Original Article

Effectiveness of delivering disability competencies to undergraduate medical students in a foundation course in a Government Medical College: A quasi-experimental study

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Abstract

Background & Objective: Globally, 16% of the world's population, or 1 in 6 of us, experience significant disability. Persons with Disabilities (PWDs) are likely to encounter insufficient healthcare provider skills to address their specific needs, to encounter denial of care, and to experience mistreatment from healthcare providers. In the diverse field of medicine, medical practitioners are often confronted with the challenge of providing equitable and effective healthcare to all patients, including those with disabilities.

Material & Methods: A quasi experimental study to evaluate the effectiveness of a need-based structured module on disability competencies with a pre-, post-, and retention post-test design. The study included 75 first year MBBS foundations students who completed the entire module. Data on knowledge regarding disability competencies was collected using a pre-test, an immediate post-test, and a retention post-test after 3 months of intervention. We used RMANOVA to compare the pretest, post-test, and 3-month retention post test scores at the 0.05 significance level.

Results: Totally, 45 (53.3%) boys and 35 (46.7%) girls participated in the study. Overall pretest scores was 10.92 ± 1.75 (95% CI: 10.54 – 11.30), which significantly increased to 19.24 ± 2.63 (95% CI: 18.66–19.82) ($p < 0.001$) following the course, and the scores were sustained at 18.67 ± 2.72 (95% CI: 18.07–19.27) even after 3 months following training. RMANOVA determined the increase in mean scores was statistically significant between assessment stages (pretest, post-test, and retention test) ($F (1.3, 95.5) = 460.69$, $p < 0.001$). The scores increased significantly across all domains of disability competency training ($p < 0.001$). A paired t test between scores shows a significant increase in scores across all domains between pre-test and post-test ($p < 0.001$); scores did not reduce significantly even after 3 months.

Conclusion: Training medical students in disability competencies using structured modules increased their knowledge significantly post-training, which was retained even after 3 months. Disability competency training is crucial to ensure equitable and inclusive healthcare, reduce healthcare disparities, and improve overall patient care outcomes.

Keywords: medical student, disability competency, medical curriculum, attitude, skill

Introduction

Globally, 16% of the world's population, or 1 in 6 of us, experience significant disability (1). India has 2.68 crore people who are disabled. According to the 2011 census, 20.3% of people with disabilities have movement disabilities, 18.8% have visual impairments, and 18.9% have hearing impairments (2, 3). People with disabilities usually face a lot of discrimination in their social and occupational lives. The healthcare requirements and healthcare-seeking behavior of persons with disabilities are distinct and characterized by a significantly higher prevalence of health issues than compared to the general population (4). According to the World Report on Disability, persons with disabilities are likely to encounter insufficient healthcare provider skills to

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address their specific needs, to face care denial, and to experience mistreatment from healthcare providers (5). In the diverse field of medicine, medical practitioners are often confronted with the challenge of providing equitable and effective healthcare to all patients, including those with disabilities. While individuals with disabilities constitute a substantial part of society, medical students often receive limited training regarding the specific health care needs and challenges of these individuals, reflecting a gap in the medical education system. In order to cater to these needs, many countries came up with innovative disability curricula, which was developed and published for use in various countries (6–10). The signing of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) marked the beginning of a revolutionary phase in India too. Activists and researchers in India recommended the inclusion of disability competencies in medical education to warrant students gaining the required competencies to care for people with disabilities (11). The National Medical Council (NMC) of India has introduced a new competency-based curriculum in place since August 2019, which includes disability competencies in the foundation course of the curriculum (12).

It is crucial to recognize the various diversities, like disability, at the beginning of medical education itself. Research suggests that specific educational interventions, such as early and regular interactions with persons with disabilities, have been shown to enhance medical students' understanding, attitudes, and abilities essential for providing care to this population and the skills necessary for caring for these people (13, 14). Through interactive teaching methodologies and sensitization, students and physicians can improve their understanding and competence regarding providing healthcare to persons with disabilities. By analyzing the benefits and potential limitations of integrating disability competencies into the foundational curriculum, this research aims to evaluate the effectiveness of delivering disability competencies to undergraduate medical students during their foundation course at a government medical college.

Though there are various studies globally implementing disability competencies among medical students, there is a need to measure the impact of implementation and also check if there is retention of imparted training (7). With this study, we intend to investigate the potential of this educational intervention to improve medical students' understanding, empathy, and preparedness towards providing healthcare for individuals with disabilities. It was felt that this pre-test and post-test analysis method will enhance the receptive capacity and understanding of 1st year MBBS students in understanding their role to eliminate discrimination in a healthcare setup.

Material & Methods

Design and setting(s)

This research utilized a quasi-experimental design to evaluate the effectiveness of a need-based structured module on disability competencies within a medical college context. The design was tailored to include a pre- and post-test evaluation without a control group, adopting a longitudinal prospective approach for data collection as shown in Figure 1. Our study population consisted of first-year MBBS students who had just embarked on their medical journey. Our inclusion criteria encompassed all first-year MBBS students who attended the complete foundation course on disability competencies. Students who could not attend the entire disability competency course on all three days were excluded from the study. ethi. To collect necessary data, we employed Google Forms-based questionnaires for pre-test, immediate post-test, and retention post-test evaluations after 3 months, providing an efficient, scalable, and flexible means of gathering essential information.

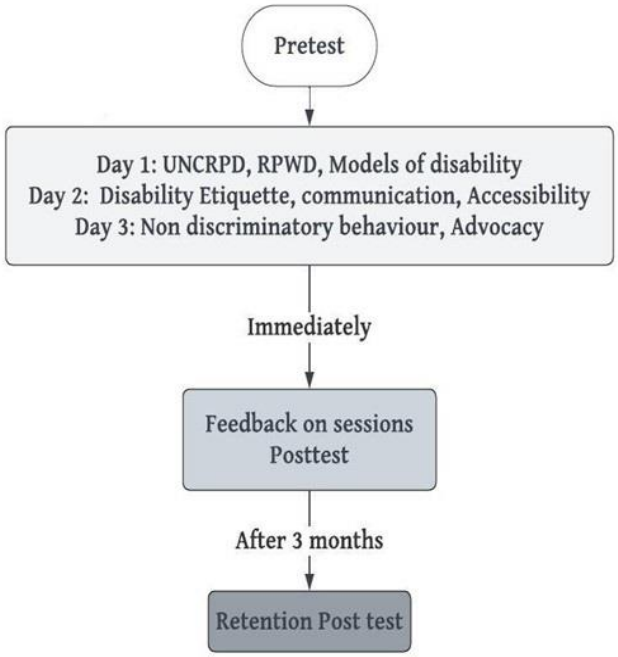

Figure1. Flow diagram of the study

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Participan ts and sampling

Sample size estimation: Assuming an effect size of intervention to be 0.15 for a one-way repeated measures ANOVA design with 3 measurements with a correlation among repeated measures of 0.5, a sample size of 73 students was required to achieve statistical power of 80% and 95% confidence levels using G Power software. An effect size of 0.15 was considered appropriate, as the changes or differences being measured are meaningful in the practical context of the research, even if they are statistically small. A total of 75 students were enrolled in the study.

Sampling Technique: Convenience sampling: All students in the first year who consented to participate were included.

Tools/Instruments

The Educational Intervention: The educational intervention took place in the medical college in December 2022. It comprised 7 hours of teaching and learning activities, as seen in Table 1, spread over 3 days. A pretest consisting of 25 questions covering topics on disability laws and their rights, models of disability, inclusive behavior, which included disability etiquette, verbal and non-verbal communication, non-discriminatory behavior, and accessibility, was administered. Students were assessed with a validated questionnaire containing 25 questions before, immediately after, and after 3 months of completing the curriculum. The questionnaire was face validated by two experts in MEU. The questionnaire was piloted on 10 students, and all items scored a Cronbach's alpha of more than 0.7. Questions were designed at different levels to test participants at multiple levels within Bloom's taxonomy of educational objectives. Integrating different levels of Bloom's Taxonomy into the questionnaire included basic knowledge of UNCRPD and RPWD, accessibility to higher-order thinking skills like identifying appropriate models, disability etiquette, and attitudinal questions on communication and non-discriminatory behavior. This approach aligns with educational goals and effectively measures the intervention's impact on students' understanding and application of key concepts in disability and inclusivity. It fosters not just knowledge acquisition but also critical thinking and problem-solving skills crucial in medical education.

Table 1. Lesson plan of curriculum to implement disability curriculum among medical students

Disability Competency	Domain and level	Teaching learning method	Duration
1. Describe disability as per UNCRPD, demonstrating respect for the differences and capacities of persons with disabilities as part of human diversity and humanity. 2. Demonstrate awareness of the disabilities included in the RPWD Act, 2016	Knows & Knows How	Interactive Lecture**,** Doctors Narratives of Treating PWD, Self-directed learning on Rights of persons with disability in India	Day 1 120 min
3. Compare and contrast medical and social model of disability.	Knows & Knows How	Interactive Lecture, Buzz Groups and exercises	
4. Build an understanding on the disability etiquettes with PWDs 5. Demonstrate the use of verbal and non-verbal empathetic communication techniques while communicating with PWDs	Shows/Attitude & Shows How	Role Play, interactive lecture followed by Small Group Discussions with PWDs, Doctors with disabilities and caregivers	Day 2 120 min
6. Understanding of accessible healthcare settings for patients with disabilities, including Universal design.	Knows/ Knows How	Interactive Lecture & field visit of campus for surveying accessibility checklist by students.	
7. Demonstrate a non-discriminatory behaviour towards patients or caregivers with disabilities	Attitude & Shows How	Forum theatre for the oppressed Classroom Session	Day 3 180 min
8. Advocate social inclusion by raising awareness of the human rights of persons with disabilities.	Knows/ Knows How	interactive talk by disability social activist running an NGO Poster display on social inclusion by students	

Abbreviations: UNCRPD, united nations convention on the rights of persons with disabilities; RPWD Act, rights of persons with disabilities act, 2016; PWD, persons with disabilities; NGO, non-governmental organization

Data collection methods

First year MBBS students were included in the study. Consent for participation in the study was obtained. A pretest was conducted among the students using Google Forms. A three-day, seven-hour intervention package was delivered to all students. An immediate post test was conducted, followed by a retention post-test at the end of 3 months using the same Google Form. Feedback from all the sessions was taken from the students.

Data analysis

We used repeated measures one way Analysis Of Variance (ANOVA) to compare the pretest, post-test, and 3-month retention post test scores of the subjects for whom all data points were available, with the

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computation of appropriate contrasts. Paired t tests were used to calculate intervention effects between any two assessments. Intergroup comparisons of compliance and expectancy measures were done with standard t tests. Data were screened for the assumptions of multivariate analysis like normality, sphericity, homogeneity of variances, and no multicollinearity, and both data sets met these assumptions. All analyses are carried out at a 0.05 significant level.

Results

Totally 75 students participated in training on disability competencies; 45 (53.3%) of them were males and 35 (46.7%) were females. As seen in Table 2, the overall pretest scores was 10.92 ± 1.75, which significantly increased to 19.24 ± 2.63 following the course, and the scores were sustained at 18.67 ± 2.72 even after 3 months following training. Scores among males were slightly higher in the pretest and post-test, and in retention post-test, females scored slightly higher; however, no statistically significant difference was observed.

Figure 2 shows the mean scores of the participants, question wise. The average scores generally increased from the pre-test to the post-test, indicating that the educational intervention may have had a positive effect on the students' knowledge or skills regarding the tested material.

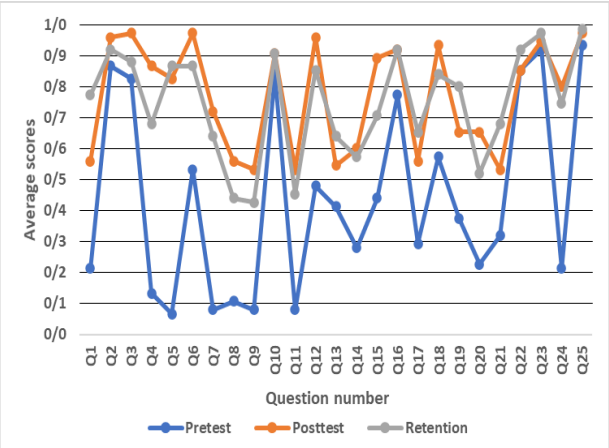

Figure2. Mean score of the participants question wise

The retention test scores, taken three months after the intervention, show that for most questions, students retained much of the information, although there is some variability and a slight drop in scores compared to the post-test. Some questions (such as Q9, Q19, and Q22) have a notable drop in average scores in the retention test compared to the posttest, which could indicate areas where the retention of knowledge or skills is less durable over time.

Pre-test knowledge of a few questions was already high for a few questions (Q2, Q3, Q10, Q23, and Q25).

Table 3 shows repeated ANOVA testing on various domain test scores and overall scores. A repeated measure ANOVA with a Greenhouse-Geisser correction determined the mean scores have been statistically significant between assessment stages (pre-test, post-test, and retention test) ($F(1.3, 95.5) = 460.69$, $p < 0.001$). The questions were classified under various domains based on the topics covered, like disability rights, disability models, inclusive behavior, and accessibility. There was also a significant difference in scores for each domain across the time line observed, implying that the educational intervention was effective across the various disability categories.

Table 4 shows a post hoc pairwise analysis of the mean difference in the participant scores using a paired t-test. There was a significant improvement in scores between pre-test and post-test of overall competencies with a mean and 95% CI of -8.32 (-8.69, -7.95); a similar significant difference was observed between pre-test and retention post-test scores of -7.75 (-8.36, -7.14); and there was a slight decrease in the retention post-test scores compared to post-test scores of 0.57 (0.39, 0.15); however, this drop was not statistically significant. There was a significant difference across all domains between pre-test and post-test, as well as between pretest and retention post test scores. However, except for the disability model's domain, there was no significant difference between post-test and retention post test scores.

Table 2. Distribution of scores among study participants

Scores	Males	Females	Total
	Mean ± SD (95%CI)	Mean ± SD (95%CI)	Mean ± SD (95%CI)
Pre-test	11.12 ± 1.87 (10.57- 11.67)	10.69 ± 1.60 (10.16- 11.22)	10.92 ± 1.75 (10.54-11.30)
Post-test	19.3 ± 2.59 (18.54- 20.06)	19.17 ± 2.71 (18.27- 20.07)	19.24 ± 2.63 (18.66- 19.82)
Retention-test	18.35 ± 2.91 (17.50- 19.20)	19.03 ± 2.47 (18.21- 19.85)	18.67 ± 2.72 (18.07- 19.27)

Abbreviations: S.D, standard deviation; 95%CI, 95% confidence interval

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Table 3. Repeated ANOVA testing on various domain test scores and overall scores

Domains	Pretest	Post test	Retention post test	F value	p value	partial eta squared
	Mean ± SD (95%CI)	Mean ± SD (95%CI)	Mean ± SD (95%CI)			
Overall	10.92 ± 1.75 (10.54-11.30)	19.24 ± 2.63 (18.66-19.82)	18.67 ± 2.72 (18.07-19.27)	F (1.3, 95.5) = 460.69	<0.001	0.86
Disability Rights	3.52 ± 1.18 (3.26-3.78)	5.49 ± 1.06 (5.26-5.72)	5.35 ± 0.97 (5.14-5.56)	F (2, 148) = 89.83	<0.001	0.55
Disability Models	1.92 ± 0.46 (1.82-2.02)	5.92 ± 1.26 (5.64- 6.20)	5.28 ± 1.45 (4.96-5.60)	F (1.8, 133.8) = 303.48	<0.001	0.8
Inclusive behaviour	3.41 ± 1.14 (3.16-3.66)	5.11 ± 1.46 (4.79-5.43)	5.33 ± 1.33 (5.04-5.62)	F (2,148) = 70.41	<0.001	0.49
Accessibility	2.89 ± 0.63 (2.75-3.03)	3.69 ± 0.64 (3.55-3.83)	3.59 ± 0.70 (3.44-3.74)	F (2,148) = 14.15	<0.001	0.32

Note: Repeated measures ANOVA was conducted to analyze the changes in test scores across different time points for various domains and overall scores.
Abbreviations: F, F-value of ANOVA test; p, probability-value of ANOVA test; SD, standard deviation; 95%CI, 95% confidence interval.

Table 4. Post hoc pairwise analysis of the mean difference

Domains	1 and 2	1 and 3	2 and 3
	Mean difference (95%CI)	Mean difference (95%CI)	Mean difference (95%CI)
Overall	-8.32 (-8.69, -7.95) *	-7.75 (-8.36, -7.14) *	0.57 (0.39, 0.15)
Disability Rights	-1.97 (-2.27, -1.68) *	-1.83 (-2.18, -1.48) *	0.15 (-0.19, 0.48)
Disability Models	-4.0 (-4.30, -3.70) *	-3.36 (-3.71, -3.01) *	0.64 (0.24, 1.03) *
Inclusive behaviour	-1.69 (-2.01, -1.37) *	-1.92 (-2.26, -1.58) *	-0.23 (-0.62, 0.16)
Accessibility	-0.80 (-0.99, -0.61) *	-0.69 (-0.91, -0.48) *	0.11 (-0.32, 0.11)

Notes: Post hoc pairwise analysis was conducted to compare the mean difference between different domains. 95% confidence intervals (95%CI) are presented for each mean difference. Significance denoted as: * $p < 0.05$.
Abbreviations: 1, pretest; 2, post-test; 3, retention post-test.

Discussion

The findings from our study underscore the importance and efficacy of integrating disability competency training into the foundational course of medical education. Our results indicate a notable increase in disability competency among the medical students after the implementation of the structured module. Prior to the intervention, the total mean pretest score was 10.92 ± 1.75, which is 43.7% of the maximum score. This figure highlights a relatively low baseline level of disability competency among medical students. Following the implementation of the training, there was an improvement of 28.9% in the competency level over a period of 3 months.

Cultural competence is crucial for physicians to understand and meet the diverse needs of individuals with disabilities, addressing healthcare disparities in countries like India. Shifting from a medical model to a social one helps healthcare providers foster more patient-centered, accessible, and inclusive care for disabled individuals. Competency in disability requires understanding and including diverse identities and needs, particularly in psychological practice. Training healthcare students in disability content through a cultural competency framework is key to resolving health disparities faced by disabled people.

These results align with the findings of similar studies conducted in the field. For example, a study by Lee et al. (15) on disability education also reported positive outcomes from disability competency training. Their pre- and post-test scores indicated significant improvement in the student's understanding of disability issues, thereby advocating for such an integration into the medical education curriculum.

Similarly, Gallego-Ortega, J.L., and Rodríguez-Fuente (16) found that teaching disability studies as part of the medical curriculum positively affected students' attitudes towards disability, resulting in enhanced patient care. The positive shift in attitude is comparable to our findings and emphasizes the role of such interventions in molding empathetic and competent healthcare professionals.

Symons et al. (7) evaluated the longitudinal disability curriculum among medical students using a controlled design. The survey is administered at the beginning and end of the curriculum to assess changes in attitudes and perceived preparedness through attitudinal surveys, reflective pieces, and performance evaluations. The author says there was a positive impact, leading to a reduction in stereotypes and prejudices, as well as the

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importance of treating them with equal care and respect, which echoes our results.

Dambal et al. (2) implemented disability competencies among medical students as a part of a foundation course in India. This was evaluated by the satisfaction score, which is graded reflections and feedback from students and teachers. Students and teachers gave a satisfaction score of 7.78 and 9.46 on a maximum score of 10, respectively.

Ioerger et al. (17) conducted a systematic review to explore the literature on disability education and effective strategies for teaching medical students about disability. They found that the overall quality of scientific literature was low, and evaluation methods were insufficient to identify specific effective educational interventions and follow up changes.

Healthcare professionals are shifting from sympathy to empathy, enhancing trust and communication with patients with disabilities. They now recognize the individuality of each patient, leading to personalized care and respect for patient autonomy. A holistic care approach is being adopted, considering the physical, emotional, and social aspects of disability for better outcomes. Collaborative decision-making between patients and providers is becoming more common, ensuring treatments align with patient needs and preferences. These attitudinal changes reduce stigma, improve healthcare access and quality, and foster continuous learning and policy improvements.

Competencies for health care Students that align with the health needs of people across the full range of disabilities are therefore necessary to ensure that learners have the capabilities necessary to provide high-quality care to patients with disabilities.

While our study and others demonstrate promising results, it is also crucial to recognize the continuing need for such interventions. The low baseline competency level found in our study reveals a significant gap in the existing medical education system. To sustain disability competency training effects, continuous education, mentorship, and integrating training into policies and standards are vital, along with regular feedback, research, recognition, and fostering an organizational culture of inclusivity and continuous improvement. Future studies could further examine the long-term effects of such training and the potential benefits of integrating it into later stages of medical education.

The study employs a quasi-experimental design with pre- and post-tests to effectively assess the impact of disability competency training on first-year MBBS students, addressing a significant gap in medical education. Its longitudinal approach, including a retention test after three months, offers valuable insights into the long-term benefits of such training. Specifically tailored to India's context, it addresses critical needs in low socio-economic settings, ensuring cultural relevance and optimizing resources in environments where disability is more prevalent.

The disadvantages are that the study's generalizability is limited due to varying teaching methods and student demographics across different medical colleges, and the absence of a control group could lead to an overestimation of the educational intervention's impact. Implementing the training modules requires significant resources and time, presenting challenges in retention and practical application in clinical settings, especially in low-income countries with resource and infrastructure constraints. Additionally, the standardized nature of the curriculum risks oversimplifying complex disability issues, and the variability in healthcare systems further limits the applicability of the findings in diverse settings. The study faces limitations like self-selection and response biases due to its reliance on participants who completed the full course and used questionnaires, potentially skewing results towards expected responses. Its sample size, while statistically adequate, lacks broad generalizability and diversity, potentially limiting its applicability across different populations. Additionally, the unique resource constraints and varied disability needs in low socio-economic countries pose challenges to the study's replication and relevance to diverse disability types.

To enhance future research in disability competency training, it's crucial to implement a control group for more rigorous outcome comparisons and extend longitudinal follow-ups to assess long-term retention and practical application in clinical settings. Expanding the study's sample size and diversity will improve generalizability, while integrating qualitative methods and clinical practice components will offer deeper insights and real-world relevance. Additionally, focusing on adapting interventions to local contexts and developing affordable, scalable solutions can significantly benefit low socio-economic settings, ensuring the training is both effective and sustainable.

Conclusion

The disability competency training in the foundation course of our study has successfully increased the competency level among medical students. It

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corroborates the assertion made by previous studies about the need for disability competency training in medical education. The findings of this study provide a strong rationale for the implementation of similar programs across other medical colleges to better prepare future doctors for the diverse needs of their patients.

Ethical considerations

We obtained ethical approval from the Institutional Ethics Review Board (IRB) of ESIC Medical College & Postgraduate Institute of Medical Science & Research and also received permission from the respective authorities with reference no. 532/L/11/12/Ethics/ESIC-MC & PGIMSR/Estt.Vol.IV dated 03.06.2022. The title of the study was "Implementing disability competencies among graduate medical students in foundation course in a government medical college". We ensured that we followed all ethical principles and guidelines throughout the course of the study.

Artificial intelligence utilization for article writing

We have adhered to the ethical principles and guidelines of using artificial intelligence for manuscript writing.

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Conflict of interest statement

The authors declare no conflict of interest.

Author contributions

Dr. Deepthi R involved in conceptualization, implementation, and analysis; Dr. Shivakumar Ajay Kumar involved in conceptualization, implementation, and manuscript writing; Dr. Anuradha Shenoy involved in conceptualization, implementation, and manuscript writing; and Dr. Suthanthira Kannan involved in conceptualization, analysis, and manuscript writing.

Supporting resources

We have not received any funding for research.

Data availability statement

Data can be made available on request to the corresponding email address.

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