RESEARCH PAPER

Enhancing Nursing Knowledge: Evaluating the Impact of a Structured Teaching Program on Fecal Microbiota Transplant Awareness in Navi Mumbai Colleges

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Abstract

Clostridioides difficile infection (CDI) and other gastrointestinal disorders pose significant healthcare challenges globally, with rising incidence and recurrence rates highlighting the need for effective interventions such as fecal microbiota transplantation (FMT). This study aimed to evaluate the effectiveness of a structured teaching programme on knowledge regarding FMT among nursing students in selected colleges of Navi Mumbai. A quantitative, pre-experimental one-group pre-test and post-test design was employed, with 127 second-year BSc Nursing students selected through non-probability convenience sampling. Data were collected using a structured self-administered questionnaire comprising sociodemographic characteristics and 20 knowledge-based items. Pre-test assessment was conducted, followed by a structured teaching session and a post-test after seven days. Reliability of the tool was confirmed using test–retest methodology ($r = 0.9$), and content validity was established through expert review. Findings revealed that prior to the intervention, the majority of students had average knowledge (67.72%), with fewer demonstrating good (17.32%) or poor knowledge (14.96%). Post-intervention results showed substantial improvement, with 52.29% attaining good knowledge, 8.26% achieving excellent knowledge, and a marked reduction in poor knowledge (3.67%). Statistical analysis using paired‘t’ test indicated a significant increase in post-test scores (mean pre-test = 7.84, post-test = 11.42; $t = 9.42$, $p < 0.0001$). No significant association was observed between baseline knowledge and demographic variables. The study demonstrates that structured educational interventions effectively enhance nursing students’ understanding of FMT, highlighting the importance of integrating microbiota-based therapies into nursing curricula. These findings suggest that improved awareness among future nurses can enhance patient education, clinical care, and implementation of FMT. Further research with larger, diverse populations is recommended to reinforce these findings and promote the integration of FMT knowledge into clinical practice.

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Introduction

Clostridioides difficile infection (CDI) is one of the most common healthcare-associated gastrointestinal infections worldwide. The incidence of CDI has increased significantly over the past few decades, contributing to substantial morbidity and healthcare burden. In the United States, CDI affects hundreds of thousands of individuals’ annually[1]. Recurrence after initial antibiotic therapy occurs in approximately 20–30% of patients. The risk of recurrence increases further with each subsequent episode. Antibiotic-associated diarrhea is also a frequent complication of antimicrobial use, particularly in hospitalized patients. Irritable bowel

syndrome affects nearly 10–15% of the global population. Inflammatory bowel diseases, including Crohn's disease and ulcerative colitis, affect millions worldwide with rising incidence trends. Gastrointestinal infections remain more prevalent in resource-limited settings due to sanitation challenges. Emerging evidence links gut microbiota imbalance to metabolic disorders such as obesity. These trends highlight the growing importance of microbiota-based therapies such as fecal microbiota transplantation (FMT)[2].

Fecal microbiota transplantation (FMT) involves transferring processed stool from a healthy donor into the gastrointestinal tract of a recipient to restore microbial balance. Clinical trials have demonstrated cure rates exceeding 80% in recurrent CDI following FMT. The therapeutic benefit is attributed to restoration of disrupted gut microbial diversity[3]. It is primarily recommended for patients with recurrent or refractory CDI who fail to respond to standard antibiotic therapy. FMT has transitioned from an experimental therapy to a guideline-supported treatment for recurrent CDI. Beyond CDI, FMT is being investigated for conditions such as irritable bowel syndrome and inflammatory bowel disease. The decision to pursue FMT depends on recurrence pattern and response to conventional treatment. Stool banks play a critical role in standardized donor screening and stool processing. Strict safety protocols are followed to reduce the risk of pathogen transmission. Regulatory frameworks continue to evolve to ensure safe clinical application. Ongoing research is exploring long-term safety and expanded indications for FMT[4].

The earliest documented use of fecal therapy dates back to fourth-century China, where Ge Hong described the administration of "yellow soup" for severe diarrhea[5]. In modern medicine, structured stool banking has improved the safety and accessibility of FMT. The world's first microbiota super donor stool bank was established in 2017 by Microbioma. Another major non-profit stool bank, OpenBiome, has processed thousands of stool donations into FMT preparations. In Australia, BiomeBank was founded with support from the Hospital Research Foundation. In India, the first stool bank was established at Lisie Hospital in Kochi. These developments reflect the global expansion of organized stool banking systems. Standardized donor screening and centralized processing have enhanced quality control. International collaboration continues to refine regulatory guidelines for FMT practice. Stool banks are expected to play an increasingly important role in microbiome-based therapeutics[6].

A cross-sectional questionnaire study conducted by Xia Wu, Min Dai, Heena Buch, et al. assessed the recognition and attitudes of postgraduate medical students toward fecal microbiota transplantation (FMT). The study targeted first-year Chinese postgraduate medical students from six major medical universities: Nanjing Medical University, Nanchang University, Guangxi Medical University, Hubei University of Chinese Medicine, Ningxia Medical University, and West China College of Medicine. A total of 2,113 students completed a self-administered questionnaire comprising 16 structured questions. The data were analyzed using simple descriptive statistical methods to evaluate levels of awareness and perception. Findings revealed that the majority of participants had limited knowledge regarding the indications, procedures, and clinical efficacy of FMT. Although some students had heard of the therapy, in-depth understanding was lacking. Attitudes toward FMT were generally cautious and influenced by insufficient exposure during medical training. The study emphasized that formal education on microbiota-based therapies remains inadequate in postgraduate curricula. The authors concluded that FMT-related knowledge should be strengthened within medical education to prepare future clinicians for evolving therapeutic practices[7].

A quantitative systematic review by Yanghua Liu, Kal Alnababtah, Simon Cook, and Ying Yu evaluated healthcare providers' perceptions of FMT in the management of Clostridioides difficile infection and inflammatory bowel disease. The researchers systematically searched five electronic databases—CINAHL, MEDLINE, Cochrane Library, Scopus, and Web of Science—along with grey literature up to May 14, 2021. Thirteen cross-sectional studies involving 4,110 validated questionnaire responses were included in the final analysis. The methodological quality of the selected studies was assessed using the Institute for Public Health Sciences cross-sectional studies appraisal tool. Results were synthesized narratively due to heterogeneity among studies. The review demonstrated that awareness and detailed knowledge of FMT among healthcare professionals were generally suboptimal. Educational interventions were identified as effective strategies to enhance understanding and acceptance of the procedure. The likelihood of recommending FMT increased significantly with improved knowledge and clinical

familiarity. The authors concluded that strengthening professional education and demonstrating clinical efficacy are essential to improve advocacy and implementation of FMT in clinical practice[8].

Another study conducted by N. Benech, C. Fidyk, P. Varriale, and H. Sokol investigated patient knowledge of gut microbiota and the acceptability of FMT among individuals with chronic diseases. The research included participants from the Carenity online French patient community between October 8, 2018, and January 25, 2019. Demographic characteristics, primary disease type and duration, treatment history, and dietary habits were systematically collected. Targeted questions were used to evaluate awareness of probiotics, understanding of gut microbiota, and attitudes toward FMT. The findings indicated that overall knowledge of gut microbiota among patients remained limited. Acceptance of FMT varied depending on disease severity and perceived treatment benefits. Patients with greater awareness of microbiota concepts were more likely to consider FMT as a therapeutic option. However, misconceptions and insufficient information reduced overall acceptability. The authors concluded that improving patient education regarding gut microbiota could enhance informed decision-making and increase acceptance of FMT in chronic disease management[9].

From the above studies it can be clearly seen that the health care professionals, nursing students as well as patients are having very minimal knowledge about the fecal micro biota transplantation. Since nurses the main pillar of the health care system and she/he is there with the patient all the time, it can be easy for patient also to get the information. Nursing students are the future of the country and hence targeting the future upcoming nurses, this study aims at increasing the knowledge of the future nurses about the fecal micro biota transplantation which will also help in the evolution of this treatment in the clinical practices.

Materials and Methods

This study adopted a quantitative research approach using a pre-experimental one-group pre-test and post-test design to evaluate the effectiveness of a structured teaching programme on knowledge regarding fecal microbiota transplantation. The target population comprised nursing students from selected nursing colleges in Navi Mumbai, while the accessible population included those present during the period of data collection. A total of 127 second-year BSc Nursing students who met the inclusion criteria were selected using a non-probability convenience sampling technique. The sample size was calculated based on a 95% confidence level, 5% precision, an estimated proportion of 0.2, and a population size of 260. Inclusion criteria consisted of second year BSc Nursing students, whereas PBBSc and MSc Nursing students and those previously exposed to teaching sessions on FMT were excluded. The independent variable was the structured teaching programme, and the dependent variable was the knowledge. Data were collected using a structured self-administered questionnaire. The tool consisted of two sections: sociodemographic characteristics and structured knowledge questionnaire. Pre-test assessment was conducted prior to the intervention, followed by administration of the structured teaching programme, and a post-test was conducted seven days later.

Content validity of the tool and teaching programme was established through expert review by seven subject specialists, and necessary modifications were incorporated based on their suggestions. Reliability of the questionnaire was assessed using the test–retest method among 20 nursing students from the same institution, yielding a reliability coefficient of 0.9, indicating high consistency. Ethical approval was obtained from the institutional scientific committee prior to data collection. Formal permission was secured from the respective nursing colleges before initiating the study. The pilot intervention included a pre-test, structured teaching session, and post-test conducted after seven days, confirming the practicability of the study design. Data collection for the main study followed the same procedure as the pilot study.

Results

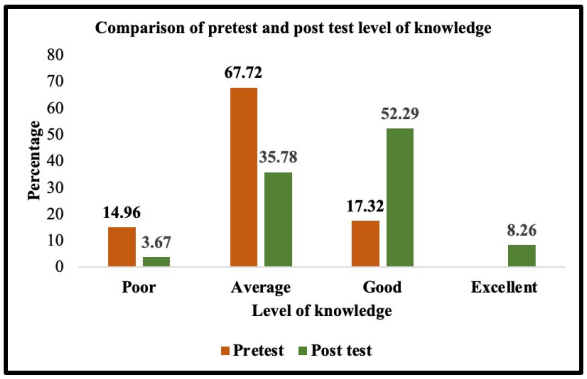
The study findings were systematically organized into four main sections for clarity and interpretation. Section I describes the frequency and percentage distribution of the sample according to selected demographic variables. Section II presents the assessment of pre-test and post-test knowledge regarding fecal microbiota transplantation among students of selected nursing colleges in Navi Mumbai. Section III evaluates the effectiveness of the structured teaching programme by comparing pre-test and post-test knowledge scores. Section IV examines the association between knowledge scores and selected demographic variables to determine any statistically significant relationships.

The distribution of the sample according to demographic variables showed that 5.5% of students

were 18 years old, 32.28% were 19 years old, 41.73% were 20 years old, 15.74% were 21 years old, and 4.72% were 22 years old. Regarding gender, 16.5% of the students were male and 83.46% were female. In terms of residence, 42.52% of students were from Navi Mumbai, while 58.48% were from areas outside Navi Mumbai. With respect to religion, the majority of students, 66.93%, identified as Hindu, followed by 11.81% Muslim, 13.38% Christian, 3.15% Buddhist, and 4.72% Sikh.

The analysis of students' knowledge regarding fecal microbiota transplantation revealed that, before the intervention, 14.96% of students had poor knowledge, 67.72% had average knowledge, and 17.32% demonstrated good knowledge. Following the structured teaching programme, there was a notable improvement in knowledge levels, with 3.67% of students remaining in the poor knowledge category, 35.78% having average knowledge, 52.29% achieving good knowledge, and 8.26% demonstrating excellent knowledge. These findings indicate that the teaching intervention effectively enhanced students' understanding of fecal microbiota transplantation, shifting the majority from average to good and excellent knowledge levels.

Figure 1: Assess the knowledge regarding fecal microbiota transplant of pre and posttest among the students



There was a 14.17% reduction in the sample size for the post-test, with 127 students participating in the pre-test and 109 in the post-test. The analysis indicated that the mean pre-test knowledge score was 7.84, which increased to 11.42 in the post-test. A paired 't' test was conducted to evaluate the significance of this change, yielding a calculated 't' value of 9.42, which exceeds the critical tabulated value. The associated p-value was <0.0001, indicating a statistically significant improvement. These results demonstrate that the structured teaching programme was effective in enhancing the knowledge of students regarding fecal microbiota transplantation, confirming a marked increase in post-test knowledge scores.

Table 1: Comparison between pretest and posttest knowledge score

n=127/109

Group	Mean	S.D	't' value
Pretest	7.84	2.39	9.42
Post test	11.42	3.07	

The analysis revealed that the p-value for the association between pre-interventional knowledge scores and demographic variables such as age, gender, area of residence, and religion was greater than 0.05. This indicates that there was no statistically significant relationship between these demographic factors and the students' baseline knowledge regarding fecal microbiota transplantation. In other words, knowledge levels prior to the structured teaching programme were independent of age, gender, residential area, or religious affiliation, suggesting that these variables did not influence the initial understanding of the topic among the nursing students.

Table 2: Association between pre-interventional knowledge score with selected demographic variables

n=127

Demographic Variable		Poor	Average	Good	Excellent	Chi-Square Value	P-Value	Significance
Age	18	1	4	2	0	9.78	0.28	NS
	19	9	28	4	0			
	20	9	33	11	0			
	21	1	18	3	0			
	22	1	1	2	0			
Gender	Male	1	15	5	0	2.21	0.33	NS
	Female	17	72	17	0			

Area	Navi Mumbai	8	37	9	0	0.03	0.98	NS
	Out of Navi Mumbai	11	49	13	0			
Religion	Hindu	14	59	12	0	6.84	0.55	NS
	Muslim	1	10	4	0			
	Christian	3	11	3	0			
	Buddhist	1	1	2	0			
	Sikh	1	3	2	0			

Discussion

In 2021, Amal G. B. conducted an observational cross-sectional study among 300 Jordanian healthcare professionals to assess their knowledge, attitudes, and perceptions of ethical and social issues surrounding FMT. The study found that a substantial proportion of participants perceived the safety and efficacy of FMT as limited, with many reporting reluctance to perform it due to ethical, legal, and infection-related concerns. Most practitioners preferred performing FMT via the lower gastrointestinal tract and emphasized patient confidentiality through measures such as double-blinding. Cultural and religious factors, including donor religion and dietary practices, were also significant considerations affecting the decision to use FMT. Overall, healthcare professionals demonstrated cautious attitudes toward FMT, showing willingness to consider it primarily after failure of conventional treatments[10].

Petru M. (2019) surveyed third-year medical students not previously exposed to formal FMT education to evaluate their knowledge, beliefs, and attitudes. Among the respondents, only a minority reported moderate knowledge of FMT, yet most recognized Clostridioides difficile infection as the primary indication and considered FMT a promising therapy for multiple conditions. While almost all students would recommend FMT to patients, many preferred to explore other treatment options first, and colonoscopy was identified as the preferred delivery method. Concerns included the potential transmission of diseases through donor stool and the need for further research before clinical implementation. The study highlighted that students possess baseline awareness but require more structured education regarding FMT indications and safety[11].

In 2019, Xia W. explored the recognition and attitudes of first-year Chinese postgraduate medical students toward FMT across six medical universities. Nearly half of the students were unaware of FMT prior to the survey, and higher recognition was associated with greater willingness to donate stool or receive FMT. Major barriers to supporting FMT included limited clinical evidence, immature technology, and insufficient analysis of patient willingness and cost-effectiveness. Conversely, life-saving potential, low cost, and convenient delivery methods were cited as motivating factors for support. The study concluded that postgraduate medical education should emphasize FMT to improve awareness and acceptance among future clinicians[12].

Mehmet Y. (2019) reviewed the clinical application of FMT, particularly in the treatment of recurrent and refractory Clostridioides difficile infection and its emerging role in inflammatory bowel disease (IBD). Although randomized controlled trials and observational studies support FMT's therapeutic potential, significant gaps remain regarding optimal preparation, administration techniques, and mechanistic understanding. The article highlighted the need for standardized protocols and further research to refine FMT practices. Understanding these limitations is critical for guiding future clinical applications and improving patient outcomes. The review emphasizes that while FMT is established for CDI, its role in IBD is still evolving and requires additional investigation[13].

In 2020, Min Z. investigated the recognition and attitudes of patients with IBD toward FMT and transendoscopic enteral tubing (TET) in Eastern and Southwestern China. The study included 620 eligible respondents and revealed that a large proportion of patients were unaware of FMT and TET as treatment options. More than half of the patients expressed willingness to undergo FMT via TET, and those with

prior FMT experience demonstrated higher satisfaction and were more likely to recommend the procedure. Patient preference for FMT delivery methods varied according to disease type and prior FMT exposure, highlighting the influence of experience on attitudes. The findings underscore the importance of patient education and engagement in improving acceptance and utilization of FMT and TET therapies[14].

The study demonstrated that a structured teaching programme significantly improves the knowledge of nursing students regarding fecal microbiota transplantation. The findings highlight the importance of incorporating FMT education into nursing curricula to prepare students for emerging therapeutic practices. Enhanced awareness among nurses can improve patient care, reduce complications, and build confidence in managing gastrointestinal disorders. The study also underscores the need for ongoing training and in-service education for staff nurses to maintain competency in FMT procedures. Nursing research can further contribute by exploring innovative strategies to optimize FMT outcomes and patient safety. Despite limitations such as a small sample size and restriction to selected nursing colleges in Navi Mumbai, the results provide valuable insights for educational and clinical interventions. Future studies with larger and more diverse populations are recommended to validate these findings and expand understanding of FMT in healthcare. Overall, this study emphasizes the critical role of education, research, and practice in enhancing knowledge and implementation of fecal microbiota transplantation in nursing care.

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