UNIVERSITI PUTRA MALAYSIA

SURVEY ON RESPONSIBLE CONDUCT OF RESEARCH AMONG RESEARCHERS IN MALAYSIA

AIN SOFEA BINTI OSLAN

Ip
FPSK2 2021 13

SURVEY ON RESPONSIBLE CONDUCT OF RESEARCH AMONG RESEARCHERS IN MALAYSIA

AIN SOFEA BINTI OSLAN

A PROJECT PAPER SUBMITTED AS PARTIAL REQUIREMENT FOR THE DEGREE OF BACHELOR OF SCIENCE (BIOMEDICAL SCIENCES)

DEPARTMENT OF BIOMEDICAL SCIENCES
FACULTY OF MEDICINE AND HEALTH SCIENCES
UNIVERSITI PUTRA MALAYSIA

2021

© COPYRIGHT UPM

ABSTRACT

Survey on Responsible Conduct of Research among Researchers in Malaysia

Ain Sofea Oslan[a], Abhimanyu Veerakumarasivam[b], Chai Lay Ching[c], Chau De Ming[a]

[a]Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

[b]Department of Biological Science, School of Medical and Life Sciences, Sunway University

[c]Institute of Biological Science, Faculty of Science, University of Malaya

Introduction: Responsible conduct of research (RCR) is a guideline to ensure high quality of research and prevent breaches of research ethics. According to Steen et. al (2013), the number of retracted articles have spiked in the last ten years. This might be caused by increased research misconduct such as falsification or fabrication of data. It might also be caused by other factors such as poor research design or non-replicable results. Hence, RCR serves as a foundation to improve the trustworthiness of research and prevent misconducts and detrimental research practices. There are currently no national-level studies that evaluate the awareness and attitudes of researchers in Malaysia towards RCR. Therefore, the aim of this study is to fill this knowledge gap through a national survey to study RCR landscape among researchers in Malaysia. **Objectives:** The objectives of this study are to determine the experience of researchers in RCR education, analyse the attitude towards RCR and evaluate the likeliness to whistle-blow. **Methodology:** An online survey has been designed, validated and hosted using Survey Monkey. This survey was approved by University of Malaya's Research Ethic Committee prior to survey distribution via snowball sampling method. We analyzed demographic data, researchers' attitude towards RCR and their likeliness to whistle-blow. The categorical data was analysed using descriptive statistics and the association studies were analysed with Kruskal Wallis, Mannwhitney U Test and Spearman Correlation Test. **Results:** There are 400 respondents who took the survey and 319 respondents have received training in at least one RCR topic. The most common RCR topics these respondents have received training in are authorship and publication, research misconducts and human ethics. There is a slight correlation between respondents' prior experience in RCR training with their attitudes towards RCR. We did not find any correlation between the duration of respondents' research experience and academic qualification with their attitudes towards RCR. Majority of the respondents choose 'somewhat unlikely' and 'somewhat likely' to whistle-blow if they encounter suspicious research misconduct. One third of the respondents are likely to whistle-blow and a minority of 15% are unlikely to whistle-blow. **Discussion and Conclusion:** This study serves as an opportunity to assess the attitude towards RCR among the researchers in Malaysia. A minority of respondents admitted that they rather ignore some research ethics if it means they can hasten the research process. This event

© COPYRIGHT UPM

may lead to research misconducts and poor quality research. Although more than half of respondents have RCR training experience, the scope of their training is limited to a few topics. Therefore, it is important to broaden their scope of RCR training to include more topics such as conflict of interests and mentor-mentee ethics. The reasons provided by the respondents who are unwilling or hesitant to whistle-blow when encountering suspicious research misconduct shows that there is a need to provide clear guidelines on reporting misconduct and to ensure the protection of whistle-blowers.

Keywords : Responsible Conduct of Research, Research Ethics, Research Misconducts, Malaysia

© COPYRIGHT UPM

ABSTRAK

Kajian terhadap Sikap Penyelidikan yang Bertanggungjawab dalam Kalangan Penyelidik di Malaysia

Ain Sofea Oslan[a], Abhimanyu Veerakumarasivam[b], Chai Lay Ching[c], Chau De Ming[a]

[a]Jabatan Sains Bioperubatan, Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia

[b]Jabatan Sains Biologi, Pusat Pengajian Perubatan dan Sains Hayat, Universiti Sunway

[c]Institut Sains Biologi, Fakulti Sains, University Malaya

Pengenalan: Sikap penyelidikan yang bertanggungjawab (RCR) adalah garis panduan untuk memastikan kualiti penyelidikan dan mencegah pelanggaran etika penyelidikan. Menurut Steen et. al (2013), jumlah artikel penarikan telah meningkat selama sepuluh tahun terakhir. Ini mungkin disebabkan oleh peningkatan salah laku penyelidikan seperti pemalsuan data. Faktor lain seperi reka bentuk penyelidikan yang tidak sesuai atau prosedur penyelidakan yang tidak dapat ditiru semula juga boleh mengundang kepada permasalahan ini. Oleh itu, RCR berfungsi sebagai asas untuk memperbaiki kepercayaan masyarakat terhadap penyelidikan dan mencegah salah laku dan amalan penyelidikan yang merugikan. Ketika ini, data berkenaan kajian penilaian kesedaran dan sikap penyelidik di Malaysia terhadap RCR adalah kurang. Oleh itu, tujuan kajian ini adalah untuk mengisi jurang pengetahuan ini melalui tinjauan nasional untuk mengkaji landskap RCR di kalangan penyelidik di Malaysia. **Objektif:** Objektif kajian ini adalah untuk menentukan pengalaman penyelidik dalam pendidikan RCR, menganalisis sikap terhadap RCR dan menilai kesanggupan responden untuk menjadi pemberi maklumat. **Metodologi:** Sebuah tinjauan dalam talian telah dirancang, disahkan dan dihoskan menggunakan perkhidmatan laman web Survey Monkey. Tinjauan ini telah diluluskan oleh Jawatankuasa Etika Penyelidikan Universiti Malaya sebelum penyebaran tinjauan melalui kaedah '*Snowball Sampling*'. Kami menganalisis data demografi, sikap penyelidik terhadap RCR dan kesanggupan mereka untuk memberi maklumat ketika menghadapi salah laku penyelidikan. Data berbentuk kategori dianalisis menggunakan statistik deskriptif dan kajian korelasi dianalisis menggunakan Kruskal Wallis, Mannwhitney U Test dan Spearman Correlation Test. **Hasil Kajian:** Terdapat 400 responden yang telibat dalam tinjauan dan 319 responden telah mendapat latihan dalam sekurang-kurangnya satu topik RCR. Topik RCR yang kerap dilatih oleh responden ini adalah kepengarangan dan penerbitan, salah laku penyelidikan dan etika manusia. Terdapat hubungan antara pengalaman responden dalam latihan RCR dan sikap mereka terhadap RCR. Kami tidak menemukan hubungan antara jangka masa pengalaman

penyelidikan responden dan kelayakan akademik dengan sikap mereka terhadap RCR. Sebilangan besar responden memilih ‘agak tidak mungkin’ dan ‘agak mungkin’ untuk memberi maklumat sekiranya mereka menghadapi salah laku penyelidikan yang mencurigakan. Sepertiga responden cenderung untuk memberi maklumat dan minoriti 15% tidak mungkin memberi maklumat. **Perbincangan dan Kesimpulan:** Kajian ini memberi peluang untuk menilai sikap terhadap RCR di kalangan penyelidik di Malaysia. Sebilangan kecil responden mengaku bahawa mereka lebih suka mengabaikan beberapa etika penyelidikan jika ini bermakna mereka dapat mempercepatkan proses penyelidikan. Kejadian ini boleh mengakibatkan salah laku penyelidikan dan hasil penyelidikan yang tidak berkualiti. Walaupun lebih daripada separuh responden mempunyai pengalaman latihan RCR, skop latihan mereka terbatas pada beberapa topik. Oleh itu, adalah penting untuk memperluas skop latihan RCR mereka untuk memasukkan lebih banyak topik seperti konflik kepentingan dan etika mentor-mentee. Sebab-sebab yang diberikan oleh responden yang tidak mahu atau ragu-ragu untuk memberi maklumat ketika menghadapi salah laku penyelidikan yang mencurigakan menunjukkan bahawa terdapat keperluan untuk memberikan garis panduan yang jelas mengenai melaporkan salah laku dan untuk memastikan perlindungan pemberi maklumat.

***Kata kunci**: Kelakuan Penyelidikan Bertanggungjawab, Etika Penyelidikan, Salah Laku Penyelidikan, Malaysia*

© COPYRIGHT UPM

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Dr. Chau De Ming for his patience in guiding and sharing his knowledge with me the entire time we are conducting this project. I may not be able to finalize this final year project if it were not for his kindness and dedication.

I would also like to thank Dr. Chai Lay Ching from University of Malaya who is the Principal Investigator of this project and Prof. Abhimanyu Veerakumarasivam from Sunway University who is Co-Investigator. Their contributions were vital towards the success of this project.

Furthermore, the implementation of this project during the crisis of the pandemic may not be made ease if it was not for my final year project coordinator, Dr. Hasni Idayu Saidi. I am also thankful for her as she has been a great help in deciding and understanding the statistical test analysis for this study.

I would like to take this opportunities to thank all the lecturers in Department of Biomedical Sciences for their enthusiasm in educating and giving advises for the last four years I have studied here.

This project does not only revolve around my efforts alone. Instead, I have received an endless supports and motivation from my family and close friends. Therefore, I am forever grateful for their existence in my life.

© COPYRIGHT UPM

TABLE OF CONTENTS

© COPYRIGHT UPM

© COPYRIGHT UPM

LIST OF TABLES

© COPYRIGHT UPM

© COPYRIGHT UPM

LIST OF FIGURES

© COPYRIGHT UPM

CHAPTER 1

INTRODUCTION

1.1 Background

According to National Institute Health (2009), responsible conduct of research is defined as research that are done with integrity. Integrity includes the basic responsibility of individual, the decision making skills and good research practise. Therefore, Office of Research Integrity (ORI) generalised the responsible conduct of research (RCR) as the good citizenship applied in the professional life. Although NIH has established a training requirement of RCR back in 1989, the incidence of scientific misconduct and the retraction of publication are still alarming. This could cause confusion and public mistrust towards researchers and hence, lead to various misconceptions.

Responsible conduct of research contains guidelines and codes for researchers to ensure the ethics are not breached during the experiments and to certify the reliability and reproducibility of the results. Office of Research Integrity has outlined nine codes of practise in RCR which encompasses human subject research, research misconduct, publication and authorship, animal subject, mentorship, data management, collaborative science, conflict of interest, and peer review (DuBois et. al, 2010).

Although RCR has been introduce globally and a number of committees has been established as a result, there are still countries that does not fully

© COPYRIGHT UPM

embody RCR practices. In order to minimize the incidence of publication retraction or research misconducts, various programme and collaboration has been done in order to raise awareness regarding RCR. One of the examples is the Asia Pacific Research Ethics Conference (APREC) that has been held a few time to discuss and share a few important topics including research ethics (Reyes, 2014). The collaboration was made in order to achieve the same goal despite the differences among the nations.

In Malaysia, RCR is considered as a fresh topic among the society. Therefore, various of efforts have been made to increase the awareness of RCR among the researchers. These efforts were made to address the issues regarding the misconducts and detrimental research practices that are becoming more common today. The efforts include the establishment of the RCR module known as 'Malaysian Educational Module on RCR'. This module contains 10 chapters that covered various aspects of RCR, including topics that are recommended by National Institute of Health, USA. Although the universities in Malaysia have established and utilized their own guidelines, RCR training is considered a significant to improvement to refine the integrity and the policies in research.

© COPYRIGHT UPM

1.2 Justification of Study

Currently, there is little data on the awareness of RCR among researchers in Malaysia. This is because RCR is a relatively new topic in the country. Therefore, the understanding of the attitude and the past experience of RCR training among the researchers may help in evaluating the knowledge of RCR in Malaysia. The ability to analyze the likeliness to whistle-blow also can result in the discovery of any loopholes in policies regarding the procedure of reporting misconduct or in the protection of whistle-blower. These data can serve as a preliminary insight in understanding the awareness of RCR among researchers in Malaysia and improve any gap in these policies.

1.3 Objectives

Generally, the objective of this study is to assess the landscape of RCR among researchers in Malaysia. The specific objectives of this study are:

1. To determine the past experience of researchers in Malaysia in RCR education.
2. To analyse the attitude of researchers in Malaysia towards RCR.
3. To evaluate the likeliness of researchers in Malaysia to whistle-blow.

© COPYRIGHT UPM

1.4 Hypothesis

It is hypothesized that majority of researchers in Malaysia have some form of RCR education and that their attitudes towards RCR are positive. We also hypothesized that the likeliness to whistle-blow varies among the respondents.

© COPYRIGHT UPM

CHAPTER 2

LITERATURE REVIEW

2.1 Researcher's Obligation and Responsible Conduct of Research

Researchers are known to obliged to three subjects that helps in improving their commitment to their professional standards. Firstly, the researchers are obliged to their colleague by respecting the confidence of the colleague towards them. Secondly, the researchers are obliged to themselves by being responsible for their own action and ensuring integrity throughout their career. Lastly, the researcher also obliged to the society as most of research result will vastly affect the society especially in aspects of health and medication (National Academy of Sciences, National Academy of Engineering (US) and Institute of Medicine (US) Committee on Science, Engineering, and Public Policy, 2009). These obligations help the researcher to become responsible with the course of actions that they make the entire period of their career and studies.

However, the rules in research can be very complex and therefore, the obligation stated above are not enough to ensure the research integrity and ethics. Some research practices are bound by law which needs to be abide. However, at the same time there are non bounded practices that written as a code and some practices that are not written but are conveyed through mentoring (Steneck & Zinn, 2007). Hence, responsible conduct of research

© COPYRIGHT UPM

have been established to serve as guideline in aspects of the things that researcher can do and cannot do.

2.2 Codes of Responsible Conduct of Research

National Institutes of Health defined responsible conduct of research as the conduct of scientific research with integrity which involve the awareness and practise of accepted professional norms and ethical principals in the entire process. Office of Research Integrity (2007) has listed nine code of practices in responsible conduct of research which are human subject research,animal welfare, research misconduct, publication and authorship, mentorship, data management, collaborative science, conflict of interest and peer review.

2.2.1 Human Research Subjects

Research studies that involve the human as the subject need to undergo some thorough process to obtain ethical approval from an appropriate authority. The authority mentioned is usually the ethical institutional committee such as Institutional Review Board.

According to the ORI Introduction to the Responsible Conduct of Research (2007), human subjects are defined as the living being in which the researcher are investigating to obtain data by either through intervention, interaction or collect any recognizable private information. The interventions in

© COPYRIGHT UPM

the experiment sessions may lead to both desirable and undesirable outcome of the human subject. Therefore, this code has been included in the RCR to prioritize the safety and minimize the risk of the subjects.

There are three principles that are maintained for human research subjects. The first principle is the respect towards the decision of the human subjects. The subjects are allowed to make their own decision without any external influence or oppression. The second principle is the beneficence which refer to the responsibility of the researcher to exploit the benefits and keep the risk of the subjects to minimal. The last principle is the justice which involve the act of spreading the benefits and risk to the people without preconception.

2.2.2 Animal Welfare

The usage of animals in the research often received backlashes from the animal lovers society. However, the need of using them for research purposes are undoubtedly essential as it helps in studying biological pathway or pathological diseases and to test the effectiveness of novel treatment. National Research Council Committee United States (2011) have defined animals laboratory as vertebrates that are bred or utilized for experimental and research purposes.

While there are a few organizations have entrusted to oversee the procedures related to animal research, there are also other principles that

© COPYRIGHT UPM

have been implemented to prevent from any unnecessary pain and slaughter of animals. Office of Laboratory Animal Welfare (2015) have outlined several principles related to the care and uses of laboratory animals. The nine principle have encompasses the transportation, welfare, usage and the treatment of the animals during the entire process.

Another principles that have been implemented is the 3R's principles that have been developed by Russell and Burch in 1959. The 3R's refer to the replacement, reduction and refinement. Replacement is a principle that suggest to find other alternative methods such as in vitro or in silico as a replacement for the animals. The number of the animals used in the animal research must be reduce but are efficient enough for the experiments. Meanwhile, the refinement refers to the experimental procedure where any unnecessary pain or kill must be eliminated.

2.2.3 Research Misconducts

Research misconducts have been defined by Office of Research Integrity (2012) as the act of fabrication, falsification, or plagiarism in proposing, performing or reviewing research or in reporting research results. While fabrication refers to the act of formulating the data or the results, falsification involve the manipulation of the research materials, apparatus, procedures and falsely report them in the records. Meanwhile, plagiarism is the act of not giving an appropriate credit after utilizing an individual's idea, procedures, results or quotation.

© COPYRIGHT UPM

However, for an act to be considered as misconducts, it must append under three conditions. The action must be appraised as significant deviation from the accepted practise and done with intention. A consequential evidence must also be provided when reporting the acts. The researchers that commit misconducts often putting their profession at risk. Depending on the misconduct they commit, their career might be abort or they may need to be put under close observation by the higher ups. Regardless, the misconducts is considered as heinous act as it could affect the society.

2.2.4 Authorship and Publication

Authorship refers to individuals that have taken responsibilities in the writing that they have published. The authorship are significant especially in aspects of social, academics and financial. International Committee of Medical Journal Editors (n.d) have suggested four criteria for the authorship. In order to be credited as the author, the individual must have contribute a significant of efforts in the designing of the study, data acquisition, analysis and interpretation. The individual whom involve with the drafting procedure for intelectual content or contribute in the publication can also be granted as author. Lastly, the authors need to take liability in their publication include the integrity and accuracy of the work.

Publication is necessary and become a requirement for the academicians and researchers. The publication of the work allow the outcome of the

© COPYRIGHT UPM

research to be known. There are four elements of publication which are abstract, methods, result, discussion and notes, bibliography and acknowledgement.

2.2.5 Mentorship

Office of Research Integrity (n.d) has state that mentors are defined as an experience individual who are willing to share their knowledge, giving aides, guide and provide supports both emotionally and morally to their mentee. Meanwhile, the research trainee is an individual that are learning to become a researchers under the guidance of the supervisors. In this mentor-mentee relationship, both sides must be committed to maintain the research environment. During the period of training, the mentor must supervise their mentee properly to ensure the procedure are safe and ethical. An effective communication need to be established to ease the mentor-mentee relationship.

2.2.6 Data Management

According to Office of Research Integrity (n.d), data management includes all the stages from designing data to discarding the data. Specifically, data management refers to data selection, data collection, data analysis, data handling, data reporting and publishing and data ownership. The Malaysian Code of Responsible Conduct of Research state that both primary and secondary data need to appropriately collected and recorded. The data must

© COPYRIGHT UPM

also be stored properly and highly classified if needed. This is to prevent from any leakage of data and prevent the possibilities of false data being published.

2.2.7 Collaborative Science

Collaborative science refer to two or more researchers from different background working together on a project. This type of collaboration may involve people from different fields or institutions. The purpose of collaboration often to exchange knowledge among the researchers to obtain the same goal. In this cases, an effective communication and understanding of the role and responsibilities are important among the researchers. Steneck and Zinn (2007) also have stated that a constructive management over the financial aspects,training and supervision, formal agreements and compliance are necessary in the collaboration research.

2.2.8 Conflict of Interest

According to The Malaysian Code of Responsible Conduct in Research, conflict of interest is a situation which effect the professional judgement of individual in a way that secondary interest overruled the primary interest of the researcher. Conflict of interest may come in different form such as financial gain and personal interest. Financial gain that rise from conflict of interest comes in the form of monetary. Although this situation may causes conflict of interest, Steneck and Zinn (2007) state that there are not exactly wrong as the

© COPYRIGHT UPM

researchers deserve to obtain money from their work. However, if it interfere with work, it will be perceived as misconducts.The personal interest refers to bias that may come from the researchers during research procedures such as proposing ideas and reviewing the research.

2.2.9 Peer Review

Peer review is an evaluation process before the results are being published. This process is essential to ensure the quality of the research and at the same time provide assistance to improve any parts of the studies. United States Geological Survey (USGS) defined peer review as a process where an individual's work are analyzed by an experts from the same field. Besides emphasizing the improvement in the study, the reviewer needs to acknowledge the positive sides of the study and support the comments with credentials. They also need to complete their work within the period given and ensure the confidentiality of the work. The reviewer should not discuss the work with anyone else unless it was necessary.

2.3 Research Integrity in Malaysia

Most of the universities and institutions in Malaysia have established their own research ethics committee and guideline. However, a guideline is not enough to guarantee the integrity in research and manage the research quality. According to Olesen et. Al (2018), the improvement on the perception and understanding of misconducts are crucial especially among the students

© COPYRIGHT UPM

and academicians. This indicates that the situation related to detrimental research practices and misconducts that damaging the research integrity are more grave than we thought. In order to address this issues, a few suggestions have been made. This includes the modification in the education system that should prioritize the ethics syllabus among the students, a clear definition on research misconducts and emphasizing the consequences of the misconducts.

Another attempt to promote research integrity include the launching of RCR in Malaysia. The RCR programme have lead to various other efforts and collaboration of the researchers and organizations to promote the integrity in the research. These collaborations have lead to Malaysia establish their own RCR module known as 'The Malaysian Code of Responsible Conduct in Research'. Since the introductory of RCR in Malaysia has not been long, there is little data on the influence of the programme among the researchers.

Nevertheless, Olesen et. Al (2019) have conducted an in depth interview with participants that have attended RCR training to determine their experience and impact of the training. Based on their findings, the RCR training have imposed a positive effects on the participants especially in terms of awareness regarding the misconducts and the importance of RCR to maintain the research integrity. The participants also have admitted that RCR training allows them to have a different perception in managing their research and confronting misconducts. However, there is a limitation in the training course in a way that the training are unable to cover all aspects of RCR.

© COPYRIGHT UPM

The study also have shown that there are other advantages besides The participants also have added that training RCR also allows them to establish networking with other researchers and promote exchanges of knowledge and collaboration in the research. The gathering of the researchers from different background enable them to have an open discussions to address issues related to misconducts and planning for strategies to improve the research integrity.

2.4 Research Misconducts in Malaysia

Research misconducts are no longer unusual among the society. In fact, it become a concern as the prevalence of unethical research practices are becoming more common over the year. Aspura et. al (2018) have conducted a study to determine the reason behind the retraction of publication in Malaysia. A total of 125 retracted articles have been identified and only two of them are indicted for scientific mistakes. The rest of papers are retracted for the reason of duplicate publication, plagiarism and compromisation in peer review.

Another study conducted by researchers from Spain has listed Malaysia as one of the country identified to have publication retraction from 2013 - 2016.Based on the study, Campos-Varela and Ruano-Ravina (2019) has find that most of the countries involve with the misconduct practices that lead to

© COPYRIGHT UPM

the retraction of publication. Out of six articles retracted in Malaysia, two of them are associated with the compromised peer review process.

Although the number may seem insignificant, the probability of the misconducts to be under reported cannot be dismissed. This is because, the culture of Asian to not report misconducts out of respect or obligation are well known. This situation has been affirmed by Olesen et. al (2019) which stated that the obligation to hierarchy and statuses from the upbringing in Asian culture even influence the work environment. Hence, majority of people are hesitant or unlikely to report or become a whistle-blower due to this issues. The study also have emphasize on the lack of the protection for the whistle-blower and the loopholes in the reporting misconduct procedure.

On the other hand, Olesen et. al (2018) have found that the common misconducts among the Malaysian universities are plagiarism and authorship disagreement. However, the misconducts does not being reported as the participants state that the procedure are time and effort consuming in addition to the fear of their identity being exposed. The author also have intensified the concerns regarding the culture of ‘publish or perish’ pressure that could promote the the unethical research practices.

The same concern have been highlighted in a study on unethical authorship practices among Malaysian higher education institutions by Olesen et. al (2018). In this study, they have found that authorship misconducts are common and the prevalence of this practices are unknown

© COPYRIGHT UPM

due to under reported. The culture of ‘publish or perish’ have been revealed to contribute in this cases. Hence, it is important to address this issues by revising the requirement for the researchers career accordingly.

© COPYRIGHT UPM

CHAPTER 3

METHODOLOGY

3.1 Study Design

This study was designed as a survey to collect data on six sections which are acceptance towards RCR, prevalence of misconducts, factors lead to misconducts, likeliness to whistle-blow and demographic data. However, this thesis will focus only on three sections in accordance to our objectives. The online survey platform that are used to host the survey is SurveyMonkey©.

3.2 Development of Survey Instruments

There are various aspects that need to be considered during the development of the survey. The most important aspect is to ensure that the survey is relevant and able to fulfill the objectives of the study. The survey is in English and the words were chosen carefully so it can be simple and straightforward. The demographics data are placed at the end of the survey instead of the beginning to avoid survey fatigue. This survey was validated before the national survey was launched.

3.2.1 Attitude Towards Responsible Conduct of Research

Section A of the survey was developed to evaluate the attitudes of the participants towards RCR. There are 5 statements that are given in the

© COPYRIGHT UPM

section and the respondents are required to answer it based on their opinion. The answers are in Likert scale of strongly disagree, disagree, slightly disagree, slightly agree, agree and strongly agree.

3.2.2 Acceptance Towards Research Practices

Section B consists of 21 items that are related to the research practices. This section was developed to determine how acceptable are these research practices. The answer provided are in a Likert scale of strongly unacceptable, unacceptable, slightly unacceptable, slightly acceptable, acceptable and strongly acceptable.

3.2.3 Prevalence of Research Misconducts

Section C of the survey was intended to identify the prevalence of research misconducts and detrimental research practices among the researchers based on their experience. The definition of research misconducts and research detrimental research practices were given at the beginning of the section. This is essential to ensure that the respondents have a good understanding of the research misconducts and detrimental practices. A list of 15 types of research misconducts and detrimental research practices were provided and the respondents required to choose research practices that they have encountered throughout in the last five years of their research career. An open-ended answer box was provided in case the respondents

© COPYRIGHT UPM

have experienced misconducts or detrimental research practices besides the one listed.

3.2.4 Factors Contributing to Research Misconducts

In section D, the respondents were given 13 factors that contribute to research misconducts. The respondents are required to choose the top 6 factors out of the 13 factors. An open-ended answer box was provided at the bottom of the section to allow the respondents to list other factors that they think contribute to research misconducts. This section is essential to identify the causes that often lead to research misconducts.

3.2.5 Likeliness to Whistle-blow

Section E was developed to evaluate the likeliness of the respondents to whistle-blow. The definition for the term whistle-blow was given to the respondents. There are 6 options and the respondents only need to choose one. The options are extremely unlikely, unlikely, slightly unlikely, slightly likely, likely and extremely likely. The respondents also need to give reason behind their options an open-ended box.

3.2.6 Demographic Data

Section F consists of 8 questions that are related to the demographic background of the respondents. This include gender, age, academic

© COPYRIGHT UPM

qualification, current status, research experiences, field of expertise, location of institution and RCR training obtained.

3.3 Sample Selection

The target participants of this study are both former and active researchers that are currently working in Malaysia or outside of Malaysia. In order to capture the most recent experience, only respondents who have conducted research in Malaysia at some point in the past 5 years were included. Snowball sampling method is used. A total of 400 respondents have participated in the survey. The respondents were asked to give their consents before they are able to proceed with the survey. The identity of the respondents were concealed to allow them to feel safe when answering the questionnaires.

3.4 Ethical Approval

This study have received ethical approval from Research Ethics Committee of University of Malaya (UMREC). The ethical number is TNC2/UMREC - 233.

3.5 Statistical Analysis

The raw data obtained from our collaborator was turned into numerical coded for analysis purposes. The statistical software that was used is IBM

© COPYRIGHT UPM

SPSS version 20 to analyse the coded data. The categorical data was analyzed using descriptive statistics to obtain the the frequency and percentage. Spearman Correlation Test has been used to evaluate Section A. Meanwhile, Kruskal Wallis and Mannwhitney U test statistics have been done to analyse Section E. The significant level for all the test is 0.05. The Bonferroni Adjustment post-hoc test has been done to identify the significant group for Kruskal Wallis test.

© COPYRIGHT UPM

CHAPTER 4

RESULTS

4.1 Demographics Data

The survey was distributed using snowball sampling method and 400 respondents participated in this survey. The inclusion criteria for this survey was that the respondents have conducted research in Malaysia at some point in the past five years. Based on Table 1, there are 220 (55.0%) female respondents, 141 (35.3%) male respondents and 39 (9.8%) respondents that prefer to not answer. A quarter of the respondents are more than 46 years old and 23.3% of them ranged in 36-40 years old. There are 4 missing data in the age section as the respondents give vague or unclassifiable answers such as 40-49, >40, 20s and 30+.

Among the respondents, 248 (62.0%) of them hold Doctoral Degree, 76 (19.0%) of them have Master's Degree and 67 (16.8%) of the respondents have graduated with Bachelor's Degree. The remaining 9 (2.3%) respondents have other academic qualification such as SPM, PhD candidate and fellowship. The majority of 233 (58.3%) of the respondents have current status as academics or researchers at higher education institutes, 9 (2.3%) of them working as researchers in industry or business enterprise and 8 (20%) of them is a post doctoral fellow. The rest of 17 (4.3%) respondents have other status such as currently looking for job,working as a surgeon or food industry and others.

© COPYRIGHT UPM

In terms of duration of research experience, 109 (27.3%) of the respondents have 1-5 years of research experience and 23 (5.8%) of them have more than 25 year of experience. Majority of the respondents come from medical or health sciences background (38.5%) followed by natural or applied sciences (25.5%) and engineering (13.0%). Other field of expertise include machine learning, strategic management, food technology and so forth.

As for the location of the institutions, 293 (73.3%) are from Selangor, Kuala Lumpur, Putrajaya, Melaka, Negeri Sembilan followed and only 21 (5.3%) are from Sabah, Sarawak, Labuan. The location for others stated by the respondents include “prefer not to answer”, “graduated” and “Hiroshima University”.

Of the 400 respondents, 319 (79.8%) of the respondents have attended RCR training in at least one topic and the remaining 81 (20.3%) have not attended any RCR training (Table 1). Table 2 listed the topics that these respondents received training in. The majority of the respondents attended RCR training on authorship and publication (52.3%) followed by research misconducts (44.5%) and human ethics in research (40.8%). The RCR topic that have the least frequency are financial responsibilities, mentor-mentee ethics and dual use research with 24.8%, 22.5% and 8.0% respectively. Some of the respondents may not officially introduced to the RCR but it is stated that they have read the professional guidelines via internet or self learning, educated by mentors or from their academic learning session.

© COPYRIGHT UPM

Table 1 : Demographics data of the respondents.

Demographics (N = 400)	n (%)
Gender	
Male	141 (35.3)
Female	220 (55.0)
Prefer not to answer	39 (9.8)
Age	
< 25 years old	51 (12.8)
26 - 30 years old	34 (8.5)
31 - 35 years old	61 (15.3)
36 - 40 years old	93 (23.3)
41 - 45 years old	57 (14.3)
>46 years old	100 (25.0)
Missing data	4 (1.0)
Academic Qualification	
Bachelor's Degree	67 (16.8)
Master's Degree ((MSc, MA, MBA, Meng etc)	76 (19.0)
Doctoral Degree (PhD, DPhil, DBA, DrPH etc)	248 (62.0)
Others	9 (2.3)
Current Status	
Undergraduate Students	28 (7.0)
MSc Students	29 (7.3)
PhD Students	40 (10.0)
Post-doctoral fellow	8 (2.0)
Academics/Researchers at Higher Education Institutions	233 (58.3)
Researchers in Government Agencies	36 (9.0)
Researchers in Industry/Business Enterprise	9 (2.3)
Other	17 (4.3)
Duration of Research Experience	
< 1 year	28 (7.0)
1 - 5 years	109 (27.3)
6 - 10 years	97 (24.3)
11 - 15 years	73 (18.3)
16 - 20 years	45 (11.3)
21 - 25 years	25 (6.3)
> 25 years	23 (5.8)
Field of Expertise	
Business (e.g.: Accounting, economics, finance, management, marketing, etc.)	13 (3.3)
Humanities (e.g.: Art, history, languages, philosophy, religion, etc.)	6 (1.5)
Social sciences (e.g.: Education, law, psychology, political	50 (12.5)

© COPYRIGHT UPM

science, etc.)	
Medical/Health sciences (e.g.: Biomedical sciences, medicine, pharmacy, dentistry, etc.)	154 (38.5)
Natural/Applied sciences (e.g.: Biology, chemistry, physics, computer science, etc.)	102 (25.5)
Engineering	52 (13.0)
Mathematics	5 (1.3)
Other	18 (4.5)
Institutional Locations	
Selangor, Kuala Lumpur, Putrajaya, Melaka, Negeri Sembilan	293 (73.3)
Johor, Kelantan, Terengganu, Pahang	42 (10.5)
Penang, Perlis, Kedah, Perak	39 (9.8)
Sabah, Sarawak, Labuan	21 (5.3)
Other	5 (1.3)
Exposure to RCR Training	
Have attended RCR training in at least one topic	319 (79.8)
Have not attended any RCR training	81 (20.3)

Table 2 : The RCR training attended by the respondents.

RCR Training	n (%)
Authorship and publication	209 (52.3)
Research misconduct (i.e.: fabrication, falsification, plagiarism)	178 (44.5)
Ethics of human use in research	163 (40.8)
Conflict of interest	133 (33.3)
Ethics of animal use in research	122 (30.5)
Data management (e.g.: data sharing or storage)	115 (28.8)
Peer review practices	107 (26.8)
Collaborative research	104 (26.0)
Biosafety or biosecurity	101 (25.3)
Financial responsibilities (e.g.: management of research funds)	99 (24.8)
Mentor-Mentee ethics (e.g.: management of relationships between mentor and mentee, etc.)	90 (22.5)
Dual use research	32 (8.0)
Other	11 (2.8)

© COPYRIGHT UPM

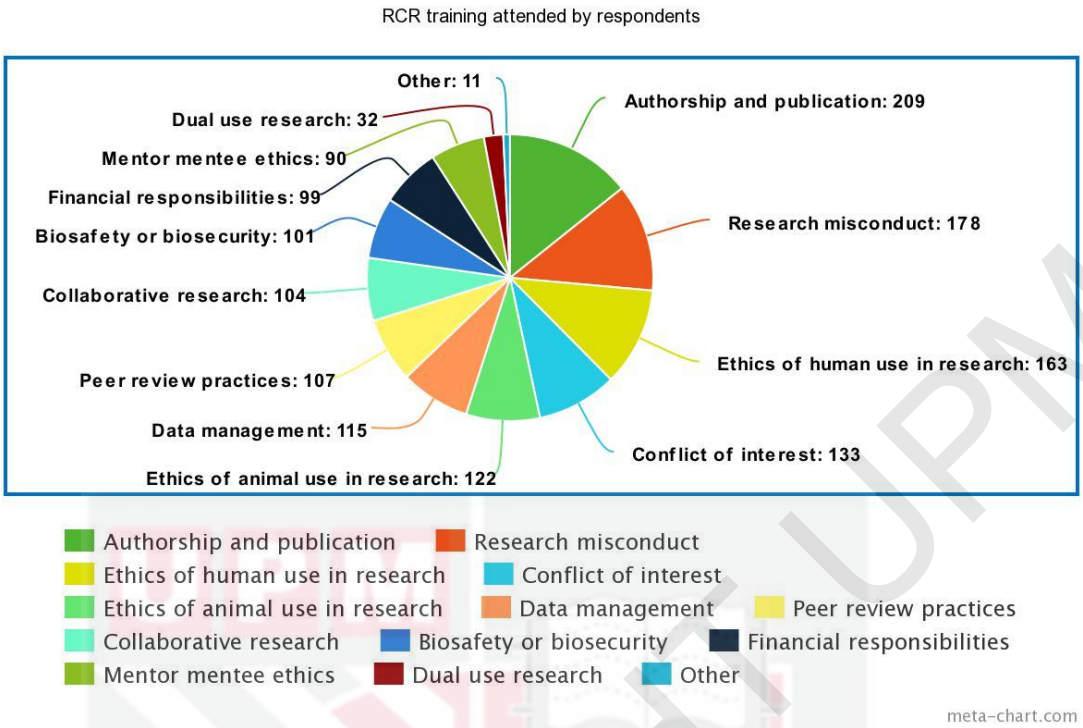

Fig. 1 The RCR training topics attended by respondents.

4.2 Attitude towards Responsible Conduct of Research

The respondents were asked about their attitudes towards responsible conduct of research. There are 5 items in this section of the survey, and it is a six points Likert scale questions and the selections range from strongly disagree to strongly agree. Table 3 summarises the response of the respondents. Since statement 4 is a negative statement, reverse coding were needed to ensure the consistency in the answer before analyzing the data.

Instead of analyzing the statements individually, the mean scores from all 5 statements of each respondents were tabulated. The data has been treated as a continuous data and Spearman Correlation Test was carried out. As

© COPYRIGHT UPM

shown in Table 4, there is no correlation between the academic qualification and attitude towards issues in research practices (r_s =0.095, p = 0.057). There is also no correlation observed between the duration of research experience and the attitude towards issues in research practices (r_s = 0.078, p = 0.120). In contrast, there is slight correlation between the RCR training and the attitude towards issues in research practices (r_s = - 0.099, p =0.047). However, according to the rule of thumbs by Schober et al. (2018), the correlation coefficient of the RCR training and attitude towards issues in research practices are considered as negligible correlation.

© COPYRIGHT UPM

Table 3 : The attitude towards responsible conduct of research.

Statements	Strongly Disagree n (%)	Disagree n (%)	Slightly Disagree n (%)	Slightly Agree n (%)	Agree n (%)	Strongly Agree n (%)
I am concerned that irresponsible research practices are becoming more common.	9 (2.3)	37 (9.3)	38 (9.5)	81(20.3)	150 (37.5)	85 (21.3)
I feel that it is important for researchers to adopt responsible conduct of research practices.	6 (1.5)	1 (0.3)	1 (0.3)	4 (1.0)	107 (26.8)	281(70.3)
I feel that adherence to responsible conduct of research guidelines help me in conducting research.	4 (1.0)	5 (1.3)	5 (1.3)	20 (5.0)	186 (46.5)	180 (45.0)
I would ignore some responsible conduct of research principles if it means I can speed up my research.	147 (36.8)	152 (38.0)	38 (9.5)	38 (9.5)	19 (4.8)	6 (1.5)
I feel that Responsible Conduct of Research education is essential in the training of all researchers.	5 (1.3)	2 (0.5)	2 (0.5)	10 (2.5)	121 (30.3)	260 (65.0)

Table 4 : The correlation test between the attitude and the demographic data.

Demographic data	Correlation Coefficient (r_s)	p - value
Academic Qualification	0.095	0.057
Duration of Research Experience	0.078	0.120
Have attended RCR training in at least one topic	- 0.099	0.047

© COPYRIGHT UPM

4.3 Likeliness to whistle-blow

Next, the respondents were asked to answer the question of how willing are they to become a whistle-blower if they witness any research misconducts. The respondents were given a six point Likert scales which range from extremely likely to extremely unlikely to choose. From the data presented in Table 5, we identified that majority of the respondents chose 'somewhat likely' and 'somewhat unlikely' as their answer with 28.5% and 24.5% respectively. Meanwhile, 5.3% of the respondents that are extremely unlikely and 11.5% of them are unlikely to become a whistle-blower. The reason behind the responses for these answers are all related to the fear of their identity as a whistle-blower might be exposed which will risk their current career or opportunities. Some of them also stated that they are unwilling or hesitate to report as the procedure are strenuous and troublesome. There are also respondents that have reported the misconducts but they found out that the perpetrator either escape the punishment or only receive a light punishment since they have connection with the higher ups.

Another reason that lead the respondents to hesitate or unwilling to become a whistle-blower is the ambiguous procedure of reporting misconducts. In contrast, there are 22.8% and 7.5% of the respondents that are likely and extremely likely to become a whistle-blower for the reason of increasing the awareness regarding misconducts. Some respondents also find misconducts as an unacceptable research practices that may damage the

© COPYRIGHT UPM

research integrity. Hence, they are willing to become a whistle-blower for the sake of morality and ethics.

Table 5 : The response for the likeliness to whistle-blow.

If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**n (%)**
Extremely Unlikely	21 (5.3)
Unlikely	46 (11.5)
Somewhat Unlikely	98 (24.5)
Somewhat Likely	114 (28.5)
Likely	91 (22.8)
Extremely Likely	30 (7.5)

In order to find association between the likeliness to whistle-blow and the academic qualification, we ran a Kruskal Wallis analysis. As depicted in Table 6, there are significant differences in the academic qualification group for the likeliness to whistle-blow with $H(3) = 15.033$ and $p = 0.002$. Further post-hoc analysis using pairwise comparison was conducted to identify the group that contributed to the significant differences. Analysis in Table 7 has showed that there are differences between the respondents with doctoral degree and respondents that listed “others” as their academic qualification ($p = 0.009$). Moreover, Figure 2 revealed that the respondents that listed “others” as their academic qualification background are highly likely to become a whistle-blower compared to respondents with doctoral degree. Since, the total respondents who listed “others” as their academic qualification is only 2.3% and therefore, we considered this differences as negligible.

© COPYRIGHT UPM

Table 6 : The association between the likeliness to whistle-blow and the academic qualification using Kruskal Wallis test analysis.

Statement	Demographics	n (%)	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Academic Qualification**				
	Bachelor's Degree	67 (16.8)	15.033	3	**0.002**
	Master's Degree	76 (19.0)			
	Doctoral Degree	248 (62.0)			
	Others	9 (2.3)			

Table 7 : The post-hoc test for the association between the likeliness to whistle-blow and the academic qualification.

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p - value	Adjusted p - value
Academic Qualification	Doctoral degree - Master's degree	23.791	14.761	1.612	0.107	0.642
	Doctoral degree - Bachelor's degree	35.394	15.502	2.283	0.022	0.134
	Doctoral degree - Others	- 121.630	38.203	- 3.184	0.001	**0.009**
	Master's degree - Bachelor's degree	11.604	18.867	615	0.539	1.000
	Master's degree - Others	- 97.839	38.688	- 2.465	0.014	0.082
	Bachelor's degree - Others	- 86.235	39.970	- 2.158	0.031	0.186

© COPYRIGHT UPM

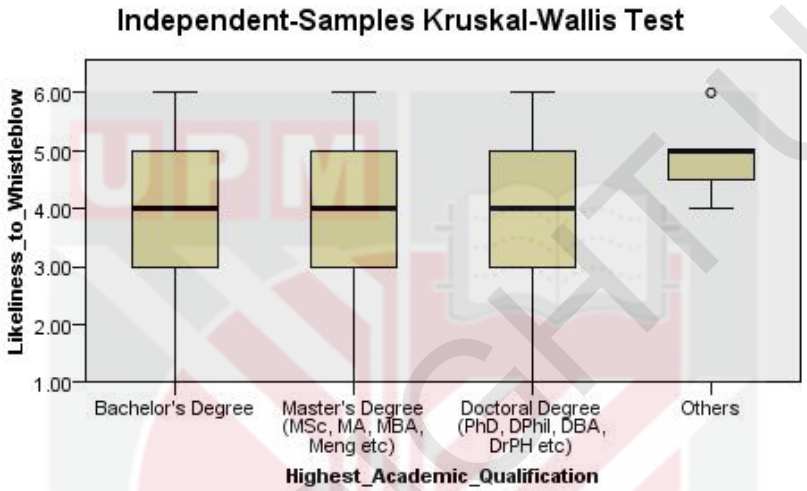

Fig 2. The distribution of likeliness to whistle-blow among the academic qualification data.

© COPYRIGHT UPM

We also have compared the likeliness to whistle-blow to the duration of research experience. Initially, data that we collected were numerical. Therefore, we sorted and classified the data into three categories, which are early career, mid-career and late-career. Early career refer to the respondents with duration of research experience with 1 - 5 years. Meanwhile, mid-career are respondents with 6 - 15 years research experience and late-career respondents have more than 16 years of research experience.

Kruskal Wallis test analysis were utilized to analyse the association between the duration of research experience of 3 categories with the likeliness to whistle-blow. The result of the analysis is shown in the Table 8. Our data shown that there are significant differences in the duration of research experience and the likeliness to whistle-blow ($H(2)= 10.215$, $p = 0.006$). Post-hoc test in Table 9 revealed that the respondents in their mid-career have significant differences to the respondents in their late-career ($p = 0.006$). The differences can also be observed in the boxplot graph displayed in Figure 3. Our data shows that mid-career researchers are less likely to whistle-blow than late-career researchers.

© COPYRIGHT UPM

Table 8 : The association between the likeliness to whistle-blow and the duration of research experience (3 categories) using Kruskal Wallis test analysis.

Statement	Demographics	n (%)	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Duration of Research Experience - 3 categories**				
	1 - 5 years (early career)	137 (34.3)	10.215	2	**0.006**
	6 - 15 years (mid-career)	170 (42.5)			
	> 16 years (late-career)	93 (23.3)			

Table 9 : The post-hoc test for the association between the likeliness to whistle-blow and the duration of research experience (3 categories).

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p - value	Adjusted p - value
Duration of research experience (3 categories)	6 - 15 years (mid-career) - 1 - 5 years (early career)	26.067	12.926	2.017	0.044	0.131
	6 - 15 years (mid-career) - > 16 years (late-career)	- 44.675	14.521	- 3.077	0.002	**0.006**
	1 - 5 years (early career) - >16 years (late-career)	- 18.608	15.127	- 1.230	0.219	0.656
	6 - 15 years (mid-career) - 1 - 5 years (early career)	26.067	12.926	2.017	0.044	0.131

© COPYRIGHT UPM

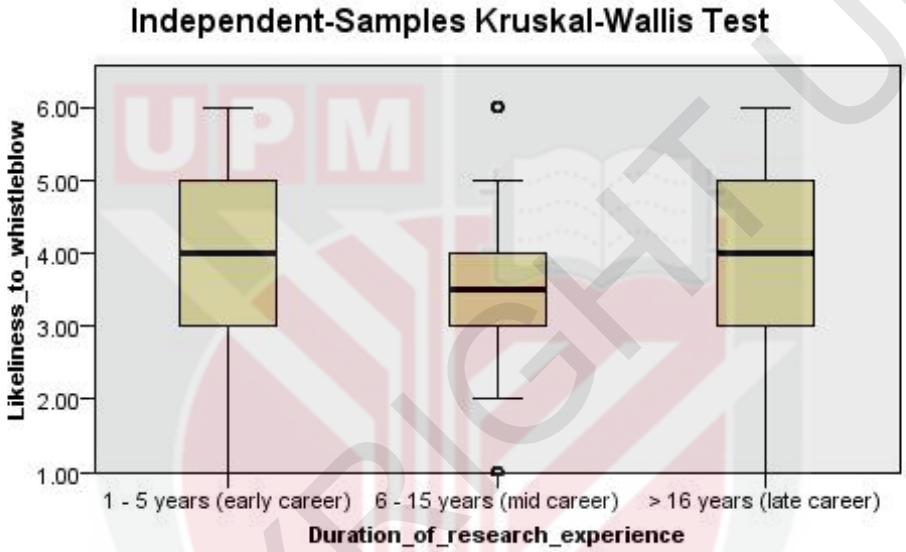

Fig 3. The distribution of likeliness to whistle-blow among the duration of research experience (3 categories).

© COPYRIGHT UPM

In addition, we also classified the duration of research experience into 7 categories which are <1 year, 1 - 5 years, 6 - 10 years, 11 - 15 years, 21 - 25 years and >25 years. The result of Kruskal Wallis test shown in Table 10 has revealed significant differences between the duration of research experience with $H(6) = 22.713$ and $p = 0.001$. The differences between the group has been visualized in form of box plot in Figure 4. The pairwise comparison in Table 11 have unveil that two pairs of group contributed to the significant differences. The first pair are respondents with 6 - 10 years research experience with respondents with less than one year of reserch experience ($p = 0.013$). Those who have 6 - 10 years of research experience are less likely to whistle-blow compare to those with less than one year of research experience. The other pair are respondents with 6 - 10 years research experience with respondents with more than 25 years research experience ($p = 0.019$). Researchers with 6 - 10 years of research experience are less likely to whistle-blow compare to those with more than 25 years of research experience.

We also analyzed the associations between the exposure to RCR training and the likeliness to whistle-blow using Mannwhitney U test analysis. We observed that there are no significant differences between respondents who have attended RCR training in at least one topic and respondents with no exposure to RCR training in their likeliness to whistle-blow ($p = 0.509$).

© COPYRIGHT UPM

Table 10 : The association between the likeliness to whistle-blow and the duration of research experience (7 categories) using Kruskal Wallis test analysis.

Statement	Demographics	n (%)	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Duration of Research Experience - 7 categories**				
	<1 year	28 (7.0)	22.713	6	**0.001**
	1 - 5 years	109 (27.3)			
	6 - 10 years	97 (24.3)			
	11 - 15 years	73 (18.3)			
	16 - 20 years	45 (11.3)			
	21 - 25 years	25 (6.3)			
	>25 years	23 (5.8)			

© COPYRIGHT UPM

Table 11 : The post-hoc test for the association between the likeliness to whistle-blow and the duration of research experience (7 categories).

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p -value	Adjusted p - value
Duration of research experience (7 categories)	6 - 10 years - 1 - 5 years	32.896	15.715	2.093	0.036	0.763
	6 - 10 years - 11 - 15 years	- 39.672	17.445	- 2.274	0.023	0.482
	6 - 10 years - 16 - 20 years	- 41.151	20.306	- 2.026	0.043	0.897
	6 - 10 years - >25 years	- 77.764	26.111	- 2.978	0.003	0.061
	6 - 10 years - <1 year	82.833	24.153	3.429	0.001	**0.013**
	6 - 10 years - 21 - 25 years	- 83.951	25.253	- 3.324	0.001	**0.019**
	1 - 5 years - 11 - 15 years	- 6.776	17.027	- 0.398	0.691	1.000
	1 - 5 years - 16 - 20 years	- 8.254	19.949	- 0.414	0.679	1.000
	1 - 5 years - > 25 years	- 44.867	25.834	- 1.737	0.082	1.000
	1 - 5 years - <1 year	49.936	23.853	2.093	0.036	0.762
	1 - 5 years - 21 - 25 years	- 51.054	24.966	- 2.045	0.041	0.858
	11 - 15 years - 16 - 20 years	- 1.478	21.338	- 0.069	0.945	1.000
	11 - 15 years - >25 years	- 38.091	26.921	- 1.415	0.157	1.000
	11 - 15 years - <1 year	43.160	25.027	1.725	0.085	1.000
	11 - 15 years - 21 - 25 years	- 44.278	26.089	- 1.697	0.090	1.000
	16 - 20 years - >25 years	- 36.613	28.858	- 1.269	0.205	1.000
	16 - 20 years - <1 year	41.682	27.099	1.538	0.124	1.000
	16 - 20 years - 21 - 25 years	- 42.800	28.084	- 1.524	0.128	1.000
	>25 years - <1 year	5.069	31.683	0.160	0.873	1.000
	>25 years - 21 - 25 years	6.187	32.529	0.190	0.849	1.000
	<1 year - 21 - 25 years	- 1.118	30.979	- 0.036	0.971	1.000

© COPYRIGHT UPM

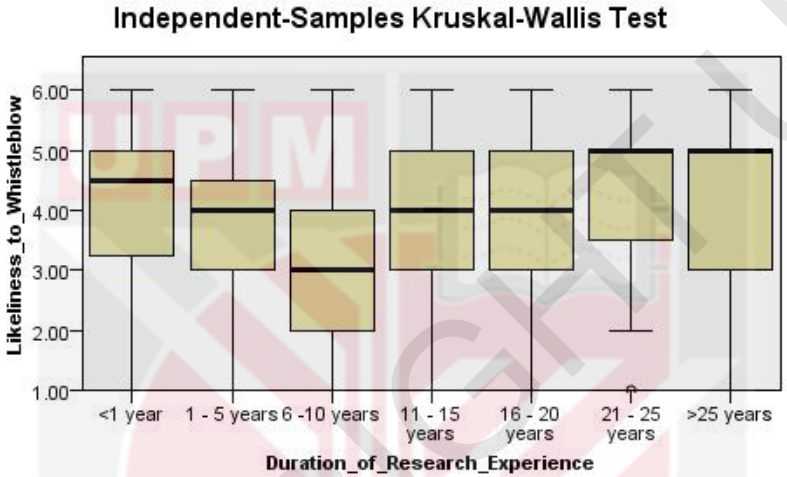

Fig 4. The distribution of likeliness to whistle-blow among the duration of research experience (7 categories).

Table 12 : The association between the likeliness to whistle-blow and the exposure to RCR training using Mannwhitney U test analysis.

Statement	Demographic Data	n (%)	U	p - value (2 tailed)
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**RCR Training**			
	Have attended RCR training in at least one topic	319 (79.8)	12,321.500	0.509
	Have not attended any RCR training	81 (20.3)		

© COPYRIGHT UPM

Up to this point, the classification of the likeliness to whistle-blow is a 6 point Likert scale. We consolidate the likeliness to whistle-blow into a 3 points Likert scale by combining ‘extremely unlikely’ and ‘unlikely’ into ‘unlikely’, ‘somewhat unlikely’ and ‘somewhat likely’ into ‘neutral’ and grouping ‘likely’ and ‘extremely likely’ were classified as ‘likely. The likeliness of the respondents to whistle-blow under this new classification is presented in Table 13. There are 53% respondents who stands “neutral” in becoming whistle-blower. In contrast, 30.3% and 16.8% of the respondents are likely and unlikely to become whistle-blower respectively. Thus, from the data we can infer that more than half of the respondents are hesitate to become a whistle-blower.

Table 13 : The response for the likeliness to whistle-blow with 3 points scale.

If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**n (%)**
Unlikely	67 (16.8)
Neutral	212 (53.0)
Likely	121 (30.3)

We repeated the analysis of comparing the likeliness to whistle-blow under this new classification with demographic data. Kruskal Wallis analysis of academic qualification exhibited the same result with the previous analysis. As depicted in Table 14, there are significant differences observed between the academic qualification and the likeliness to whistle-blow of 3 points Likert scale ($H(3) = 14.348$, $p = 0.002$). Further pairwise comparison showed that

© COPYRIGHT UPM

the respondents with doctoral degree and respondents who listed “others” as their academic qualification has contributed to the differences (p = 0.008)(Table 15) . The differences between the pair can also be seen in Figure 5. However, as mentioned in the previous analysis, we did not find this as meaningful since the number of the respondents who listed “others” as their academic qualification is only 2.3%.

© COPYRIGHT UPM

Table 14 : The association between the likeliness to whistle-blow with 3 points scale and the academic qualification using Kruskal Wallis test analysis.

Statement	Demographic Data	n (%)	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Academic Qualification**				
	Bachelor's Degree	67 (16.8)	14.348	3	**0.002**
	Master's Degree	76 (19.0)			
	Doctoral Degree	248 (62.0)			
	Others	9 (2.3)			

Table 15 : The post-hoc test for the likeliness to whistle-blow with 3 points scale and the academic qualification.

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p - value	Adjusted p - value
Academic Qualification	Doctoral degree - Master's degree	21.364	13.716	1.558	0.119	0.716
	Doctoral degree - Bachelor's degree	29.662	14.404	2.059	0.039	0.237
	Doctoral degree - Others	- 114.095	35.498	- 3.214	0.001	**0.008**
	Master's degree - Bachelor's degree	8.297	17.531	0.473	0.636	1.000
	Master's degree - Others	- 92.730	36.878	- 2.515	0.012	0.072
	Bachelor's degree - Others	- 84.433	37.139	- 2.273	0.023	0.38

© COPYRIGHT UPM

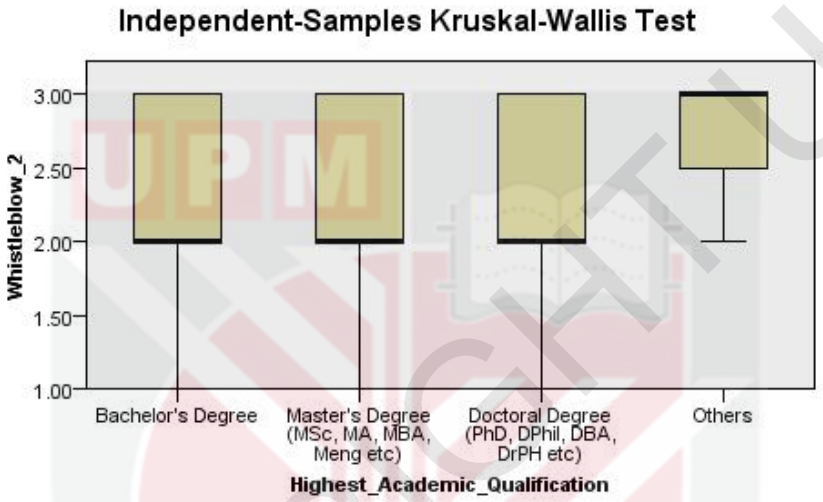

Fig 5. The distribution of likeliness to whistle-blow with 3 categories among the academic qualification group.

© COPYRIGHT UPM

Next, we also analysed the correlation between the likeliness to whistle-blowing this new of 3 points Likert scale with the duration of research experience of early career, mid-career and late career. The outcome of this analysis are as shown in the Table 16 in which there are significant differences between the duration of research experiences of 3 categories with the likeliness to whistle-blow of 3 points measurement ($H(2) = 10.297$, $p = 0.006$). A pairwise comparison in Table 17 shown that mid-career respondents and late-career researchers contributed to the significant differences. The differences between the two group is illustrated in the form of boxplot graph in Figure 6. Just like what we showed before, mid-career researchers are less likely to whistle-blow ("neutral') compared to late-career respondents ("likely").

© COPYRIGHT UPM

Table 16 : The association between the likeliness to whistle-blow with 3 points scale and the duration of research experience (3 categories) using Kruskal Wallis test analysis.

Statement	Demographic Data	n (%)	Mean Rank	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Duration of Research Experience - 3 categories**					
	1 - 5 years (early career)	137 (34.3)	205.00	10.297	2	**0.006**
	6 - 15 years (mid-career)	170 (42.5)	183.14			
	> 16 years (late-career)	93 (23.3)	225.61			

Table 17 : The post-hoc test for the likeliness to whistle-blow with 3 points scale and the duration of research experience (3 categories).

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p -value	Adjusted p - value
Duration of research experience (3 categories)	6 - 15 years (mid-career) - 1 - 5 years (early career)	21.865	12.011	1.820	0.069	0.206
	6 - 15 years (mid-career) - > 16 years (late-career)	- 42.478	13.493	- 3.148	0.002	**0.005**
	1 - 5 years (early career) - >16 years (late-career)	- 20.613	14.056	- 1.467	0.143	0.428

© COPYRIGHT UPM

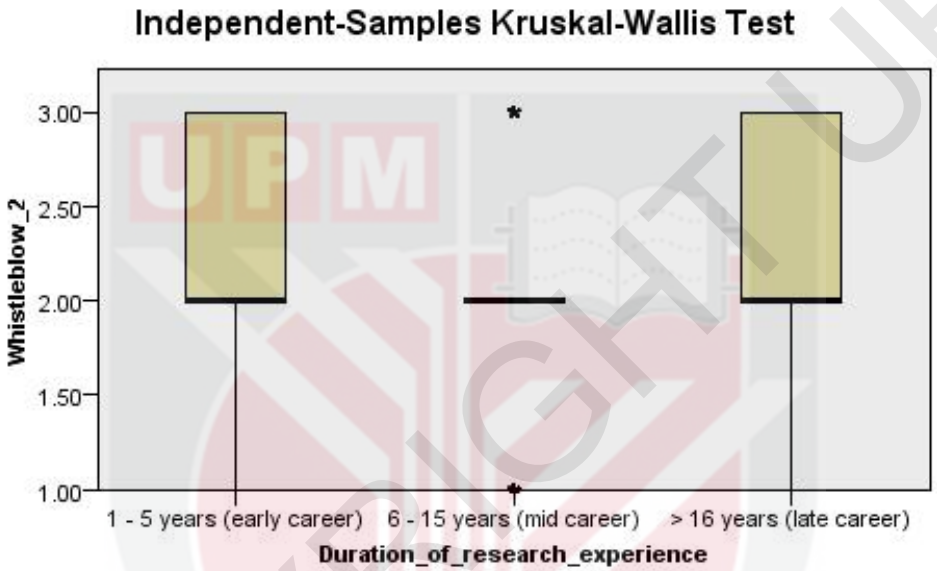

Fig 6. The distribution of likeliness to whistle-blow with 3 point scale among the combined version of duration of research experience (3 categories).

© COPYRIGHT UPM

Previously, we describe the categorization of the duration of research experience into 7 categories. The outcome of Kruskal Wallis test analysis for the associations is the same as previous analysis. There is a significant differences between the two variable with H(6) = 22.915 and p = 0.001 (Table 18). Interestingly, the post-hoc test in Table 19 have showed that there are three pairs in the group that have contributed to the significant differences. The three pairs are 6 - 10 years - <1 year pair, 6 - 10 years - >25 years pair and 6 - 10 years - 21 - 25 years pair with p-value of 0.030, 0.027 and 0.017 respectively. The differences between the pairs are illustrated in Figure 7. The respondents with 6 - 10 years research experiences are less likely to whistle-blow compared to respondents with less than one year research experiences. The respondents with 6 - 10 years research experiences are also less likely to become a whistle-blower compared to researchers with 21 - 25 years research experiences and respondents with more than 25 years research experiences.

Finally, we analysed the RCR education experience of the researchers and their likeliness to whistle-blow under the new 3 point classification. The Mannwhitney U test analysis in Table 20 showed that there is no significant differences between the groups in their likeliness to whistle-blow (U = 12,415.500 and p = 0.549). The outcome of this analysis is the same with the previous analysis. There is no differences between the respondents who have attended RCR training in at least one topic and the respondents with no experience in RCR training..

© COPYRIGHT UPM

Table 18 : The association between the likeliness to whistle-blow with 3 points scale and the duration of research experience (7 categories) using Kruskal Wallis test analysis.

Statement	Demographic Data	n (%)	H	df	p - value
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**Duration of Research Experience - 7 categories**				
	<1 year	28 (7.0)	22.915	6	0.001
	1 - 5 years	109 (27.3)			
	6 - 10 years	97 (24.3)			
	11 - 15 years	73 (18.3)			
	16 - 20 years	45 (11.3)			
	21 - 25 years	25 (6.3)			
	> 25 years	23 (5.8)			

© COPYRIGHT UPM

Table 19 : The post-hoc test for the association between the likeliness to whistle-blow with 3 points scale and the duration of research experience.

Demographic Data	Pairwise Comparison	Test Statistics	Standard Error	Standard Test Statistics	p - value	Adjusted p - value
Duration of Research experience (7 categories)	6 - 10 years - 1 - 5 years	25.386	14.602	1.738	0.082	1.000
	6 - 10 years - 11 - 15 years	- 30.217	16.209	- 1.864	0.062	1.000
	6 - 10 years - 16 - 20 years	- 30.940	18.869	- 1.640	0.101	1.000
	6 - 10 years - <1 year	71.644	22.443	3.192	0.001	**0.030**
	6 - 10 years - >25 year	- 78.079	24.262	- 3.218	0.001	**0.027**
	6 - 10 years - 21 - 25 years	- 78.760	23.464	- 3.357	0.001	**0.017**
	1 - 5 years - 11 - 15 years	- 4.831	15.822	- 0.305	0.760	1.000
	1 - 5 years - 16 - 20 years	- 5.554	18.536	- 0.300	0.764	1.000
	1 - 5 years - <1 year	46.258	22.164	2.087	0.037	0.775
	1 - 5 years - >25 years	- 52.693	24.005	- 2.195	0.028	0.591
	1 - 5 years - 21 - 25 years	- 53.374	23.198	- 2.301	0.021	0.449
	11 - 15 years - 16 - 20 years	- 0.723	19.827	- 0.036	0.971	1.000
	11 - 15 years - <1 year	41.427	23.254	1.781	0.075	1.000
	11 - 15 years - >25 years	- 47.862	25.015	- 1.913	0.056	1.000
	11 - 15 years - 21 - 25 years	- 48.543	24.242	- 2.002	0.045	0.950
	16 - 20 years - <1 year	40.704	25.180	1.616	0.106	1.000
	16 - 20 years - >25 years	- 47.139	26.815	- 1.758	0.079	1.000
	16 - 20 years - 21 - 25 years	- 47.820	26.815	- 1.758	0.079	1.000
	<1 year - >25 years	- 6.436	29.439	- 0.219	0.827	1.000
	<1 year - 21 - 25 years	- 7.116	28.786	- 0.247	0.805	1.000
	>25 years - 21 - 25 years	0.681	30.225	0.023	0.982	1.000

© COPYRIGHT UPM

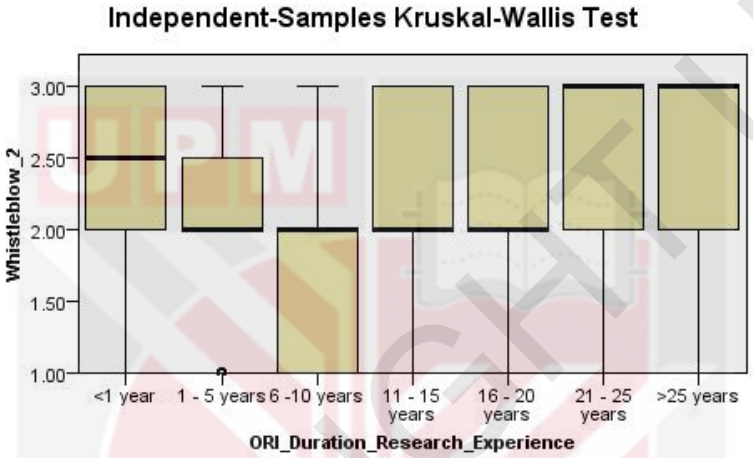

Fig 7. The distribution of likeliness to whistle-blow with 3 points scales among the duration of research experience (7 categories).

Table 20 : The association between the likeliness to whistle-blow with 3 points scale and the exposure to RCR training using Mannwhitney U test analysis.

Statement	Demographic Data	n (%)	U	p - value (2 tailed)
If you encountered research misconduct or detrimental research practices, how likely are you to "whistle-blow"?	**RCR Training**			
	Have attended RCR training in at least one topic	319 (79.8)	12,415.500	0.549
	Have not attended any RCR training	81 (20.3)		

© COPYRIGHT UPM

CHAPTER 5

DISCUSSION

5.1 Demographics Data of the Respondents

There are 79.8% of the respondents have attended RCR training in at least one topic and the most common RCR topics are authorship and publication (52.3%), research misconduct (44.5%) and human ethics (40.8%). According to Olesen et. al (2018), the most common misconduct practices in Malaysian Universities are plagiarism and arguments on authorship. These explain the reason behind both authorship and publication and human ethics being the most common topics in RCR training. Meanwhile, human ethics is one of the most common topic because majority of our respondents have medical or health sciences background (38.5%).

In contrast, the least common RCR training topics are dual use research (8.0%), mentor-mentee ethics (22.5%) and financial responsibilities (24.8%). The cases of misconducts related to these three topics may be less common or under reported in the research society. Hence, the topics have been neglected and underrated compared to other RCR topics.

As mentioned, the respondents are unable to represent the whole population of researchers. We deduce that the uneven demographic data may be due to the limitation of the snowball sampling method. Therefore, more

© COPYRIGHT UPM

respondents from various backgrounds are needed to have an appropriate representation of the researchers in Malaysia.

5.2 Attitude towards Responsible Conduct of Research

Five statements related to issues in research practices has been given to the respondents to analyze their attitude towards RCR. Table 3 has summarize the distribution of the responses for each of the statements. Majority of the respondents have agreed to Statement 2, Statement 3 and Statement 5 which are related to the importance of application of RCR in the research. Olesen et. Al (2019) has stated that training of researchers in RCR have positive impact on the awareness and attitude towards RCR. This may be the results of the endless efforts in RCR education among the researchers.

However, there are some concerns regarding the awareness and the pursuit of detrimental research practices that have depicted in Statement 1 and Statement 4. As observed in Table 3, the are about 20% of the respondents have disagreed with Statement 1 which reflected the awareness of research detrimental in the society. Meanwhile, around 16% of the respondents have find Statement 4 which illustrate the responsibilities of researchers towards their research quality as disagreeable. We perceived this value as significant in consideration of our large sample size. These data displayed a contrast between the importance of RCR and the research misconducts. Although the researchers may understand the value of RCR, the culture that encourage misconducts may still persists over the year.

© COPYRIGHT UPM

Therefore, there is a need to address this issues as we are concern that some researchers will disregard research ethics despite knowing the importance of RCR.

Table 4 has shown that there is slight correlation between RCR training and the attitude towards RCR. The correlation portray that the more respondents are exposed to RCR education, the poorer the attitude towards RCR (r_s = - 0.099, p = 0.047). The reason behind this result are yet to be determined. However, we speculate that it might be related to our sample size and uneven demographic data. Based on Schober et. Al (2018), the correlation coefficient of - 0.099 are deemed to be negligible. Even so, the author also state that most researchers may misinterpret the variables are not related if the correlation coefficient are close to zero. Hence, a detail analysis on a sample that able to represent the whole population are needed.

5.3 Likeliness to Whistle-blow

Section E has centralize on the inclination of the respondents to become a whistle-blower in case they encounter misconducts and the reason behind their answers. As Table 5 depicted, majority of the respondents have chose 'somewhat likely' and 'somewhat unlikely' with 28.5% and 24.5% respectively. We have been looking from another perspectives and based on Table 11, we infer that more than half of the respondents are hesitant and 16.8% of them are unlikely to become a whistle-blower. Based on the reasons they provided, most of them are afraid that their identity as a whistle-blower might be

© COPYRIGHT UPM

exposed and affect their current career. Some of the respondents also have mentioned about the reporting misconducts that are vague and taking too much time. Another major reason that lead them unlikely and hesitate to become whistle-blower is the fact that the misconducts involve their close acquaintance or higher ups. These indicate that there is a need to revise the guideline of reporting the misconducts and the strengthen protection for the whistle-blowers.

A Kruskal Wallis and Mannwhitney U Test have been done to analyzed both data on likeliness to whistle-blow against academic qualification, duration of research experience and exposure to RCR training. Based on Table 6 and Table 12, there are significant differences between the academic qualification and the likeliness to whistle-blow. The post-hoc test have reveal that the respondents with doctoral degrees and others academic qualification have contributed to the differences. However, since respondents with other academic qualification only has 9 respondents, we considered this value as insignificant.

In terms of duration of research experiences, there that contribute to the significant differences among the group. Based on Table 9 and Table 15, there are differences in respondents with mid-career experiences and late-career experiences. Figure 3 and Figure 6 revealed that respondents with mid-career are hesitate to become a whistle-blower compared to respondents with late-career. A post-hoc test on Table 10 has revealed respondents with 6 - 10 years research experience have significant differences with respondents

© COPYRIGHT UPM

with <1 year and respondents with >25 years research experience. Meanwhile, Table 16 displayed a significant differences between the respondents with 6 - 10 years research experience with the respondents with <1 year, >25 years and 21 - 25 years research experience. The differences in research experience may result to differences in the perception towards cases on misconduct. Throughout their career, variety of experiences may affect their inclination to become a whistle-blower. For example, some people are hesitating to become a whistle-blower as most of the time it involves their clique and some other may have reported the misconducts but the authority does not take action.

On the other hand, there are no significant differences among the group of exposure to RCR training with the likeliness to whistle-blow. Although RCR education may encourage the whistle-blowing, a proper functioning of guideline for whistle-blow and protection of their identity need to be prioritize. A clear procedure of reporting the misconducts have to be made clear among the researchers because there are still some of them that are unaware of it. The identity of the whistle-blower need to be strictly hidden as a whistle-blower has always been considered as a negative image. The exposure of their identity will place a huge risk on their career.

© COPYRIGHT UPM

CHAPTER 6

CONCLUSION

In summary, this study has been able provide a preliminary insights on the general landscape of RCR among researchers in Malaysia. We are able to analyze the attitudes of the respondents towards RCR and the inclination to whistle-blow in case the respondents encounter misconducts. We are also able to determine the past experience on RCR education and identify the topics of RCR they have attended. Based on the data, there are differences in attitude and likeliness to whistle-blow as the respondents have different academic qualification, duration of research experiences and exposure to RCR training.

Although majority of the respondents have attended RCR training, the amount of respondents that does not receive any RCR training are still considered as significant. Furthermore, the training attended by the respondents are limited to only a few of the topics. Hence, there is a need to widen the scope of RCR topics for the training as misconducts can happened from every aspects.

Generally, the respondents have acknowledge the importance of RCR in research practices. However, there is a small concern that they would sidestep RCR due to the culture that often encouraging misconducts and detrimental research practices. This can be seen on the notable value of respondents that prefer to hasten their research procedure rather than

© COPYRIGHT UPM

prioritizing their research quality. Therefore, a persistent efforts in promoting RCR in research and changes in the culture need to be done to reduce the prevalence of misconducts.

The data on the likeliness to whistle-blow have revealed more than half of the respondents are hesitant to become a whistle-blower. The reasons behind their answers are related to the inability to take the risk of losing their career and opportunities, the vague policies of reporting misconducts and the fear of their identity as a whistle-blower are exposed. In order to overcome this issues, a proper and clear guideline are needed in addition to the strict protection of whistle-blower's identity.

This study is an ongoing study and the request of the respondents are yet to be closed. Throughout the data, we are able to identify the limitation of the study and acquired an advance information on the state of RCR among researchers in Malaysia. The uneven demographic data has lead to inability to represent the whole population of researchers in Malaysia. This may effect the result in a way it was not as significant as we thought. Thus, a larger sample that are able to represent the true population are needed in order to obtain more accurate results.

© COPYRIGHT UPM

REFERENCES

Aspura, M. K. Y. I., Noorhidawati, A., & Abrizah, A. (2018). An analysis of Malaysian retracted papers : Misconduct or mistakes? *Scientometrics*, 115(3), 1315-1328. https://doi.org/10.1007/s11192-018-2720-z

Campos-Varela, I., & Ruano-Raviña, A. (2019). Misconduct as the main cause for retraction. A descriptive study of retracted publications and their authors. *Gaceta sanitaria*, *33*(4), 356–360. https://doi.org/10.1016/j.gaceta.2018.01.009

DuBois, J. M., Schilling, D. A., Heitman, E., Steneck, N. H., & Kon, A. A. (2010). Instruction in the responsible conduct of research: an inventory of programs and materials within CTSAs. *Clinical and translational science*, *3*(3), 109–111. https://doi.org/10.1111/j.1752-8062.2010.00193.x

Federal Research Misconduct Policy | ORI - The Office of Research Integrity. (2012). Hhs.gov. https://ori.hhs.gov/federal-research-misconduct-policy

Integrity Matters. (2013). *Integrity Matters!* Integrity Matters! https://www.aseanrcr.com/

ICMJE | Recommendations | Defining the Role of Authors and Contributors. (n.d). Icmje.org.

© COPYRIGHT UPM

http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html

Launch of the Malaysian Educational Module on Responsible Conduct of Research (RCR). (2018). ASM FOCUS. https://www.akademisains.gov.my/asm-focus/launch-of-the-malaysian-educational-module-on-responsible-conduct-of-research-rcr/

Malaysian Educational Module on Responsible Conduct of Research. (2018). Retrieved from https://issuu.com/asmpub/docs/rcr_module_readonly

NIH. (2009). NOT-OD-10-019: Update on the Requirement for Instruction in the Responsible Conduct of Research. Retrieved from https://grants.nih.gov/grants/guide/notice-files/not-od-10-019.html

National Research Council (US) Committee for the Update of the Guide for the Care and Use of Laboratory Animals. (2011). *Key Concepts*. Nih.gov; National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK54054/

National Academies of Sciences, Engineering, and Medicine, Policy and Global Affairs, Committee on Science, Engineering, Medicine, and Public Policy, & Committee on Responsible Science. (2017). *Incidence*

© COPYRIGHT UPM

and Consequences. Nih.gov; National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK475945/

National Academy of Sciences, National Academy of Engineering (US) and Institute of Medicine (US) Committee on Science, Engineering, and Public Policy. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research*. National Academies Press (US).

Office of Laboratory Animal Welfare (2015). *PHS Policy on Humane Care and Use of Laboratory Animals | OLAW*. Nih.gov. https://olaw.nih.gov/policies-laws/phs-policy.htm

Olesen, A. P., Amin, L., & Mahadi, Z. (2018). In Their Own Words: Research Misconduct from the Perspective of Researchers in Malaysian Universities. *Science and engineering ethics*, *24*(6), 1755–1776. https://doi.org/10.1007/s11948-017-9997-9

Olesen, A. P., Amin, L., Mahadi, Z., & Ibrahim, M. (2019). Emphasizing the experiences of researchers after RCR instructions: Introduction to Responsible Conduct of Research (RCR) in Malaysia. *Accountability in research*, *26*(3), 157–175. https://doi.org/10.1080/08989621.2019.1607312

Olesen, A. P., Amin, L., Mahadi, Z., & Ibrahim, M. (2019). Whistle blowing and research integrity: Potential remedy for research misconduct in

© COPYRIGHT UPM

Malaysian institutions of higher education. *Accountability in research*, *26*(1), 17–32. https://doi.org/10.1080/08989621.2018.1554444

Olesen, A. P., Amin, L., & Mahadi, Z. (2019). Research Ethics: Researchers Consider How Best to Prevent Misconduct in Research in Malaysian Higher Learning Institutions Through Ethics Education. *Science and engineering ethics*, *25*(4), 1111–1124. https://doi.org/10.1007/s11948-018-0054-0

Olesen, A., Amin, L., & Mahadi, Z. (2018). Unethical authorship practices: A qualitative study in Malaysian higher education institutions. *Developing world bioethics*, *18*(3), 271–278. https://doi.org/10.1111/dewb.12200

ORI Introduction to the Responsible Conduct of Research. (2011). Google Books. https://books.google.com.my/books?hl=en&lr=&id=4FDpBXBaVy8C&oi=fnd&pg=PR3&ots=NgwRlFOqRq&sig=0_WvzKEwunkhVfmGCc40BiXsTyU&redir_esc=y#v=onepage&q&f=true

Overview of Mentoring. (n.d). Hhs.gov. https://ori.hhs.gov/education/products/niu_mentorship/mentoring/overview/overview.html

© COPYRIGHT UPM

Overview of Data Integrity. (n.d). Hhs.gov. https://ori.hhs.gov/education/products/n_illinois_u/datamanagement/dmotopic.html

Reyes, M. V. T. (2014). An Update on Research Ethics in Asia. *Journal of the ASEAN Federation of Endocrine Societies*, *27*(1), 10. Retrieved from https://www.asean-endocrinejournal.org/index.php/JAFES/article/view/7

Responsible Conduct of Research : Collaborative Science. (n.d). Columbia.edu. https://ccnmtl.columbia.edu/projects/rcr/rcr_science/foundation/index.html#2_A

Steneck, N. H. (2007). ORI introduction to the responsible conduct of research. Washington, D.C.: Departement of Health and Human Services, Office of the Secretary, Office of Public Health and Science, Office of Research Integrity.

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation Coefficients: Appropriate Use and Interpretation. *Anesthesia and analgesia*, *126*(5), 1763–1768. https://doi.org/10.1213/ANE.0000000000002864

What does it mean when a publication is peer reviewed? (2020). Usgs.gov. https://www.usgs.gov/faqs/what-does-it-mean-when-a-publication-peer-reviewed?qt-news_science_products=0#qt-news_science_products

© COPYRIGHT UPM

APPENDIX

No	Respondent ID
1	12680656005
2	12674320790
3	12666013239
4	12669028559
5	12718284221
6	12748065997
7	12650279168
8	12660781483
9	12649615383
10	12650251581
11	12662154453
12	12663604941
13	12665478558
14	12649889845
15	12661920055
16	12666021187
17	12679251387
18	12661961632
19	12647562915
20	12747156343
21	12662523100
22	12660502376
23	12660738566
24	12649997638
25	12660277560
26	12649702012
27	12647319174
28	12650386049
29	12660826624
30	12665523607
31	12747110066
32	12683970519
33	12657821659
34	12661883022
35	12662256637
36	12661947244
37	12669020998
38	12679800234
39	12672506758
40	12665991700

No	Respondent ID
41	12665858654
42	12662583812
43	12666403968
44	12665895907
45	12654852857
46	12679223876
47	12669013846
48	12703914767
49	12660511756
50	12670475425
51	12668935485
52	12748299699
53	12652910461
54	12660579584
55	12747617196
56	12631084633
57	12743483030
58	12647404165
59	12735026360
60	12665858705
61	12649864431
62	12662244369
63	12665300378
64	12663864100
65	12662171958
66	12701566019
67	12711068356
68	12740624521
69	12710648281
70	12656196417
71	12704071809
72	12649296102
73	12710682886
74	12679466308
75	12650689257
76	12668062874
77	12650430827
78	12669426218
79	12665934248
80	12662048563

No	Respondent ID
81	12672928589
82	12665861515
83	12665834242
84	12726946944
85	12660428203
86	12663400059
87	12679454944
88	12747255421
89	12652963279
90	12672972505
91	12747026949
92	12662842323
93	12666312956
94	12679012002
95	12660439821
96	12724031851
97	12679058929
98	12757845899
99	12679122429
100	12663743499
101	12679346345
102	12677802444
103	12665709755
104	12663719864
105	12660607703
106	12747053491
107	12666070618
108	12663126411
109	12666348221
110	12679604318
111	12747016349
112	12651095981
113	12668708542
114	12679360428
115	12672757852
116	12740269626
117	12679446628
118	12685057585
119	12660480740
120	12660785478

© COPYRIGHT UPM

121	12660376949
122	12710994804
123	12649501027
124	12660768480
125	12665525218
126	12678994120
127	12666260605
128	12673043946
129	12666008337
130	12679016735
131	12660792570
132	12658927625
133	12655915624
134	12673849504
135	12666032563
136	12744300334
137	12661797883
138	12666347403
139	12674001833
140	12649484511
141	12660979287
142	12703088668
143	12731855848
144	12664761432
145	12673544548
146	12650167847
147	12660727874
148	12665837607
149	12654604307
150	12652763707
151	12660512688
152	12666084286
153	12662103118
154	12695481827
155	12668668896
156	12730865269
157	12674384743
158	12652660946
159	12718259672
160	12710836962
161	12707183922
162	12649413665
163	12668715255

164	12660998408
165	12682754009
166	12669421776
167	12747332574
168	12662599078
169	12649646573
170	12668099725
171	12651173952
172	12660969974
173	12679313265
174	12669118781
175	12649374120
176	12630467208
177	12656793917
178	12718149390
179	12665467965
180	12665702592
181	12679325287
182	12668804096
183	12724037572
184	12672957168
185	12665988734
186	12650797160
187	12660536522
188	12718148153
189	12630546598
190	12663848708
191	12660955946
192	12665615877
193	12672297699
194	12652058923
195	12660446673
196	12672489416
197	12650331217
198	12662008035
199	12665320731
200	12663648890
201	12665569276
202	12665519275
203	12662382365
204	12686880012
205	12669025805
206	12660578289

207	12659376633
208	12679384635
209	12664903738
210	12747589225
211	12710879489
212	12649871195
213	12734963621
214	12648081255
215	12668916770
216	12673347943
217	12712680948
218	12665947033
219	12679656198
220	12668964132
221	12653438246
222	12672647212
223	12672632301
224	12659254221
225	12665571029
226	12682273807
227	12685241432
228	12660749306
229	12678989917
230	12672796150
231	12665917974
232	12665879181
233	12735934463
234	12660639125
235	12668902605
236	12661963347
237	12665512013
238	12650324940
239	12660567014
240	12649811436
241	12747004143
242	12719640161
243	12651385059
244	12747132440
245	12630523090
246	12649467601
247	12665809247
248	12665558222
249	12668986571

250	12631939811
251	12735000763
252	12669680215
253	12661950990
254	12653830227
255	12650346636
256	12727188575
257	12668754812
258	12661903943
259	12715076767
260	12659346924
261	12660998891
262	12662121322
263	12665631385
264	12668894688
265	12668935657
266	12649527655
267	12665860137
268	12665873177
269	12701986530
270	12704005567
271	12669612856
272	12649844027
273	12672487029
274	12685302709
275	12666027497
276	12649354879
277	12653072599
278	12711117885
279	12669517310
280	12650464024
281	12747114015
282	12662585785
283	12737729914
284	12672527458
285	12679249847
286	12757851393
287	12649553525
288	12679513334
289	12718148433
290	12660481967
291	12662077072
292	12724347127

293	12650174046
294	12660732000
295	12650326785
296	12672402365
297	12676138041
298	12650193268
299	12727679237
300	12651302234
301	12727051564
302	12662839283
303	12661802288
304	12710729459
305	12665816209
306	12656964431
307	12672931314
308	12665910688
309	12676188221
310	12650213152
311	12703982044
312	12740122809
313	12679241397
314	12650749705
315	12711143647
316	12666001158
317	12660479773
318	12679322186
319	12710803746
320	12662129451
321	12666166200
322	12666117302
323	12663272564
324	12649273988
325	12662400721
326	12660752792
327	12663782085
328	12680649537
329	12679144799
330	12662783782
331	12665590647
332	12662474034
333	12665661532
334	12669105742
335	12740195060

336	12660731761
337	12646872832
338	12656479035
339	12659584610
340	12665801745
341	12649971254
342	12747118021
343	12672102090
344	12650339321
345	12650826842
346	12662519078
347	12672937235
348	12650959473
349	12649784134
350	12737731445
351	12650053347
352	12666057471
353	12666828224
354	12665923481
355	12735981177
356	12653124942
357	12650377862
358	12672959041
359	12703985634
360	12650065362
361	12666853824
362	12634075744
363	12679109304
364	12682099385
365	12661934474
366	12654685511
367	12665904496
368	12740686922
369	12672453355
370	12673168487
371	12662150191
372	12665294404
373	12665865050
374	12650168325
375	12743651266
376	12677667844
377	12671896993
378	12672771120

379	12656046033
380	12682026800
381	12653477612
382	12649871848
383	12672313043
384	12662129780
385	12710769915
386	12661880307
387	12660515590
388	12666759791
389	12649781175
390	12703989759
391	12651190763
392	12660471167
393	12679053617
394	12737448434
395	12660821943
396	12650007066
397	12670082543
398	12666172325
399	12661174078
400	12668794117

© COPYRIGHT UPM