

Impact of a Publication Ethics Orientation Program on the Knowledge and Attitude of Postgraduate Students of Health Sciences

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ABSTRACT

Introduction: Pressure to publish and for better academic recognition, issues of publication misconduct like plagiarism, data fabrication and falsification, authorship disputes, conflict of interest, redundant and salami publications are on rise. A capacity building program on publication ethics for postgraduate students who are still young as researchers can be beneficial for them to get sensitised to ethical issues related to publishing.

Aim: To assess the impact of orientation program on the knowledge and attitude of postgraduate students towards "Publication Ethics".

Materials and Methods: This is an educational interventional study where postgraduate students were given an orientation on "Publication Ethics". A semi-structured questionnaire was designed to assess students' level of knowledge and attitude regarding publication ethics which was administered before and after the program to assess its impact. Frequency and percentage of study participants' demographic profile and participants' responses to various statements was calculated.

Chi-square test was used to compare the pre- and post-intervention knowledge of study participants regarding different aspects of "Publication Ethics".

Results: The mean age of 143 participants was 27.07±4.56 years and 105 (73.42%) were women. The percentage of participants providing correct responses for different statements used to assess knowledge and attitude of postgraduate students regarding publication ethics increased from 17.47-82.51% before attending the orientation session to 49.64-93% after attending the session. This increase in proportion of participants responding correctly was statistically significant ($p<0.05$) except for the statements where pre-intervention scores were already higher.

Conclusion: A significant post-training improvement was observed in knowledge and attitude regarding publication ethics amongst postgraduate students. As publication misconduct is very common, good publication practices should be promoted in young researchers by conducting such kind of educational interventions regularly.

Keywords: Authorship and plagiarism, Biomedical research, Publication misconduct

INTRODUCTION

Office of Research Integrity (ORI) and Indian Council of Medical Research (ICMR) guidelines state, "All the members of the team doing research are expected to maintain high standards to uphold the fundamental values of research and the principles arising out of those values for 'Responsible Conduct of Research' (RCR)" [1,2]. Publication ethics and misconduct in publication are described along with various other components of RCR [2].

Biomedical research starts with a novel idea which becomes research question and then after following proper research methodology, data is collected, analysed and interpreted. The results of research are then shared with other scientists in the form of original published article in a reputed peer-reviewed journal. Scientists and other readers read these papers assuming that research is original, unbiased, true and ethical. Many of them might use these research articles for conducting further research studies based on same topic and there could be a ripple effect in case of publication misconduct. There is a rise in various issues of publication misconduct such as plagiarism, redundant and salami publications, guest and ghost authorship, data manipulation and conflict of interest [3]. The mandatory requirement to publish research papers for postgraduate students and for the promotion of medical teachers may be the reason behind this rise [3-5].

Nowadays research studies are routinely being done in medical colleges and other health professional colleges by faculty as well as students. It is very important that results of any biomedical research should be published and it is also important that these should be published ethically. To preserve integrity of scientific research, it is duty of medical researchers to communicate and

share only accurate information to readers for which they are accountable [2,6].

Many studies and training have been done on research ethics as a general topic but the number is scarce for publication ethics. There is need to reinforce and expand Publication Ethics as an important component of Bioethics. As a part of training, it is compulsory for Postgraduate students to do research in the form of their thesis work and to publish paper. Most of the postgraduate students, as budding researchers, are not aware of publication ethics and publication misconduct. By means of present study cum educational program, postgraduate students can be sensitised about Publication Ethics, Publication Misconduct and Guidelines from various resources like ICMR [2], International Committee of Medical Journal Editors (ICMJE) [7], Committee on Publication Ethics (COPE) [8], ORI [1], World Association of Medical Editors (WAME) [9], Consolidated Standards of Reporting Trials (CONSORT) [10] and Council for International Organisations of Medical Sciences (CIOMS) [11]. The students can publish their research paper ethically after gaining knowledge about publication ethics which can also be helpful for their academic progress as health professionals. Thus, the present study was aimed to assess the impact of 'Publication Ethics' orientation program on knowledge and attitude of postgraduate students of Health Sciences.

MATERIALS AND METHODS

An intervention study was conducted at four different colleges of health profession education under Maharishi Markandeshwar University (MMU), Mullana, Ambala, Haryana, India from November 2016 to March 2017. The intervention was in the form of educational

lecture on Publication Ethics. Ethical approval was obtained from the Institutional Ethics Committee (IEC) before the start of the study. Data collection tool was pre- and post-test questionnaire.

Study Participants

Postgraduate students from four colleges of MMU i.e., MM Institute of Medical Sciences and Research (MMIMSR), MM College of Dental Sciences and Research (MMCDSR), MM Institute of Physiotherapy and Rehabilitation (MMIPR) and MM College of Nursing (MMCON).

Questionnaire

A semi-structured questionnaire was designed to assess students' level of knowledge and attitude regarding publication ethics. The two-sided one-page questionnaire was finalised after questions were validated by pretesting on 10 randomly selected health professionals. The questionnaire was based on guidelines of ICMR, ICMJE and COPE, covering many issues regarding Publication Ethics and Publication Misconduct such as Plagiarism, authorship, data manipulation etc. The content of both pre and post-test questionnaire was same except for two additional questions in post-test regarding students' opinion and comments related to orientation program. No personal information was recorded on questionnaire to ensure confidentiality and anonymity of participants.

Questionnaire included: Demographic details (Age, gender, college, year and excluding name or any other personal details); 15 Statement questions regarding Publication Ethics and responses of these 15 statements were obtained on five point Likert's scale (wherein each item was categorised as: 5-strongly agree, 4-agree, 3-neutral, 2-disagree and 1-strongly disagree). The study participants were asked to rate their agreement with the items on this five point scale. Out of 15 statements, 10 statements were positive with 'Agree' or 'Strongly Agree' as corrected response and five statements were negative with 'Disagree' or 'Strongly Disagree' as corrected response.

A combination of open ended comments; single-response items (either yes/ no/ not sure) regarding awareness of regulatory bodies, IEC and anti plagiarism software; level of knowledge before and after the session (on a scale of 1 to 5, 5 being very good) were also included in the questionnaire.

Orientation Program

The orientation program on 'Publication Ethics' was based on guidelines of ICMR, ICMJE, COPE, ORI, CONSORT, a power point presentation was prepared which included general principles of publication ethics, guidelines, publication misconduct and various regulatory bodies. The didactic lecture was delivered to post-graduate students followed by interactive discussions.

Strategy

After getting approval from IEC, permission for conducting educational program was taken from four Principals of respective colleges and separate dates were finalised for the program. On the fixed day, all study participants were briefed about the purpose of study and an informed consent was obtained. Students were given 15 minutes to fill up an anonymous pre-test questionnaire at the beginning of lecture to assess the extent of their knowledge and understanding about concepts of Publication Ethics. After the session on publication Ethics was delivered to students (intervention), post-test questionnaire was collected. Soft copy of lecture and related reading material was emailed to Principal as well as to student whosoever demanded the same.

STATISTICAL ANALYSIS

Data analysis was done by using Statistical Package for Social Sciences (SPSS) statistical software version 20.0. Frequency and percentage of study participants' demographic profile and

participants' responses to various statements was calculated. Chi-square test was used to compare the pre and post-intervention knowledge of study participants regarding different aspects of Publication Ethics. A p -value < 0.05 was considered significant (S), $p < 0.001$ was considered Highly Significant (HS) and $p \geq 0.05$ was considered Non Significant (NS).

RESULTS

Based on data collection on pre- and post-test questionnaires, results are tabulated. Demographic profile of 143 postgraduate students are given in [Table/Fig-1]. The mean age of postgraduate students was 27.07 ± 4.56 years and 105 (73.42%) were women. In the present study, the number of female participants is more as Nursing College is women college and also in other three colleges of university, the frequency of admission was more for female postgraduate students as compared to male postgraduate students. 29 (20.27%) students had experience in publishing research paper and 46 (32.16%) of paper presentation at the conference. The impact of an orientation program on 'Publication Ethics' among postgraduate students are shown in [Table/Fig-2-4]. As shown in [Table/Fig-2,3], the percentage of participants providing correct responses for different statements used to assess knowledge and attitude of postgraduate students regarding publication ethics increased from 17.47-82.51% before attending the orientation session to 49.64-93% after attending the session.

Characteristic	Number (Percentage)
Total Participants	143 (100)
Women	105 (73.42)
Men	38 (26.57)
Colleges: Medical (MMIMSR)	49 (34.26)
Dental (MMCDSR)	43 (30.06)
Physiotherapy (MMIPR)	11 (7.69)
Nursing (MMCON)	40 (27.97)
Mean Age (in years)	27.07 ± 4.56

[Table/Fig-1]: Demographic Profile of Study Participants (Postgraduate students).

After attending the session, there was statistically significant increase in number of students who provided correct responses related to knowledge of IEC, Anti-plagiarism software, publication misconduct and various regulatory bodies of Publication Ethics [Table/Fig-4]. When postgraduate students were asked to rate their own level of knowledge on a scale of 1 to 5 (5 being very good), >95% of students answered ≥ 3 in post-test as compared 18% in pre-test questionnaire [Table/Fig-5].

In present study, statistical analysis thus revealed that the intervention was powerful enough to significantly improve the knowledge and awareness of postgraduate students regarding various issues related to publication ethics.

DISCUSSION

Mostly due to authors' ignorance or sometimes due to their willful deceptions, published manuscript may be biased leading to 'Scientific or Publication Misconduct'. Publication misconduct is not uncommon and it is responsibility of journal editors, reviewers, readers and authors to make sure that scientific literature is reliable and trustworthy [12]. All over the world, colleges conduct training programs separately for different levels like for faculty, for postgraduate and undergraduate students. These programs, in the form of workshops, CMEs, guest lectures etc., acclimatise and familiarise the students to the important topics in hand and 'Publication Ethics' is one of these topics. Postgraduate students of medical and paramedical courses now-a-days are fully aware of benefits of research and research publication for their bright future. In the present study, an orientation program on publication ethics was conducted for the postgraduate students of health sciences

S. No.	Level of agreement Positive Statements (N=143)	5 Strongly Agree No. (%)	4 Agree No. (%)	3 Neutral No. (%)	2 Disagree No. (%)	1 Strongly Disagree No. (%)	No Response No. (%)	p-value (Significance)
1	You think you have adequate knowledge regarding publication ethics Pre-test	2 (1.39)	23 (16.08)	68 (47.55)	40 (27.97)	8 (5.59)	2 (1.39)	<0.001**
	Post-test	28 (19.58)	98 (68.53)	16 (11.18)	1 (0.69)	0	0	
2	You are aware of publication misconduct being done among health professionals Pre-test	3 (2.09)	45 (31.46)	54 (37.76)	32 (22.37)	6 (4.19)	3 (2.09)	<0.001**
	Post-test	23 (16.08)	98 (68.53)	22 (15.38)	0	0	0	
3	Name of the person should not be omitted from the research article, who has contributed significantly Pre-test	57 (39.86)	49 (34.26)	16 (11.18)	11 (7.69)	6 (4.19)	4 (2.79)	0.097
	Post-test	59 (41.25)	64 (44.75)	10 (6.99)	7 (4.89)	3 (2.09)	0	
4	Plagiarism or copying is very common Pre-test	38 (26.57)	68 (47.55)	26 (18.18)	9 (6.29)	2 (1.39)	0	0.058
	Post-test	41 (28.67)	70 (48.95)	24 (16.78)	4 (2.79)	4 (2.79)	0	
5	Informed written consent should be taken from study participants and should be mentioned in your publication Pre-test	63 (44.36)	53 (37.32)	17 (11.97)	6 (4.22)	2 (1.40)	1 (0.70)	0.420
	Post-test	72 (50.34)	56 (39.16)	11 (7.69)	3 (2.09)	0	1 (0.69)	
6	Your perception regarding 'Salami Publication' is clear Pre-test	4 (2.79)	15 (10.48)	47 (32.86)	38 (26.57)	19 (13.28)	20 (13.98)	<0.001**
	Post-test	62 (43.35)	67 (46.85)	11 (7.69)	2 (1.39)	0	1 (0.69)	
7	In case of clinical trials, clinical trial registration number should be mentioned in publication Pre-test	30 (20.97)	57 (39.86)	39 (27.27)	8 (5.59)	1 (0.69)	8 (5.59)	<0.001**
	Post-test	59 (41.25)	65 (45.45)	18 (12.58)	1 (0.69)	0	0	
8	You think you have adequate knowledge regarding 'Conflict of Interest' Pre-test	7 (4.89)	31 (21.67)	57 (39.86)	35 (24.47)	7 (4.89)	6 (4.19)	<0.001**
	Post-test	33 (23.07)	91 (63.63)	17 (11.88)	1 (0.69)	0	1 (0.69)	
9	Authors should ensure study participant's confidentiality Pre-test	63 (44.05)	55 (38.46)	18 (12.58)	3 (2.09)	1 (0.69)	3 (2.09)	0.150
	Post-test	76 (53.14)	57 (39.86)	8 (5.59)	1 (0.69)	0	1 (0.69)	
10	Proper action using well- defined protocols should be taken in case of research or publication misconduct Pre-test	40 (27.97)	73 (51.04)	13 (9.09)	9 (6.29)	2 (1.39)	6 (4.19)	0.001*
	Post-test	69 (48.25)	64 (44.75)	7 (4.89)	2 (1.39)	0	1 (0.69)	

[Table/Fig-2]: Impact of positive statements regarding Publication Ethics on postgraduate students.

S.No.	Level of agreement Negative Statements (N=143)	5 Strongly Agree No. (%)	4 Agree No. (%)	3 Neutral No. (%)	2 Disagree No. (%)	1 Strongly Disagree No. (%)	No Response No. (%)	p-value
1	It is justifiable to alter or fabricate data in order to get a paper published Pre-test	4 (2.79)	18(12.58)	30 (20.97)	50 (34.96)	37 (25.87)	4 (2.79)	0.089
	Post-test	5 (3.49)	15 (10.48)	30 (20.97)	38 (26.57)	55 (38.46)	0	
2	Although you are the primary investigator of the study, it is Ok to have your HOD's/ Guide's name as first author in YOUR research publication Pre-test	14 (9.79)	38 (26.57)	34 (23.77)	33 (23.07)	22 (15.38)	2 (1.39)	<0.001**
	Post-test	5 (3.49)	9 (6.29)	29 (20.27)	52 (36.36)	48 (33.56)	0	
3	Because this is my study, I can add name of my colleague in my publication as 'Gift authorship' Pre-test	13 (9.09)	39 (27.27)	38 (26.57)	35 (24.47)	15 (10.48)	3 (2.09)	0.018*
	Post-test	10 (6.99)	34 (23.77)	27 (18.88)	33 (23.07)	38 (26.57)	1 (0.69)	
4	Redundant or multiple publications is not unethical Pre-test	11 (7.69)	32 (22.37)	42 (29.37)	31 (21.67)	14 (9.79)	13 (9.09)	<0.001**
	Post-test	6 (4.19)	18 (12.58)	23 (16.08)	50 (34.96)	43 (30.06)	3 (2.09)	
5	Negative or inconclusive results of your research should not be published Pre-test	17 (11.88)	36 (25.17)	33 (23.07)	37 (25.87)	15 (10.48)	5 (3.49)	<0.001**
	Post-test	5 (3.49)	5 (3.49)	45 (31.46)	52 (36.36)	36 (25.17)	0	

[Table/Fig-3]: Impact of negative statements regarding Publication Ethics on postgraduate students.

*p<0.05 Significant, **p<0.001 Highly Significant

	Pre-test (N=143) Number (Percentage)	Post-test (N=143) Number (Percentage)	p-value
Institutional Ethics Committee	75 (52)	132 (92)	<0.001**
Anti-plagiarism soft ware	97 (68)	137 (96)	<0.001**
In case of Publication dispute, whom to contact	33 (23)	54 (38)	0.021*
Observed publication misconduct	11 (8)	41 (29)	<0.001**
Regulatory Bodies	47 (32.8)	83 (58)	<0.001**

[Table/Fig-4]: Number and percentage of postgraduate students providing correct responses regarding PE.

Level of knowledge (scale 1 to 5, 5 being maximum), Answered:	Pre-test (N=143) Number (Percentage)	Post-test (N=143) Number (Percentage)
1	38 (27)	0
2	79 (55)	6 (4)
3	21 (15)	58 (41)
4	5 (3)	69 (48)
5	0	10 (7)

[Table/Fig-5]: Pre and post test perceptions of postgraduate students regarding their own level of knowledge.

and impact of the program on students was assessed by pre- and post-test questionnaire evaluation.

The present interventional study conducted on postgraduate students revealed that initial (pre-test) understanding and knowledge regarding publication ethics was low among postgraduate students. Only about 18% of students admitted to having adequate knowledge of PE which increased significantly to about 88% in post-test assessment. The training cum orientation program was developed and delivered to postgraduate students, in which various issues related to research publication ethics like authorship, plagiarism, data manipulation, reporting, publication misconduct and various guidelines were discussed. In the present study, significant post training improvement was found in students' knowledge regarding various issues of publication ethics [Table/Fig-2-5].

Many statements in the present questionnaire were about authorship issues and a significant knowledge gain was observed in postgraduate students after attending the session. ICMR [2] accepts ICMJE [7] guidelines for authorship which is also endorsed by WAME [9] and ORI [1]. Authorship should be decided at the very start of research study along with the disclosure of individual contribution to avoid authorship disputes. The latest ICMR 2017 guidelines clearly states that, "the primary author should be the person who has done most of the research work related to the manuscript being submitted for publication. Research performed as part of a mandatory requirement of a course/fellowship/training programme including student research should have the candidate as the primary author. All efforts must be made to provide the candidate with an opportunity to fulfil the second, third and fourth criteria of the ICMJE guidelines" [2].

In 2017 Das S et al., in their editorial, presented a series of interesting cases related to issues on student-guide authorship conflicts in articles which were mainly thesis or PhD work. They also suggested, among other important proposals, that "the principal investigator must be the first/second author, as the thesis is principally his own research" [13]. Mondal H and Mondal S, discussed authorship conflicts and made a "C loop" of possible conflicts between medical teachers, between teachers and students and between students. Research publication has become an important and mandatory necessity for both postgraduate student and medical teacher which might be the reason behind in numerous papers published in India. This has a negative impact on research and has created authorship conflicts and publication misconduct. As publication ethics are

rarely taught in postgraduate course, thus a training program on publication ethics is the need of the hour for both groups [5].

The ghost and gift authorship as well as 'medical ghost writing' are not acceptable [2,3,14]. Editors are considered stewards of journal and Committee on Publication Ethics (COPE) has provided proper flow charts to guide editors of Journals to deal with authorship disputes and to investigate misconducts [6,8,12]. In all reputed journals, there is a section of 'Advice or Instructions to Authors' which should be read by all researchers/authors before sending the research article for publication.

Dhingra D and Mishra D, conducted a questionnaire study to determine the extent of occurrence of misconduct in publication. The observed misconduct was offering gift authorship reported by 65% respondents, alteration of data reported by 56% and plagiarism was observed by 53% respondents. A 33.5% respondent had observed a colleague's name being omitted from a paper to which she/he had significantly contributed (ghost authors) [15]. In the present study, 33.55% students admitted to being aware of 'publication misconduct was done among health professional' before attending the session and after attending the educational program (post- test), awareness increased in 85% of students.

Authors perform unethical practices like salami and redundant publications to strengthen their curriculum vitae [3,12,16]. "Salami Publication is the practice of dividing one significant piece of research into a number of small experiments (least publishable units or LPUs), simply to increase the number of publications" [1]. Salami publication or salami slicing or bologna or trivial publication should be avoided by authors as it may mislead readers believing that published articles are from different samples. As these are very difficult to get detected by software applications, salami publications are considered a serious threat to publication ethics [1,3,17]. Perception regarding salami publications in the present study was found only in about 13% of students in pre-test questionnaire which was quite low and after attending the session it was significantly increased to about 90%.

In Redundant or Multiple Publications, a research paper is published in more than one journal without acknowledging the original source [3,12]. In present study, about 32% of postgraduate students stated redundant publication as unethical in pre-test and after attending the session percentage of students increased to 65. Meta-analysis i.e., analysis of a group of similar experiments or studies of studies, is done to improve the understanding of difficult problems and these unethical practices could be wrongly assumed as multiple studies in meta-analysis and thus could lead to inaccurate conclusions [1]. On June 15, 2009 CDSCO has made it mandatory to register clinical trials in CTRI (Clinical Trial Registry-India) to improve transparency, accountability and accessibility of research data [2]. For publication of clinical trials, editors of medical journals require authors to mention the name of trial register and clinical trial registration number in the publication [7,10]. If new analysis of same data is to be published, original clinical registry number and primary source should be cited to prevent redundant publications [3].

Wager E et al., surveyed journal editors to determine their views about a range of publication ethics issues. Although the issue of greatest concern was redundant publication but authors found in their survey that most journal editors seem not very concerned about publication ethics and awareness and use of guidelines was generally low [18].

A questionnaire based study was done by Ryan G et al., on undergraduate and postgraduate Pharmacy students to determine their levels of awareness of plagiarism and study showed widespread deficiencies in knowledge and attitudes towards the plagiarism [19]. About 74% of students in present study were already aware that plagiarism as publication misconduct is very common in research publications. As it was mandatory for postgraduate students of the institution to submit their thesis plan and thesis for the plagiarism

check, so a detailed information regarding plagiarism and different anti plagiarism software was provided to postgraduate students. Plagiarism detecting programs or software like Turnitin, iThenticate etc., are available for academic institutions to find the similarity index for the plagiarised content. Many websites provide free of cost plagiarism detection service. Mondal H et al., in their article provided hands-on guide to help authors in making their article plagiarism free before submitting to any journal to avoid rejection due to plagiarism [20]. The research misconduct, if found, should be reported and it is primary responsibility of research institutions to investigate the allegations of misconduct. Thus institutions should have policies to deal with research misconduct and along with that whistleblowers should also be protected [1,3].

Ibrahim NKR et al., conducted a study to determine knowledge, attitude and practice of medical students and interns towards research through an educational intervention course. Study participants who received research training and conducted researches had higher knowledge score ($p < 0.05$) compared to others. 38.1% participated in researches and 5.8% of participants published a scientific paper. Authors found a marked improvement of mean knowledge score after the educational program ($p < 0.001$) and thus concluded that intervention program was successful in improving research knowledge [21]. Similarly, present study showed improvement in awareness and knowledge of various ethical issues regarding PE after attending the orientation program on PE.

A questionnaire based survey study done on dental faculty regarding research ethics showed that Mid-level faculty and those with 'prior ethics training' gave more correct answers compared with that obtained by Professor and Junior faculty. More than 90% believed the need of confidentiality, >85% had strong opinion regarding Informed Consent and >90% were in the favor of research ethics education for postgraduates, investigators, and members of RECs [22].

A pre-post test evaluation of the training workshop on research ethics in a Nigerian university also showed a significant improvement in participants' knowledge of principles of research guidelines and operations of IRBs [23].

Kalichman M and Brown S, conducted a questionnaire based study on trainees to assess the role of ethics training in altering their perceptions or their knowledge regarding ethical problems in conducting and reporting research. It was found that knowledge regarding research ethics problems was significantly increased in association with increased hours of discussion, class time, or case study discussion [24].

Dishonest researchers or authors waste public funds, harm the research record, mislead the readers of their published research article who may quote the author presuming the research work to be original and authentic and may even harm their career prospects [1,3]. Inadequate knowledge of publication ethics can lead to future publication misconduct. Thus, it is very important to train young researchers about principles of publication ethics to reduce the occurrence of publication misconduct. The guidelines from ICMR [2], ICMJE [7], ORI [1], COPE [8], CONSORT [10] and CIOMS [11] are very valuable for all the stake holders involved in research and research publication like investigators, authors, editors, reviewers, publishers, IEC members etc. In the present study main relevant points regarding publication ethics and guidelines were discussed and a significant difference was observed in the knowledge and attitude of publication ethics among postgraduate students after attending the orientation program. Conferences, workshops, symposiums on publication ethics may act as a means of sensitising students as well as faculty and thus will help to bridge this gap.

LIMITATION

In present study only pre- and post-test questionnaire was taken due to time constraint. The follow-up study after one month or

three months would have been helpful in determining the extent to which participants or trainees retained the information long-term. The participants in present study were only postgraduate students of health sciences and thus future studies are warranted to include faculty and undergraduate students also.

CONCLUSION

The impact of publication ethics orientation program on postgraduate students was assessed in the present study and a significant post training improvement was observed in knowledge and attitude regarding publication ethics amongst students. There is an ongoing need to reinforce the knowledge gained by students by conducting more of such kind of educational interventions that will lay sound foundation for the bright future of students. As publication misconduct is very common, good publication practices should be promoted through sensitising programs for young researchers.

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