

# Assessment of change in knowledge about research methods among delegates attending research methodology workshop

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## Abstract

**Aim:** In an era of evidence based medicine research is an essential part of medical profession whether clinical or academic. A research methodology workshop intends to help participants, those who are newer to research field or those who are already doing empirical research. The present study was conducted to assess the changes in knowledge of the participants of a research methodology workshop through a structured questionnaire.

**Methods:** With administrative and ethical approval, a four day research methodology workshop was planned. The participants were subjected to a structured questionnaire (pre-test) containing 20 multiple choice questions (Q1-Q 20) related to the topics to be covered in research methodology workshop before the commencement of the workshop and then subjected to similar posttest questionnaire after the completion of workshop. The mean values of pre and post-test scores were calculated and the results were analyzed and compared.

**Results:** Out of the total 153 delegates, 45(29%) were males and 108 were (71%) females. 92 (60%) participants consented to fill the pre-test questionnaire and 68 (44%) filled the post-test questionnaire. The mean Pre-test and post-test scores at 95% Confidence Interval were 07.62 (SD  $\pm$ 3.220) and 09.66 (SD  $\pm$ 2.477) respectively. The differences were found to be significant using Paired Sample T test ( $P < 0.003$ ).

**Conclusion:** There was increase in knowledge of the delegates after attending research methodology workshops. Participatory research methodology workshops are good methods of imparting knowledge, also the long term effects needs to be evaluated.

**Keywords:** Academic research, medical professionals, structured questionnaire

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## INTRODUCTION

Research is an essential part of medical profession whether clinical or academic. The essential procedure which is followed by the researchers and medical professionals through their work is called as research methodology.<sup>[1]</sup> To develop new techniques in the field of medical science

for patient management and care, research is required, and to keep the knowledge up-to-date, training is required. This is an era of evidence-based medicine which intends the ethical, precise, and judicious use of current evidence in decision-making about the care of individual patients which can be achieved by gaining the individual clinical expertise with the best available clinical evidence collected

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from the means of systematic research.<sup>[2]</sup> In spite of having keen interest in research, to conduct a research study, it is essential to possess adequate knowledge of research methods, practical skills, and ethical principles, which leads to the development of the right attitude. Moreover, lack of research curriculum and time both could be reasons in failure of better attitude or knowledge in being converted to practicing research by the resident doctors.<sup>[3,4]</sup>

The studies have shown that there is a rise in research interest, confidence in conducting research, and improvement in knowledge of research, if the medical students were introduced to the concept of research in their undergraduate course.<sup>[5]</sup> This has also shown to influence students to choose research as a choice of specialty and also found to increase the ability to critically appraise the literature and write good-quality research articles.<sup>[5]</sup>

The medical institutions are following guidelines laid by the Medical Council of India (MCI) for appointment and promotion of medical teachers which includes promotion and publication of research as a mandatory requirement. To improve the teachings in medical education and to engage the faculty and students in research activity, MCI has made it compulsory to produce a “thesis” for postgraduate (Masters – MD/MS/DNB) and postdoctoral (DM/MCh/DNB) courses which incorporate training in doing research along with appraisal of research methodology and critical analysis.<sup>[6]</sup>

Clinical research is a new although fast-growing field in any country and requires trained medical personnel for conducting effective research. Hence, effective training in research is an essential requirement in all the fields related to medical care.<sup>[7,8]</sup> A research methodology workshop intends to help participants, who have had a minimum or no previous research experience, who have just started working toward formulating a research question or topic, or those who are already doing empirical research. Evaluating a workshop program and assessing the knowledge of the participant before and after the workshop or an educational workshop program is an effort to determine whether the program objectives have been achieved. The present study was conducted to assess the changes in knowledge of the participants of a research methodology workshop through a structured questionnaire.

## MATERIALS AND METHODS

With administrative approval, a 4-day research methodology workshop was planned. The information of the workshop was uploaded on the website of the hospital, sent

through personal e-mail, and pamphlets were distributed to cover almost all the medical colleges, postgraduate colleges, nursing colleges, and physiotherapy colleges. A heterogeneous group of 153 participants comprising of graduate students, medical students, clinicians, medical postgraduates, postgraduate nursing students, physiotherapists, and physiotherapy students registered for the workshop. A questionnaire was designed containing twenty multiple choice questions (Q1-Q20) with a single correct choice of answer. The questions were relevant to the topics being covered in the workshop. [Annexure 1]. The participants were subjected to the questionnaire (pretest) on day 1 before the commencement of the workshop. Each question had one correct answer, and every correct answer was given 1 score, and there was no negative marking. The workshop was held for 4 days and covered the basics of research methodology through lectures delivered by experts as well as group activities and interactive sessions. The participants were again subjected to the posttest questionnaire containing same sets of questions at the end of the workshop. The anonymously filled questionnaires were collected. The mean values of pre- and posttest scores were calculated, and the results were analyzed and compared. The administrative approval as well as ethical approval from the Institutional Ethics Committee was obtained for the study.

## Statistical analysis

Statistical analysis was done for calculations of means, percentages, and ranges. The comparison of means was done using paired sample *t*-test at 95% confidence interval, and  $P < 0.05$  was considered significant.

## RESULTS

Out of the total 153 delegates, 45 (29%) were males, and 108 were (71%) females. Ninety-two (60%) participants

**Table 1: Details of the registered participants**

Participants	<i>n</i>	Percentage
Sex		
Male	45	29
Female	108	71
Specialty		
Professor	9	6
Associate professor	7	5
Assistant professor	16	10
Residents	7	5
Students	91	59
Laboratory technicians	4	3
Reader	3	2
Lecturer	6	4
Medical officer	1	1
Scientist	3	2
Physiotherapist	2	1
Research associates	2	1
Others	2	1

consented to fill the pretest questionnaire and 68 (44%) filled the posttest questionnaire. Most of the registered participants were students (59%) including graduate nursing students, postgraduate nursing students, graduate medical students, and postgraduate medical students, and the rest were medical doctors including 9 (6%) professors, 7 (5%) associate professors, 16 (10%) assistant professors, 6 (4%) lecturers, and 4 (3%) readers. Ten other professionals associated with medical care also participated in the study [Table 1]. The mean pretest and posttest scores at 95% confidence interval were 07.62 (standard deviation [SD]  $\pm$  3.220) and 09.66 (SD  $\pm$  2.477), respectively. The differences were found to be significant using paired sample *t*-test ( $P < 0.003$ ).

In pretest questionnaire, of 92 delegates, 29% delegates scored between 0 and 5 number range, 51% delegates scored between 6 and 10 which was maximum, whereas 18% delegates scored the highest score range between 11 and 15. In posttest questionnaire, of 68 delegates, the number of delegates who scored between 0 and 5 reduced to 6%. The maximum number of delegates (63%) still scored in the number range of 6–10. There was a rise in the number of delegates falling in this number range. The percentage of delegates scoring in number range 11–16 rose to 31% [Table 2].

**Table 2: Pre- and post-test scores (number range)**

Number range	Pretest (n=92)	Percentage	Posttest (n=68)	Percentage
0-5	27	29	4	6
6-10	47	51	43	63
11-15	17	18	21	31
16-20	1	1	0	-

As evident from pretest scores [Table 3], Q1, Q3, and Q16, the delegates were well aware about the basics of research including framing of research question through Population, Intervention, Comparison, Outcomes, Time duration [PICOT] criteria, need of framing a good research question, and the criteria to accept or reject null hypothesis before the workshop as Q1 and Q3 were answered correctly by 50% or more delegates. In the posttest questionnaire, the knowledge about Q1 (PICOT criteria), Q2 (consort guidelines), and Q5 (skewness of data) was increased as 88.23%, 54.41%, and 60.29% delegates, respectively, answered the questions correctly, which was found highly statistically significant with  $P = 0.000, 0.006, \text{ and } 0.000$ , respectively. The learning about probability as a research parameter increased from 46.00% to 75.00% as evident from scores of Q12 ( $P = 0.006$ ). 61.7% delegates in post-test answered Q19 correctly ( $P = 0.022$ ) as compared to 40.21% in pretest indicating that knowledge about methods of data collection was well understood by the participants of the workshop. Almost 50% of the questions in the questionnaire were answered correctly by more than 50% delegates who participated in posttest as evident from Table 3.

## DISCUSSION

When we consider the quality of medical research in India, with respect to the medical research in world, we find that we lack in quality research. The reasons for this lack could be many, including lack of funding, workforce, resources, and lack of or reduced research orientation in medical education as research methodology is not incorporated in medical education in India.<sup>9,10</sup> If we look back to the

**Table 3: Question-wise scoring of participants in pre- and post-test assessment**

Question	Pretest (n=92)				Posttest (n=68)			
	Correct	Incorrect	Percentage (correct score)	Percentage (incorrect score)	Correct	Incorrect	Percentage (correct score)	Percentage (incorrect score)
Q1	47	45	51.08	48.92	60	8	88.23	11.76
Q2	24	68	26.08	73.91	37	31	54.41	45.58
Q3	78	14	84.78	15.22	56	12	82.35	17.64
Q4	17	75	18.47	81.26	19	49	27.94	72.05
Q5	26	66	28.26	71.74	41	27	60.29	39.7
Q6	23	69	25.00	75.00	17	51	25.00	75.00
Q7	44	48	47.82	52.18	40	28	58.82	41.17
Q8	26	66	28.26	71.74	19	49	27.94	72.05
Q9	25	67	27.17	72.83	25	43	36.76	63.23
Q10	24	68	26.08	73.92	20	48	29.41	70.58
Q11	30	62	32.60	67.40	19	49	27.94	72.05
Q12	42	50	45.65	54.35	51	17	75.00	25.00
Q13	37	55	40.21	59.78	31	37	45.58	54.41
Q14	37	55	40.21	59.78	35	33	51.47	48.52
Q15	41	51	44.56	55.44	29	39	42.64	57.35
Q16	46	46	50.00	50.00	31	37	45.58	54.41
Q17	36	56	39.13	60.87	37	31	54.41	45.58
Q18	29	63	31.52	68.48	18	50	26.47	73.52
Q19	37	55	40.21	59.78	42	26	61.76	38.23
Q20	32	60	34.78	65.21	26	42	38.23	61.76

statistics of past twenty years, we will find that China has raised its proportion of published indexed medical articles from 0.6% by over 1100%, whereas India lacks far behind and is shown to have a marginal rise, from 0.4% and accounts for only 1.5% of published articles indexed in PubMed.<sup>[11]</sup>

Although MCI and other international organizations have recommended to introduce research methodology in early years of medical education, in India, it has not been included as mandatory part of undergraduate curriculum, and therefore the concept of evidence-based practice is still a strange fact in majority of colleges.<sup>[6,9,12]</sup> Trainings and workshops are the best ways to introduce the concept of research as they are very well received and enhance the knowledge as well as performances of the medical personnel.<sup>[7,8,13,14]</sup> The research methodology workshops are common ventures of medical colleges and hospitals, but the workshop conducted by us was among the rarest workshops, conducted in a superspecialty hospital and research center, where participants were invited from all parts of the country and were introduced to the research lectures delivered by eminent faculty invited from esteemed institutions, which makes this study unique.

Various studies have concluded an increase in knowledge of the medical students after attending research methodology workshops or after attending a short-term training which was found similar in our study. However, the participants in our study were healthcare professionals along with the medical and nursing students.<sup>[5,14]</sup> Most of the studies like ours have concluded that participatory research methodology workshops are good methods of imparting knowledge, and one study advocated that the long-term effects need to be evaluated.<sup>[14]</sup>

This workshop was designed to introduce the participants to the basic principles of research methodology. The topics included were framing of research question and hypothesis interpretation, basic statistical methods including interpretation of graphs, introduction to research variables and probability, data collection and ethical principles. The basis of framing the questions for the assessment of knowledge through the pretest and posttest in this study was similar to certain other studies.<sup>[4,8]</sup> A study from UAE had questionnaire-based pre- and posttest scores and concluded the need to conduct evidence-based medicine course through workshops for effective learning.<sup>[15]</sup>

It is difficult to compare the findings of this workshop with any other workshop as this workshop includes a

heterogeneous group of participants, whereas other workshops were conducted in a similar group of participants – mostly the students at graduate and undergraduate medical levels, clinicians, research associates, and interns.<sup>[3,7,8,14]</sup> However, increase in knowledge after the workshop is similar in all the studies.

The limitation of this study was that we could not compare participant to participant data as many participants refrained from disclosing their identities, and the study was not planned for quantitative analysis. For a better quantitative evaluation to achieve the effectiveness and improvement in knowledge, scientific application and planning of studies are important. A study evaluated five research methodology workshops using Kirkpatrick's model to assess the knowledge gained and improvement in research skills. An improvement by 17.67% ( $P \leq 0.005$ ) in pre and post-MCQ test mean scores of relevant basic knowledge and cognitive skills was shown. Research methodology workshops promoted research culture and also encouraged participants to impart training at their workplaces; thus faculty development and scientific writings and publications improved.<sup>[16]</sup> The workshop was first of its kind we organized and the assessment tool validity and reliability, and a better tool for assessment of not only the change in knowledge but also the skills will be targeted in future studies.

Our study revealed that the medical professionals and students from the field of health care keep good interest in research methodology and research methodology workshops can play a significant role in teaching research to medical personnel as well in creating enhancement of knowledge among the participants. Assessment tools for studying the long-term effects of such workshops need to be developed to evaluate the results of educational workshops more scientifically.

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### Conflicts of interest

There are no conflicts of interest.

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## ANNEXURE 1

Please encircle the correct answer

1. PICOT is criteria for
  - a. Formulating research question
  - b. Planning RCT
  - c. Observational study
  - d. Case study
2. Consort guidelines are used for
  - a. Randomized control trial
  - b. Observational study
  - c. Case study
  - d. Systematic review
3. A good research question is innovative since it provides new findings and adequate technical expertise.
  - a. True
  - b. False
4. Which of the following variables is a continuous quantitative variable?
  - a. Favorite fruit
  - b. Gender
  - c. Occupation
  - d. Decade of birth
  - e. Age at first birth
5. If you have left-skewed data, which of the following will be true?
  - a. Mean > median
  - b. Mean  $\geq$  median
  - c. Median  $\geq$  mean
  - d. Median > mean
  - e. Mean = media
6. If you toss a six-sided die, what is the probability that you roll a 3 or less?
  - a. 1/6
  - b. 1/3
  - c. 1/2
  - d. 1/4
  - e. 5/6
7. If the null hypothesis is true (there is no effect), you cannot make a Type II error.
  - a. True
  - b. False
8. What is statistical power?
  - a. The probability of getting a statistically significant result when the null hypothesis is true
  - b. The probability of getting a statistically significant result when the null hypothesis is false.
  - c. The probability of getting a nonsignificant result when the null hypothesis is true.
  - d. The probability of getting a nonsignificant result when the null hypothesis is false.
9. A variable that is presumed to cause a change in another variable is called
  - a. Categorical variable

- b. Dependent variable
  - c. Independent variable
  - d. Intervening variable
10. Qualitative research is often exploratory and has all of the following characteristics except:
- a. It is typically used when a great deal is already known about the topic of interest
  - b. It relies on the collection of nonnumerical data such as words and pictures
  - c. It is used to generate hypotheses and develop theory about phenomena in the world
  - d. It uses the inductive scientific method
11. The strongest evidence for causality comes from which of the following research methods?
- a. Experimental
  - b. Causal-comparative
  - c. Correlational
  - d. Ethnography
12. When each member of a population has an equally likely chance of being selected, this is called:
- a. A nonrandom sampling method
  - b. A quota sample
  - c. A snowball sample
  - d. An equal-probability selection method
13. As a general rule, the \_\_\_\_\_ is the best measure of central tendency because it is more precise.
- a. Mean
  - b. Median
  - c. Mode
  - d. Range
14. What does it mean when you calculate a 95% confidence interval?
- a. The process you used will capture the true parameter 95% of the time in the long run
  - b. You can be “95% confident” that your interval will include the population parameter
  - c. You can be “5% confident” that your interval will not include the population parameter
  - d. All of the above statements are true
15. What is the standard deviation of a sampling distribution called?
- a. Sampling error
  - b. Sample error
  - c. Standard error
  - d. Simple error
16. \_\_\_\_\_ results if you fail to reject the null hypothesis when the null hypothesis is actually false.
- a. Type I error
  - b. Type II error
  - c. Type III error
  - d. Type IV error
17. A statistical test used to determine whether a correlation coefficient is statistically significant is called the \_\_\_\_\_
- a. One-way analysis of variance
  - b. *t*-test for independent samples
  - c. Chi-square test for contingency tables
  - d. *t*-test for correlation coefficients

18. This type of research tests hypotheses and theories to explain how and why a phenomenon operates as it does.
  - a. Descriptive research
  - b. Predictive research
  - c. Explanatory research
  - d. None of the above
  
19. Which of these is not a method of data collection?
  - a. Questionnaires
  - b. Interviews
  - c. Experiments
  - d. Observations
  
20. Which of the following terms best describes data that were originally collected at an earlier time by a different person for a different purpose?
  - a. Primary data
  - b. Secondary data
  - c. Experimental data
  - d. Field notes