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EVALUATION OF WORKSHOP ON BIOSTATISTICS AND RESEARCH METHODOLOGY: WE MUST KNOW FOR SUCCESSFUL RESEARCH PROTOCOLS

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ABSTRACT

Introduction: Competence in biostatistics and research methodology is essential for developing robust, fundable research protocols in biomedical sciences. Recognizing gaps in practical knowledge and application, the Department of Community Medicine, Government Medical College and Hospital (GMCH), Chandigarh, in collaboration with the Anusandhan National Research Foundation (ANRF)/SERB under the Department of Science and Technology, Government of India, organized a two-day workshop on *"Biostatistics and Research Methodology: We Must Know for Successful Research Protocols"* on February 7–8, 2025. This workshop aimed to strengthen research capacity by imparting theoretical and hands-on training. **Methodology:** A qualitative, questionnaire-based feedback evaluation was conducted among participants at the end of the workshop. The structured tool included both closed- and open-ended questions assessing workshop planning, content, pedagogy, and perceived utility. 70 registered participants (60 selected + 10 nominated faculty) attended, with 67 completing the feedback form. Sessions covered research design, topic selection, sample size calculation, statistical methods, data analysis using SPSS and SYSTAT, and interpretation of results. **Results:** Participants included faculty members, post graduates and undergraduate students predominantly from medical colleges. Most respondents (88–90%) agreed or strongly agreed that workshop objectives and content were relevant to their academic activities. Study material quality was rated acceptable by 86%, and 84% found the teaching methods engaging. 97% reported acquiring new skills, and 98.5% perceived improvement in their competence. Sample Size Calculation (61.2%), RCT Design (52.2%), and Statistical Fallacies (26.9%) were ranked as the top three topics. The majority (79.1%) suggested extending the duration to 3–7 days, with greater emphasis on hands-on training (37.3%) and interactive sessions (16.4%). **Conclusion:** The workshop effectively enhanced participants' knowledge and skills in biostatistics and research methodology, with significant implications for research, teaching, and academic training. Capacity-building initiatives of this nature are essential to strengthen biomedical research quality and protocol development in India. Such workshops are desired to strengthen skills and capacity building of medical professionals.

KEYWORDS: Biostatistics, Capacity Building, Medical Education, Research Methodology, Workshop Evaluation.

INTRODUCTION

The advancement of medical research hinges on the ability to design rigorous studies, analyze data accurately, and interpret results effectively. Acquiring novel insights to bridge prevailing lacunae presents an intellectual rigor, necessitating a profound grasp of the sequential paradigms of research—both conceptual and empirical—which is indispensable for excelling in the scientific domain.[1]

Biostatistics and research methodology serve as the backbone of evidence-based medicine, ensuring that clinical and public health policies are informed by scientifically validated research. Without a strong

foundation in these disciplines, researchers risk drawing erroneous conclusions, which can misguide medical practice and healthcare interventions. Therefore, cultivating expertise in biostatistics and research methodology is crucial for all medical professionals and researchers engaged in scientific inquiry.[2]

In recent years, the significance of structured training in biostatistics and research methods has gained recognition worldwide. A growing body of research highlights that educational interventions, such as workshops, significantly enhance participants' ability to apply statistical techniques, interpret findings, and critically evaluate scientific literature.[3]

These initiatives empower researchers with the necessary skills to formulate robust study designs, navigate ethical considerations, and employ appropriate statistical tools, leading to higher-quality research outcomes. In medical science, the ability to generate reliable and reproducible results depends on a well-planned research framework. A lack of proficiency in research methods can lead to biases, flawed analyses, and misleading conclusions, ultimately compromising the credibility of scientific discoveries. By equipping researchers with the skills to identify potential sources of bias and apply rigorous analytical techniques, training programs help mitigate these risks and ensure methodological soundness.[4]

Biostatistics plays a pivotal role in understanding disease patterns, evaluating treatment efficacy, and guiding policy decisions. Through statistical modeling, researchers can quantify relationships between variables, detect associations in clinical data, and make data-driven healthcare decisions.[1]

Research methodology encompasses study design principles, sampling strategies, data collection techniques, and ethical guidelines—each of which contributes to the integrity and reliability of research outcomes.[5]

Numerous studies have assessed the effectiveness of research methodology workshops in improving participants' statistical competence and attending structured biostatistics training exhibits significant improvements in understanding statistical concepts, including hypothesis testing, regression analysis, and sample size estimation. Furthermore, it helps to increase confidence in designing and conducting own research projects, demonstrating the real-world applicability of such training initiatives.[6]

Interactive teaching methodologies, such as hands-on exercises, software demonstrations, and case-based discussions, have been shown to enhance learning outcomes in biostatistics education. By incorporating these elements into workshops, institutions can create engaging learning environments that foster deeper comprehension and skill retention. Additionally, training programs that introduce participants to statistical software such as SPSS, R, and STATA further strengthen their analytical capabilities by providing practical experience with data analysis.[7]

A crucial component of research training is its emphasis on ethical considerations. Ethical research practices, including informed consent, confidentiality, and data integrity, form the foundation of responsible scientific inquiry. Educational interventions focused on research ethics significantly improve adherence to ethical guidelines, ensuring that studies are conducted with integrity and respect for human subjects.[8]

Despite the undeniable benefits of research methodology training, several challenges hinder its widespread adoption. Limited access to trained faculty, competing academic commitments, and a general perception of biostatistics as a difficult subject often deter medical students and professionals from actively engaging in statistical learning.[9]

Addressing these barriers requires an integrative approach that blends theoretical instruction with real-world applications, making biostatistics more accessible and relevant to clinical practice. The emergence of digital learning platforms offers a promising solution to expanding access to biostatistics education. Online courses and hybrid learning models provide flexibility, enabling a broader audience to acquire research skills at their own pace. Additionally, collaborations between medical institutions and research organizations can facilitate mentorship programs, fostering a culture of continuous learning and professional development.[10]

Biostatistics and research methodology training are fundamental to advancing medical science and improving healthcare outcomes. By equipping researchers with essential statistical knowledge and methodological expertise, structured training programs enable the production of high-quality research that informs clinical practice and public health policies. To maximize the impact of such initiatives, institutions must adopt innovative teaching methodologies, integrate research training into formal curricula, and leverage technology to enhance accessibility.

In line with this vision, the Department of Community Medicine at Government Medical College and Hospital (GMCH), Chandigarh, organized a workshop titled "Biostatistics and Research Methodology: We Must Know for Successful Research Protocols." This initiative provided participants with practical knowledge, hands-on training, and expert guidance, reinforcing the importance of methodological rigor in medical research. By continuing to invest in such educational programs, the medical community can foster a research-driven culture that advances scientific discovery and improves patient care.

METHODOLOGY

A qualitative, questionnaire-based feedback evaluation was conducted during a two-day research workshop titled **"Biostatistics and Research Methodology: We Must Know For Successful Research Protocols"** held on February 7–8, 2025, at Government Medical College and Hospital (GMCH), Chandigarh, India. The workshop was organized by the Department of Community Medicine, GMCH, in collaboration with the Anusandhan National Research Foundation (ANRF)/Science and Engineering Research Board (SERB), under the Department of Science and Technology, Government of India.

The primary aim of the workshop was to enhance the research skills of biomedical researchers by providing in-depth training in research methodology. It focused on equipping participants with the knowledge required to design fundable research projects and thesis protocols, guiding them in selecting appropriate research topics, study designs, and sample sizes, as well as managing data, applying statistical methods, and interpreting results. Additionally, the workshop provided hands-on training in sample size calculation and data analysis using SPSS and SYSTAT software.

To assess the effectiveness of the workshop, a structured feedback tool comprising both closed- and open-ended questions was administered to participants. This evaluation aimed to capture their experiences, insights, and immediate reflections on the workshop content. Open-ended questions were included to understand how participants intended to apply their newly acquired knowledge in their future research endeavors.

All 70 participants (there were limited seats for 60 participants + 10 nominee faculties) were informed in advance about the feedback collection process, which was conducted at the end of the final session on the second day. Resource persons provided PowerPoint presentations of their sessions after the workshop to serve as reference materials for further learning. The feedback process helped gauge the impact of the workshop and its practical relevance to the participants' research work.

RESULTS

The evaluative feedback of the Workshop convened encompassed assessment parameters such as workshop structuring, thematic pertinence, pedagogical methodologies, and overall participant contentment.

A total of 70 individuals took part in the workshop, representing diverse academic qualifications and institutional affiliations out of which 67 participants filled the form.

Table 1: Participant demographics.

Qualification	Number of Participants
MBBS	32
MD	13
BDS	3
MSc Nursing	5
MPH	6
PhD	3
Others	5

Institutional distribution delineated a predominance of medical college affiliates (42 participants), followed by individuals from alternative institutions (12), postgraduate students (10), and miscellaneous categories (3).

Table 2: Evaluation of Educational Programme: Part- A Planning.

	Strongly Disagree	Disagree	Agree	Strongly Agree
Evaluation Of Educational Programme				
1. Received precise information in advance on the aims of workshop	3 (4%)	5 (8%)	21 (32%)	37 (56%)
2.The goals of the workshop appeared to me to be of immediate interest for my academic activities	2 (3%)	5 (7%)	23 (35%)	36 (55%)
3. The content of the workshop dealt with issues I generally encounter in my academic assignments	3 (5%)	6 (10%)	25 (38%)	31 (47%)
4. Considering my other professional commitments, the workshop scheduling was appropriate	4 (6%)	5 (8%)	26 (40%)	30 (46%)
Utility Of Workshop Methods				
5. I found the study material provided of acceptable quality	3 (5%)	6 (9%)	24 (36%)	33 (50%)
6. Time was provided to seek clarification on issues included/discussed	5 (7%)	8 (12%)	20 (30%)	33 (51%)
7.The discussion/ teaching methods used during the workshop encouraged me to take an active interest in the session themes	4 (6%)	7 (10%)	25 (37%)	30 (47%)
Format Of Workshop				
8. The pace of presentation of the subject content	3 (4%)	5 (8%)	26 (40%)	31 (48%)

was appropriate				
9. The general atmosphere of the workshop was conducive to serious work	3 (5%)	6 (9%)	22 (34%)	34 (52%)
10. The organisers gave me opportunity for critical comments.	5 (7%)	7 (11%)	23 (35%)	31 (47%)
11.The organisers made use of any critical comments I made during the workshop	5 (8%)	8 (12%)	22 (33%)	31 (47%)

The evaluation of the educational program revealed that most participants had a positive experience. A majority (88%) agreed or strongly agreed that they received precise information about the workshop aims, while 90% found the goals relevant to their academic activities. Regarding content, 85% felt it addressed issues they commonly face, and 86% found the scheduling appropriate despite other professional commitments.

The utility of workshop methods was also well-rated, with 86% considering the study material of acceptable quality and 81% appreciating the opportunity for clarifications. The discussion methods were engaging for 84% of participants. In terms of format, 88% found the pace appropriate, and 86% believed the atmosphere was conducive to serious work. While 82% acknowledged opportunities for critical comments, 80% felt their feedback was utilized effectively by the organizers. [Table 2]

Table 3: Evaluation of Educational Programme: Gain In Knowledge and Skills.

Parameter	Number of Responses (n=67)	Percentage (%)
a) Were you already familiar with the problem, which has been dealt with in this training programme/workshop and in what way have you gained in the following areas?		
No prior knowledge	22	32.8%
Basic familiarity	15	22.4%
Some prior knowledge	30	44.8%
b) Have you attained new skills and will you be able to utilise them in your practice/profession/teaching field?		
Yes	65	97%
No	2	3%
c) In what way do you think it has improved your competence in managing such problems in future?		
Yes	66	98.5%
No	1	1.5%
Additional information		
a) Was theme of the workshop was appealing to you?		
Yes	66	98.5%
No	1	1.5%
b) Which were the topics of the presentation you rank top 3?		
Sample Size Calculation	41	61.2%
RCT Design	35	52.2%
Statistical Fallacies	18	26.9%
c) What additional topic areas should be included in the workshop of this nature?		
Hands-on Training	20	29.8%
Research Funding	7	10.4%
Systematic Reviews & Meta-analysis	5	7.5%
None	35	52.2%
d) What topics/subjects should be deleted or under-emphasized if this workshop is to be repeated in future?		
None	56	83.6%
Basic Biostatistics (already covered in MBBS)	8	11.9%
Repetitive Content	3	4.5%
e) Whether 1 day workshop is sufficient on this topic?		

Yes	14	20.9%
No, should be longer (3-7 days)	53	79.1%
f) Is one workshop/symposium on this subject sufficient or more workshops should be conducted?		
Yes	64	95.5%
No	3	4.5%
h) Would you like to suggest any improvements?		
More Hands-on Training	25	37.3%
Better Time Management	13	19.4%
More Interactive Sessions	11	16.4%
No improvements required	18	26.8%
i)What were the deficiencies in the planning, conduct, or any other academic/ organizational aspect of workshop		
No deficiencies	36	53.7%
Time Management Issues	15	22.4%
Some Sessions Rushed	9	13.4%
Lack of Interactive Components	7	10.4%
j) In what way, you will be able to utilise/ propagate further the ideas expressed in present workshop.		
Future Research & Thesis	50	74.6%
Teaching & Training Others	10	14.9%
Planning Further Workshops	7	10.5%

The workshop significantly enhanced participants' proficiency in biostatistics, with 97% acquiring new skills applicable to research and academia. While 32.8% had no prior knowledge, 98.5% acknowledged an improvement in their competence. Sample Size Calculation, RCT Design, and Statistical Fallacies emerged as the most valued topics. A majority (79.1%) deemed a one-day format inadequate, advocating for an extended 3–7 day structure with more hands-on training (37.3%) and interactive sessions (16.4%). Time management issues (22.4%) and rushed content (13.4%) were identified as areas for refinement. The acquired knowledge is expected to be instrumental in research (74.6%), teaching (14.9%), and organizing future workshops (10.5%), underscoring the need for continued capacity-building initiatives. [Table 3]

DISCUSSION

The evaluation of the recent biostatistics workshop, which included participants from diverse academic backgrounds, provides valuable insights into the effectiveness of such educational interventions in India. A notable 97% of participants reported acquiring new skills applicable to their professional activities, with 98.5% acknowledging an improvement in their competence. These findings align with previous studies, underscoring the positive impact of structured workshops on enhancing research capabilities among medical professionals. In a comparable study conducted in 2016, 75% of participants recognized the significance of biostatistics.[11]

Importance of such educational programmes for imparting knowledge of research are also highlighted in another study which highlights that training in statistical analysis helps medical students apply appropriate methods and enhancing their research skills. Proficiency in biostatistics enables independent data analysis, fostering confidence and improving research quality in advanced medical studies.[12]

Another study assessing a health research methodology workshop using the Kirkpatrick model demonstrated a significant improvement in participants' knowledge, with mean pre-workshop scores increasing from 9.27 to 16.18 post-workshop. Additionally, 66.7% of the students exhibited a 30% rise in their post-workshop scores, indicating the workshop's effectiveness in imparting essential research skills.[13]

Similarly, another study evaluated postgraduate medical trainees' understanding of biostatistics before and after a workshop. The results showed a significant improvement in correct responses, from 42.9% pre-workshop to 57% post-workshop, highlighting the workshop's role in enhancing biostatistical knowledge.[14]

In the current workshop, participants identified Sample Size Calculation, RCT Design, and Statistical Fallacies as the top three topics, with 79.1% suggesting an extension of the workshop duration to 3–7 days to allow for more in-depth coverage and hands-on training. This feedback is consistent with observations from other workshops, where participants expressed a desire for more comprehensive sessions and practical exercises to reinforce learning.[15]

In our study, 74.6% of participants expressed their willingness to apply and disseminate the concepts discussed in the current research methodology workshop

for future research and thesis work. A related study conducted in 2019 similarly reported that 90% of students were inclined toward conducting research.[2]

In our study, most participants were of the opinion that they would like to attend more workshops of longer duration to further enhance their knowledge and understanding regarding research methodology and protocol writing. This is in line with another study which highlights that workshops and training programs provide an effective way to introduce research concepts, improve knowledge, and enhance the performance of medical professionals.[16]

Multiple studies have demonstrated a knowledge surge among medical students following research methodology workshops or short-term training, aligning with our findings. However, our study included healthcare professionals alongside medical and nursing students. Similar research underscores the efficacy of participatory workshops in knowledge dissemination, though one study emphasizes the necessity of assessing their long-term impact.[17-18]

Time management and the inclusion of interactive components were highlighted as areas needing improvement in the current workshop. Addressing these aspects is crucial, as effective time allocation and interactive teaching methods have been shown to enhance participant engagement and knowledge retention in similar educational settings.

The positive outcomes of this workshop, coupled with participant feedback, underscore the importance of continuous refinement in the planning and execution of such educational programs. By incorporating more hands-on training and interactive sessions, future workshops can further enhance the research competencies of medical professionals in India.[1]

RECOMMENDATIONS

To enhance the effectiveness of future biostatistics workshops, it is recommended to extend the workshop duration to allow for comprehensive discussions on intricate concepts, ensuring participants gain a deeper understanding of complex statistical constructs. Incorporating experiential learning sessions that focus on practical applications, such as statistical modeling and research design, would facilitate hands-on engagement and reinforce theoretical knowledge. Additionally, to prevent cognitive overload, didactic sessions should be strategically segmented across multiple days, allowing participants adequate time to process and internalize the information. Furthermore, the inclusion of specialized themes, such as regression analytics and randomized controlled trial methodologies, would provide participants with advanced analytical skills crucial for robust research design and data interpretation. These measures collectively would enhance the overall learning experience and contribute to the development of proficient researchers.

CONCLUSION

The workshop on biostatistics and research methodology significantly enhanced participants' research skills, reinforcing the importance of methodological rigor in medical studies. With a strong emphasis on practical application, it empowered researchers with essential tools like sample size estimation, statistical modeling, and data interpretation. The overarching sentiment amongst participants was one of approbation, with substantial satisfaction reported concerning the thematic structuring, organizational logistics, and pedagogical strategies. The overwhelmingly positive feedback highlighted the need for extended duration, greater interactivity, and a balanced integration of theory and hands-on training. Implementing the recommended enhancements in subsequent iterations shall potentiate a more immersive and efficacious learning trajectory. By fostering a research-driven mindset, such initiatives play a crucial role in strengthening evidence-based medical practice, ultimately advancing scientific inquiry and improving patient care. Such workshops are desired to strengthen skills and capacity building of medical professionals.

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