. She stated:

“Honestly, we do not have the sufficient technologies in our laboratory (...) most of the labs instruments, here, are either not working or inaccurate (...) I think wrongdoers commit unethical research practices to be able to publish in reputable journals and get promoted.”

(Ghadeer, Associate professor, March 2019).

Ghadeer's remarks show that some labs in Egyptian research institutions are not fully equipped with the needed instruments that allow researchers to produce reliable scientific papers. She was extremely upset when she was showing me that most of the instruments in her laboratory are obsolete. In addition, she pointed out that most of the devices are either not working or imprecise and therefore, many researchers cannot fully rely on them.

4.2.2. Lack of attention paid by the Egyptian public academic and research institutions

It is worth noting that in Egypt most of the public academic and research institutions do not have clear rules and regulations to maintain high standards of responsible conduct of research

(Yacout et al., 2018). Yousra, a teaching assistant in Egyptian public university, was extremely upset as there are no rules or guidelines for responsible science in her university to address irresponsible research practices. She mentioned:

“In this organization, nobody cares about this serious problem. We do not have rules or guidelines to avoid the egregious transgressions of fabrication, falsification and plagiarism that can undermine the research enterprise (...) I feel that most of the public academic and research institutions in Egypt need a clear and well-communicated guidelines that explain irresponsible research practices.”

(Yousra, teaching assistant, April 2019).

Yousra’s remarks reveal that Egyptian public academic and research institutions have responsibilities in formulating and upholding standards of responsible science. In addition, her comments clarify that research organizations should ensure that all the research staff are well-trained in the application of these regulation while performing research. Yousra was very disappointed when she stated that research misconduct problem is given to little attention in her institution as there are no clear guidelines that define irresponsible research practices. This finding is in harmony with Yacout et al. (2018), who argued that most of the public academic and research institutions in Egypt do not uphold clear standards of responsible science.

Similarly, professor Ahmed pinpointed that Egyptian academic and research institutions have responsibilities to address and prevent unethical research practices. From his own point of view, the policies they formulated have a direct impact on all researchers and therefore all investigators should be familiar with these policies. He mentioned:

“Although the prevention of research misconduct is more important than punishments or treatments, it is given little attention in public academic or research organizations. In my opinion, institutions need to formulate effective policies and mechanisms for reporting suspected breaches.”

(Ahmed, professor, March 2019).

Professor Ahmed's statement reveals that the prevention of irresponsible research practices is more important than imposing punishments on wrongdoers. He stated that one of the most crucial institutional responsibilities is to tackle research misconduct problem. This could be done through implementing effective mechanisms to address allegations of research misconduct. In addition, national academics and research institutions need to formulate and disseminate guidelines and standards aiming at protecting the integrity of scientific research. This finding is in line with NAS (2013), which shed the light on the fact that universities and research institutions need to set clear guidelines for responsible science and implement effective mechanisms to prevent irresponsible research practices.

4.2.3. Unsuccessful role of the Egyptian government in combating research misconduct

It is worth mentioning that a full solution of research misconduct cannot depend only on the role of research institutions but also require active an active role from the government (The Global Network of Science Academies, 2016). The government may set definitions or standards for scientific research integrity and identify some irresponsible research practices as "fraud" or "misconduct" (NAS, 2013). Professor Walaa said that a national, legislated and centralized system is needed to foster research integrity in Egypt. She stated:

"Our country is not playing an effective role to tackle this serious problem. I think one of the solution to this problem is to establish dedicated permanent committees at the national level to examine and report upon the unethical research practices."

(Walaa, professor, February 2019).

Professor Walaa statement reveals that the establishment of one or more devoted committee(s) at the national level is counted as a very effective mechanism to combat research misconduct. Notably, members of these committees can be selected to represent a wide spectrum

of relevant professional persons, who are responsible for tracking record of misconduct cases and counseling the government on misconduct-related policies. This finding is in harmony with The Global Network of Science Academies (2016), which shed the light on the fact that governments have several approaches to ensure research integrity.

In the same manner, Rabab highlighted that importance of formation of standing committees that ensure the integrity of research in public academic and research institutions. She mentioned:

“I think the government should establish standing committees in all the Egyptian public academic and research institutions. These committees can have several roles starting from raising the awareness of researchers about the different forms of research misconduct to receiving accusations and processing them.”

(Rabab, associate professor, February 2019).

Rabab’s remarks clarify the importance of establishment of standing committees in all the Egyptian public academic and research institutions. She stated that these committees can play an effective role in combating research misconduct at the institutional level (e.g. university or research laboratory), where misconduct can take place. These committees can ensure scientific integrity and prevent research misconduct through raising the awareness of researchers about the standards and values on which good research is based and receiving allegations of research misconduct and process them.

Chapter Five: Conclusions and Recommendations

5.1. Conclusions

Scientific research is recognized as one of the important catalyst for national development. In many nations, advancement in scientific research has a positive impact on economy and development. Notably, research misconduct is counted as one of the problems that nowadays' academic community is involved in and should identify its root causes in order to come up with effective solutions. Indeed, research misconduct establishes a silent epidemic to modern science as they have become part of the research culture. It has been recognized as a global problem as many medical research studies are replete with its unethical practices and no country is immune from its deleterious consequences. It is defined as forgery or infringement of the moral behavior and standard codes of scholarly conduct in the field of scientific research. Research misconduct is divided into three main practices known as the big three practices of research misconduct. It includes: [a] plagiarism, which is the appropriation of another researcher's words without giving full credit, [b] data fabrication, which is making up data and reporting them and [c] data falsification, which is manipulating, omitting or changing data of a scientific experiment. It has been noted that research misconduct big three practices tarnishes the credibility, reputation and reputation of researchers, research institutions and integrity of scientific research in general. Regrettably, studies on violation of research integrity have mostly been conducted in developed countries such as United States, Canada and Western European. On the other hand, in developing nations studies on research misconduct is still new although these countries have a significantly higher rate of research violation cases than the developed ones. In addition, up to the knowledge of the researcher, most of the developing countries do not have any institutional or national system to combat the unethical practices of research misconduct.

In Egypt, there are many public academic and research institutions that are considered to be among the greatest worldwide. Regrettably, these institutions are unquestionably deteriorating and the reason behind this is the rise of the big three practices of research misconduct. Although Egypt is currently facing challenges regarding the increased number of research misconduct cases, they are still unwillingly mentioned in the literature. It is worth noting that most of the research studies produced from the Egyptian public academic and research institutions are tainted by fabricated and falsified_data as well as plagiarism. In addition, under most of the Egyptian public academic and research institutions, mechanisms used for detecting the unethical research practices are either vague or not seriously imposed. Furthermore, punishment laws are not sufficient and are not punitive.

This instrumental study aimed at filling the gap that was found in the literature regarding the intertwined risk factors that can lead to the occurrence of research misconduct in Egyptian public academic and research institutions. In addition, this study is designed to examine the perceptions and attitude of Egyptian investigators towards the big three unethical practices of research misconduct. The findings of the current study revealed that although absence of awareness is a key factor that lead to the occurrence of big three practices of research misconduct in Egyptian public universities, there are many other intertwined factors that can result in this multifaceted phenomenon. These factors are: **[a]** pressure to publish in reputable journals, **[b]** lack of awareness and conceptual confusion, **[c]** ineffective oversight and weak regulations, **[d]** ease of cooking data and immature writing skills and **[e]** unethical environment and attitude of tolerance towards research misconduct. One unique contribution of this investigation is that it identified three other factors that are more specific to the Egyptian public universities and research institutes and can contribute to the occurrence of research misconduct. These factors are: **[a]** low salaries of

Egyptian researchers and underdeveloped laboratories, [b] lack of attention paid by the Egyptian public academic and research institutions and [c] unsuccessful role of the Egyptian government in combating research misconduct. Another unique contribution of this study is that it showed that there is a discrepancy in the perception of the term “research misconduct” among Egyptian researchers. In addition, it clarified that not all Egyptian researchers have the right perception about research misconduct as most of them are not fully aware of its detrimental big three practices. Similarly, the findings of this study clarified that not all the Egyptian researchers have positive attitudes towards research misconduct practices as some of them believe that workmates should not criticize their colleagues’ reputation nor report unfortunate behavior.

5.2. Recommendations

Misconduct in research tarnishes the scientific enterprise and its consequences also extend into the wider public domain. Indeed, the different forms of research misconduct known as the big three practices undermine the confidence of the citizen in scientific research and in government’s ability to foster scientific research in a competent and ethical manner. Research misconduct, likewise, harms individuals and the whole society, especially if a result becomes extensively known and believed by the citizens. In addition, it results in the damaging of relations among scientists. Therefore, ensuring research integrity is a multifaceted, complex task, touching upon several factors such as education, functions of academic and research institutes and role of the government. Notably, when the advances in scientific research are considered to be important in areas, including health, national security, economic competitiveness and ecological protection, government officials should be strongly driven-indeed- obliged to guarantee the highest level of integrity in research produced. According to the analysis and findings formerly reached in the current study, the following suggested recommendations pave a possible way for policymakers to

deepen the conceptualization of research misconduct phenomenon and to identify a range of a possible effective solutions to reduce research misconduct in Egyptian public academic and research institutions. Accordingly, the proposed recommendations are as follows:

First, it is important for the Egyptian public academic and research institutions to ensure that all researches, academic and research staff and students are fully aware of the different forms of research misconduct. It is vital to assure that research mentors, department heads and senior faculty are able to define, elucidate, exemplify and requiring researchers to adhere to the value systems of their institutes. Indeed, prevention of research misconduct is better than punishments or remedies and yet given slight attention by public academic and research institutes. Therefore, all the Egyptian researchers should take the opportunity to learn the morals and ethics on which a trustworthy research is based. Therefore, responsible conduct of research should be an element of all courses in order to be seen as a central constituent of scientific research not as a separate component.

Second, all the Egyptian public academic and research institutes need to establish a self-regulatory system that fosters integrity in a continuously changing research environment. They need to formulate well-defined and well-communicated rubrics and guidelines that define irresponsible research practices. In addition, both academic and research institutes can maintain ethical environment for research integrity through formulating effective and confidential mechanisms to investigate and report research misconduct cases. Investigations should happen as early as possible. Through these mechanisms, the whistle-blowers should be protected from vengeance and the rights of the accused researcher should be taken into considerations. The reaction to findings of reckless research practices should be based on correct research record, with penalties serving as deterrent to others.

Third, it should be stressed that the Egyptian public academic and research institutes should assure and maintain high quality of research conduct. They should ensure that research studies are undertaken appropriately, accurately and responsibly, without compromising the integrity or quality. This can be done through establishing policies that discourage questionable research practices. In addition, promotion or employment policies should stress the quality rather than the quantity of publications produced. In other words, policies that lead to overemphasis of quantity over quality of scientific research in the reward system for researchers should be ignored.

Fourth, all Egyptian public academic and research institutes should establish standing committee(s) for responsible science. Indeed, adherence to scientific research principles and code of conduct is at the root of an effective and productive research environment. Therefore, these committees are responsible for handling cases of research misconduct through receiving accusations, processing them and recommending solutions. Confidentiality is a key value of these standing committees, where accused scientists' reputations and careers are justifiably protected. Indeed, the communication of the norms and values is a cornerstone for fostering responsible conduct of research and curbing the big three practices of misconduct in science. Based on that, these committees should be responsible for conducting explicit training programs, interactive workshops using active didactic techniques as well as round table discussions with all researchers to foster responsible science.

Fifth, funding agencies have an important role to play for fostering responsible conduct of research in Egypt. They should support efforts of public academic and research institutes to develop interactive training programs and workshops on responsible conduct of research.

Sixth, based on The Global Network of Science Academies (2016), the public agencies that support scientific research, including governments, also have important responsibilities to curb research misconduct. In many ways, governments should make its best efforts to assure that it supports that best research possible (The Global Network of Science Academies, 2016). This can be done through providing all the Egyptian public academic and research institutions access to plagiarism checker software like Turnitin to be used before accrediting any future scientific degrees or publications.

Seventh, the Egyptian government should invest more heavily in higher education. Notably, an investment in public higher education is vital if the government is serious about fighting the practices of research misconduct. In addition, increasing investment in higher education will benefit the economy and community at large.

Eighth, the Egyptian government should establish dedicated committees at the national level to keep a permanent record of research misconduct cases. Based on that, the Egyptian government needs to establish one or more dedicated permanent committee(s) at the national level. Members of these committees can be nominated to represent a wide range of expertise. These national committees are responsible for creating a dependable track record of research misconduct cases. Similarly, these national committees should have stable support staff and stable long-term relations with funding agencies and should play an important role fine-tuning its own procedures, advising the government on research misconduct-related rules and strategies and maintain a permanent record of research misconduct cases.

Eventually, national policies are very important to assure consistent promulgation and implementation of ethical standards (Resnik et al., 2015). These national policies should include a definition of research misconduct and procedures for investigating and arbitrating misconduct

(Resnik et al., 2015). Most of the developing countries, including United States and Canada, developed national policies to address research misconduct problem, such as rules and regulations, journal policies, professional ethical standards, education in responsible science and oversight by national bodies (Resnik et al., 2015). Based on that, the Egyptian government need to develop a national legal instrument for research misconduct. Indeed, a legal basis and a national legislation is very important for curbing research misconduct problem in Egypt. Therefore, the Egyptian government should set clear laws and rubrics at the national level that direct the process of scientific research and forbid any violations of the standard codes of scholarly conduct.

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Annex 2: IRB Approval

CASE #2018-2019-071



THE AMERICAN UNIVERSITY IN CAIRO
INSTITUTIONAL REVIEW BOARD

To: Passant Elwy Moustafa

Cc: Mariez Wasfi

From: Atta Gebril, Chair of the IRB

Date: Feb 10, 2019

Re: Extensions of CASE #2016-2017-094

This is to inform you that I reviewed your revised research proposal entitled "Assessment of awareness and attitudes towards research misconduct in different public universities in Egypt" and determined that it required consultation with the IRB under the "expedited" category. As you are aware, the members of the IRB suggested certain revisions to the original proposal, but your new version addresses these concerns successfully. The revised proposal used appropriate procedures to minimize risks to human subjects and that adequate provision was made for confidentiality and data anonymity of participants in any published record. I believe you will also make adequate provision for obtaining informed consent of the participants.

This approval letter was issued under the assumption that you have not started data collection for your research project. Any data collected before receiving this letter could not be used since this is a violation of the IRB policy.

Please note that IRB approval does not automatically ensure approval by CAPMAS, an Egyptian government agency responsible for approving some types of off-campus research. CAPMAS issues are handled at AUC by the office of the University Counsellor, Dr. Ashraf Hatem. The IRB is not in a position to offer any opinion on CAPMAS issues, and takes no responsibility for obtaining CAPMAS approval.

This approval is valid for only one year. In case you have not finished data collection within a year, you need to apply for an extension.

Thank you and good luck.

A handwritten signature in black ink, appearing to read "Atta Gebril".

Dr. Atta Gebril
IRB chair, The American University in Cairo
2046 HUSS Building
T: 02-26151919
Email: agebril@aucegypt.edu



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Annex 3: Informed Consent Form



Documentation of Informed Consent for Participation in Research Study

Project Title: Curbing the practices of research misconduct: a qualitative study on the perceptions of researchers at Egyptian public institutions

Principal Investigator:

Passant Elwy Moustafa, mobile: +201225608081, email: passantelwy@aucegypt.edu, Address: Taha El Fashny Str., 11351 Nasr City 6th District, Cairo 11351, Egypt.

You are being asked to participate in a research study. The purpose of the research is to determine the intertwined risk factors that contribute to the occurrence of research misconduct in Egypt, and in turn examine the extent to which the Egyptian researchers are accepting the big three unethical practices of research misconduct. The expected duration of your participation is a one-hour in-depth interview and I might contact you for any further information during the research duration that will take three months.

The procedures of the research will be as follows: I will meet you at your university or research institute that you are either working in or doing your postgraduate studies and I will ask you several questions about the following topics:

- What are the risk factors that contribute to research misconduct problem in Egyptian public institutions?

- What is the perception of Egyptian researchers towards the terminology “research misconduct”?
- What are the possible solutions for solving research misconduct problem in Egypt?

There is no risks or discomforts associated with this research and there will be no compensation for the time we spend during the interview.

There are no benefits from participating in this research. Additionally, confidentiality is a key point in this study. Study will not include any information that may cause harm to the participants. Any comments that participants refuse to be listed in the interview sheet will be considered.

Participation in this study is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or the loss of benefits to which you are otherwise entitled.

Above you will find my contact information, please don't hesitate to contact me if you have any inquiries.

Printed Name

Signature

Date