Original Research Article

Case-based learning in integrated management of neonatal and childhood illness

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ABSTRACT

Background: This complete-enumeration, before-and-after type of study (without controls) was conducted on 61 third-year medical students at Rajiv Gandhi Medical College, Thane, Maharashtra state to study the difference in cognitive domain scores after attending lecture-based learning (by a pre-test) and after attending case-based learning (by a post-test).

Methods: After approval from the institutional ethics committee, the purpose of the study was explained to third-year medical students and written informed consent was obtained. After curriculum-based lectures on integrated management of neonatal and childhood Illness, a pre-test was administered wherein each student was asked to fill up case sheets for five case scenarios. The maximum marks obtainable were 10 marks per case (total 50 marks). Case-based learning was conducted in two sub-groups comprising 31 and 30 randomly assigned students by the same faculty and students in each sub-group were exposed to identical case scenarios. The post-test was conducted using case scenarios and case sheets that were identical to that of the pre-test.

Results: The overall mean score increased and the difference between the case-wise pre-test and post-test scores of both female (n=35) and male (n=26) students was highly significant (p <0.00001). However, the gender differences in pre-test score (Z=1.038; p=0.299) and post-test score were not significant (Z=0.114; p=0.909).

Conclusions: Using case scenarios augmented the cognitive domain scores of participating students and the gender differences in scores were not statistically significant. The post-test scores showed higher variability. Remedial educational interventions would be required for students who obtained low scores in the post-test.

Keywords: Case-based learning, Integrated management of childhood illness, Lecture-based learning

INTRODUCTION

The integrated management of neonatal and childhood illness (IMNCI) programmed is an Indian adaptation of the world health organization's integrated management of childhood illness (IMCI) programmed. IMNCI has been incorporated in the syllabus for the Bachelor of Medicine and Bachelor of Surgery (MBBS) course by the Maharashtra University of Health Sciences and training is imparted to third-year and final-year MBBS students. Typically, the IMNCI training is classroom-based and students usually do not fill up IMNCI case sheets, which may be inadequate in imparting the optimum skills needed for precise recognition of childhood illnesses in out-patient settings.

According to the adult learning theory, or andragogy, adult learners willingly learn a given topic only after they understand its direct relevance and practical applicability ("meaningful learning").[1-3] Transfer of learning (application of knowledge across varied circumstances, domains, and contexts) calls for the activation of the learner's prior knowledge.[4]

Case-based learning (CBL) is a discussion-based small-group learning method that utilizes a guided inquiry method and imparts more structure during small-group sessions. CBL enhances comprehension and acquisition of cognitive skills since learning is positioned within its context. The faculty formulate actual or hypothetical case scenarios that are used as launch pads to generate interest in a specific topic among small groups of students, who discuss these case scenarios and utilize the knowledge acquired from previously taught curricular content. The teacher acts as a facilitator in the learning process rather than as a provider of knowledge. This results in self-directed learning and application of their knowledge to the case scenario.[5-7] Case scenarios that extend over multiple topics enable the students to generate inter-concept linkages that enhance retention of knowledge and the students tend to develop a holistic perspective.[8,9] Since the packed medical curriculum calls for efficient use of both student and faculty time, the student-centered CBL format offers an alternative teaching-learning model.[10] CBL is case-specific and is best carried out in a multidisciplinary context.[11] CBL has been shown to improve students' scores, enhance communication skills, augment reasoning skills and grasp of basic sciences, stimulate the students towards self-directed learning, augment their level of satisfaction with their studies, sensitize them about the psycho-social problems faced by patients and the cost implications when various diagnostic tests are ordered.[12-16]

CBL helps students to link clinical conditions to basic sciences and cultivate clinical reasoning skills.[17] Clinical reasoning is a method of determining a range of facets of health and disease of the patients and for promoting clinical reasoning among the students, the teachers need to know the basic aspects of the clinical reasoning process and focus the instructions suitably.[18,19]

The objectives of the present study were to compare the cognitive domain scores of the participating third-year MBBS students after attending classroom teaching on IMNCI (using a pre-test) with that after using CBL as the educational intervention (using an identical post-test).

METHODS

This complete-enumeration, before-and-after type of study (without controls), was conducted in July-August 2018 at Rajiv Gandhi Medical College in Kalwa, Thane, which is located about 30 Kilometres from Mumbai city in the state of Maharashtra in Western India. This medical college has an intake capacity of 60 students per year for the MBBS course.

After obtaining approval from the institutional ethics committee of Rajiv Gandhi Medical College for conducting the study, the purpose of the study was explained to third-year MBBS students. Written informed consent was taken from students who were willing to participate in the study.

Inclusion criteria

- The study included all third-year MBBS students, of either gender,
- Who gave written informed consent to participate in the study and attended the educational interventions as well as the pre- and post-tests.

Exclusion criteria

- Those who did not give written informed consent or
- Absent during the educational interventions or pre- or post-test.

Lecture-based IMNCI training was conducted as per curriculum for the third-year MBBS course. In the pre-test, which was conducted after the lecture-based learning, each student was asked to fill up IMNCI case sheets for five case scenarios. Maximum marks obtainable were 10 marks per case (total 50 marks). For CBL, the participating students were randomly assigned (using lottery system) to two sub-groups, comprising 31 and 30 students, respectively, to enable small-group discussion. In order to preclude effects of possible confounding variables, the same faculty (SK and AAM) jointly guided the discussion and encouraged participation of all students in each sub-group. Moreover, students in each sub-group were identically exposed to CBL using IMNCI-related case scenarios, such as, diarrhoea, acute respiratory illness, acute febrile illness and exanthematous fevers. The post-test was conducted after CBL, using case scenarios and case sheets that were identical to that of the pre-test. The scores of students in the two sub-groups were merged for analyzing results of the pre- and post-tests. The outcome studied was the difference in cognitive domain scores after attending class-room-based training (by a pre-test) and after attending CBL (by a post-test).

Statistical analysis

The pre-test and post-test scores were tabulated in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and statistically analysed using EpiInfo Version 7.0 (public domain software package from the centers for disease control and prevention, Atlanta, GA, USA). The standard error of difference between two means (Z value) was calculated. 95% confidence interval (CI) was stated as: [Mean-(1.96)* Standard error)]-[Mean+(1.96) *Standard Error)]. Statistical significance was determined at $p < 0.05$.

RESULTS

A total of 61 third-year MBBS students (Females=35, 57.38% and Males =26, 42.62%) participated in the study. The overall mean score (out of 50) increased from 26.13±3.14 (95% CI: 25.34-26.92) to 32.80±4.43 (95% CI: 31.69-33.92) and the difference between the overall pre-and post-test scores of the participating students was

highly significant (Z=9.594; p <0.00001). The gender differences in the pre-test score (Z=1.038; p=0.299) as well as in the post-test score were not significant (Z=0.114; p=0.909) (Table1).

Table 1: Gender-wise mean scores (out of 50) in pre- and post-tests.

	Females (N=35)	Males (N=26)	Z value #	P value
	Mean (SD)	Mean (SD)		
Pre-test	25.71 (3.13)	26.50 (2.79)	1.038	0.299
Post-test	32.74 (3.58)	32.88 (0.114)	0.114	0.909

SD= Standard deviation; # Standard error of difference between two means

In the pre-test, female students had marginally higher maximum score (32 out of 50) as compared to their male counterparts (31 out of 50).

However, the median, first quartile and minimum scores were higher for male students. In the post-test, though male students had a marginally higher maximum score (46), compared with females (45), the third quartile, median, first quartile and minimum scores for males were lower than that for females (Figure1).
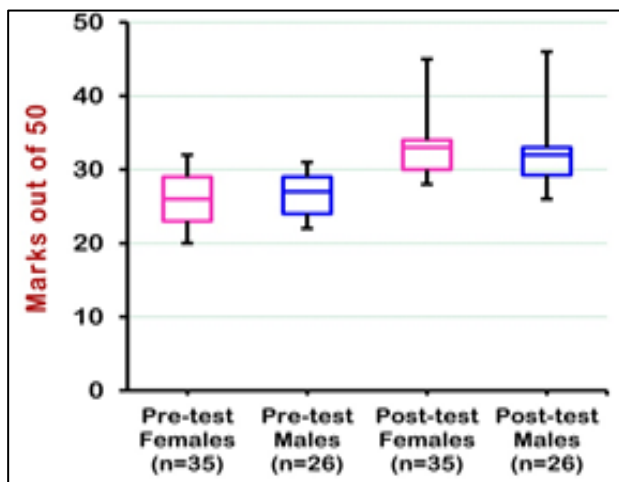

Figure 1: Boxplot depicting pre-and post-test scores.

Table 2: Case-wise mean scores (out of 10) for female students (n=35).

Case no.	Pre-test Mean (SD)	Post-test Mean (SD)	Z value #	p value
1	4.91 (0.98)	6.43 (1.07)	6.198	<0.0001*
2	4.83 (0.95)	6.43 (1.04)	6.720	<0.0001*
3	5.20 (0.87)	6.40 (0.95)	5.511	<0.0001*
4	6.00 (0.80)	7.11 (0.68)	6.254	<0.0001*
5	4.77 (1.03)	6.37 (0.84)	7.122	<0.0001*

SD = Standard deviation; # Standard error of difference between two *Highly significant

The difference between the case-wise pre-and post-test scores of the female students (n=35) was highly significant (p <0.0001) in all five cases (Table 2).

Likewise, in all five case scenarios, the differences between the case-wise pre-and post-test scores of the male students (n=26) were found to be highly significant (p <0.0001) (Table-3).

Table 3: case-wise mean scores (out of 10) for male students (n=26).

Case no.	Pre-test Mean (SD)	Post-test Mean (SD)	Z value #	p value
1	5.12 (0.59)	6.69 (1.32)	5.537	<0.0001*
2	5.00 (0.75)	6.50 (1.27)	5.186	<0.0001*
3	5.19 (0.75)	6.62 (1.02)	5.759	<0.0001*
4	5.69 (0.55)	6.96 (1.22)	4.839	<0.0001*
5	5.04 (0.72)	6.35 (1.13)	4.985	<0.0001*

SD = Standard deviation; # Standard error of difference between two means *Highly significant

DISCUSSION

An increase in overall post-test scores has also reported been by other studies.[5,20] The mean score has been reported to be higher in student examination results when facilitated by subject-expert tutors.[21] CBL changes the teacher into a facilitator who can blend with the students, become familiar with them at a more personal level, trigger the discussion and encourage student participation.[22,23]

A single post-test after CBL has been found adequate and learning was retained even after six months.[5] Learning retention is the capacity to maintain the acquired knowledge so that it may be retrieved and utilized when required later. To facilitate retrieval, the training sessions should utilize multiple contexts and situations in order to establish retrieval "hooks."[24] The correlates of retention of learning include complexity of the task, time limits, stress, individual aptitude, and amount of original learning.[25]

In the present study, the gender differences in scores in the pre- and post-tests were not significant (Z=0.114; p=0.909) (Table 1). Several studies have reported gender differences in learning styles.[26-28] Teachers who are knowledgeable about the diversity of learning styles can augment student motivation and performance by devising suitable learning approaches to complement the learning style preferences of students.[29]

CBL enhances learning and retention and allows students to explore real or virtual situations and enables them to comprehend complicated issues and analyse them more effectively.[30,31] When a satisfactory "depth" of knowledge is attained, numerous "interconnected mental models" are generated and the students become adept at

generalizing their knowledge to a broad range of contexts and in utilizing it in practical settings.[32] During CBL, students discuss and give valid justifications for various probable diagnoses and investigations. Since these discussions assist students in comprehending the consequences of ordering unnecessary and high-priced investigations in resource-poor settings, their application of knowledge would also extend to the affective domain.[5]

CONCLUSION

The results of the study indicate that participating third-year medical students had satisfactory basic knowledge of IMNCI and the use of case scenarios augmented their cognitive domain scores. The gender-wise differences in scores were not statistically significant. The scores in the post-test showed higher variability as compared to that in the pre-test and additional remedial educational interventions would be required for some students who obtained low scores in the post-test. Expansion of this study to other topics in the third-year MBBS course may help in devising appropriate teaching-learning techniques.

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