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# **Case-based Learning in Respiratory System for First-year MBBS Students**

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	Abstract: This complete-enumeration, before-and-after type of study (without
Original Research Article	controls), was conducted in April 2018 on 53 First-year MBBS students (24 females:
	45.28% and 29 males: 54.72%) at a medical college in Kalwa, Thane, Maharashtra,
*Corresponding author	India. After explaining the purpose of the study to the prospective participants,
Rucha Waah	written informed consent was obtained. Those who did not give written informed
Rucha magn	consent or those who were absent during either pre- or post-test were excluded. The
Article History	pre-test, conducted after traditional didactic lectures on respiratory system, comprised
Received: 22.06.2018	15 questions (2 marks each; total 30 marks). The post-test was conducted after case-
Accented: 07 07 2018	based learning, using a questionnaire that was identical to that of the pre-test. The
Published: 30 07 2018	outcome studied was the difference in cognitive domain scores after attending
	traditional didactic lectures (by a pre-test) and after case-based learning (by a post-
DOI:	test). The difference between the mean pre-test score (14.11 +/- 5.12; 95% CI: 7.13 -
10.36348/sjmps.2018.v04i07.006	15.49) and post-test score (25.92 +/- 4.63; 95% CI: 24.68 - 27.17) was highly
	significant (Z=12.455; p<0.0001). In the pre-test, the first quartile score of female
[5] % d 2 [5]	students was on par with the third quartile score of their male counterparts while the
	third quartile score of female students was on par with the maximum score obtained
	by males. The pre-test result also exhibited higher variability in scores obtained by
2-30 <u>72</u> -1-1-	male students. In the post-test, the overall scores of male students improved and the
	maximum score and third quartile were identical for students of both genders. In the
TENG AND A	pre-test, the gender differences in mean scores were statistically significant for 5 out
	of 15 questions, while the mean scores in the post-test did not exhibit significant
	gender differences. Extension of this study to other topics in the First-year MBBS
	course may enable formulation of suitable teaching-learning techniques.
	Keywords: Case-based learning, Didactic lectures, Respiratory system, First-year
	MBBS.

### INTRODUCTION

Case-based learning (CBL) is a discussionbased small-group learning method that utilizes a guided inquiry process. CBL increases comprehension and acquisition of cognitive skills since learning is positioned within its context. In the Indian scenario, medical education is weighed down by focus on traditional didactic lectures (TDLs). CBL has been compared with the TDL format by various authors [1-4]. In CBL, the faculty create actual or hypothetical case scenarios to generate interest in a specific topic among small groups of students, who discuss these clinical case scenarios, wherein clinical signs and symptoms, vital parameters and laboratory results are provided and a facilitator usually guides the direction of discussion. The students utilize the knowledge acquired from previously taught curricular content. This results in self-directed learning and application of their knowledge to the case scenario [5-9].

CBL increases reasoning skills and comprehension of basic sciences, since learning is positioned within the framework of a practical problem [10]. CBL has been shown to impart early clinical exposure, improve students' scores, increase communication skills, inspire the students towards selfdirected learning, assist students to relate clinical conditions to basic sciences and develop clinical reasoning skills [8]. CBL amplifies higher-order thinking and cognitive learning and can facilitate the development of skills that are identified as essential for overcoming the multi-faceted problems that are likely to be encountered in professional practice [11]. Clinical reasoning is a method of determining a range of facets of health and disease of the patients [10] 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 [12].

CBL has been found to be a feasible and an effective way to conduct inter-professional multidisciplinary health science education [13]. Since the packed medical curriculum necessitates efficient use of student and faculty time, the student-centred case-based learning (CBL) format offers an alternative learning model [14].

According to Knowles, the principles of adult learning should be utilized while teaching medical students since adults wholeheartedly learn facts that have direct relevance and practical applicability [15]. Application of knowledge across diverse circumstances, domains, and contexts ("positive transfer of learning") requires the activation of the student's previous knowledge [16]. Applications that incorporate video interactions, case simulations, and problem-solving formats have been found to be particularly effective [17].

The Medical Council of India's "Vision-2015" document has emphasized early clinical exposure as one of the strategies to improve medical education [18], but till date, this is not mandatory. Early clinical exposure may assist in creating interest in basic sciences amongst pre-clinical students by making them know the practical applications. Studies have reported that early clinical exposure motivated students [19], increased their selfconfidence [20-22], increased their level of satisfaction with their studies [23], sensitized them about the psycho-social problems faced by patients. Students also become sensitive to the cost implications when multiple diagnostic tests are ordered [24].

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

### MATERIALS AND METHODS

This complete-enumeration, before-and-after type of study (without controls), was conducted in April 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 Bachelor of Medicine and Bachelor of Surgery (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 first-year MBBS students. Written informed consent was taken from students who were willing to participate in the study. The study included all first-year MBBS students, of either gender, who gave written informed consent to participate in the study. Those students who did not give written informed consent or those who were absent during either pre- or post-test were excluded.

Teachers from the Departments of Anatomy, Physiology and Community Medicine conducted TDLs on respiratory system and its applied aspects, as per syllabus for the first-year MBBS course. The pre-test, conducted after the TDLs, comprised 15 questions (2 marks per question; total 30 marks). For CBL, the participating students were randomly assigned (using lottery system) to two sub-groups comprising 27 and 26 students to enable small-group discussion. Each subgroup was identically exposed to case-based learning modules using case scenarios pertaining to respiratory system related conditions. The same faculty jointly guided the discussion and encouraged participation of all students in each sub-group. The post-test was conducted after CBL, using a questionnaire that was identical to that of the pre-test. The scores from 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 TDLs (by a pre-test) and after attending CBL (by a post-test).

The pre-test and post-test scores were tabulated. The data were 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 AND DISCUSSION**

A total of 53 students (24 females: 45.28% and 29 males: 54.72%) participated in this study. Since all the participating students were jointly exposed to the same set of teachers for TDLs and the same set of facilitators for CBL and took identical pre-and posttests, the probable effects of confounding variables would be nullified.



Fig-1: Boxplot of marks obtained in pre- and post-tests

Table-1: Gender	differences in	pre-test scores

Q. No.	Females (n=24)		Males (n=29)		Z value	p value
	Mean	SD	Mean	SD		
1	0.2	0.6	0	0	1.633	0.102
2	0.8	1	0.4	0.8	1.584	0.113
3	1.9	0.4	1.3	1	2.958	0.003 *
4	0.4	0.8	0	0	2.449	0.014 *
5	1.2	1	0.5	0.9	2.653	0.008 *
6	1.6	0.8	1.3	1	1.213	0.225
7	0.8	1	0	0	3.919	< 0.0001 *
8	1.9	0.4	1.7	0.8	1.180	0.238
9	0.6	1	0.3	0.7	1.240	0.215
10	1	1	0.9	1	0.362	0.717
11	1.3	1	0.8	1	1.812	0.007
12	1.8	0.6	1.6	0.8	1.039	0.298
13	1.7	0.7	1.4	0.9	1.364	0.712
14	0.5	0.9	0.1	0.4	2.019	0.043 *
15	1.6	0.8	1.4	0.9	0.856	0.392

SD = Standard Deviation; Z = Standard Error of difference between two means \* Statistically significant a p<0.05

0	Females	(n=24)	Males	(n=29)	Z value	n value		
No.	Mean	SD	Mean	SD	2 value	p vulue		
1	1.2	0.9	0.9	0.9	1.208	0.227		
2	1.8	0.6	1.7	0.7	0.560	0.575		
3	1.9	0.4	1.8	0.6	0.724	0.469		
4	1.6	0.8	1.5	0.8	0.453	0.650		
5	1.5	0.9	1.8	0.6	1.396	0.163		
6	1.7	0.7	1.8	0.6	0.552	0.580		
7	1.9	0.4	1.8	0.4	0.906	0.365		
8	2	0	2	0				
9	1.8	0.6	1.6	0.8	1.039	0.298		
10	2	0	1.9	0.4	1.346	0.178		
11	1.9	0.4	1.7	0.7	1.303	0.192		
12	2	0	2	0				
13	1.6	0.8	1.5	0.8	0.453	0.650		
14	1.5	0.9	1.4	0.9	0.403	0.686		
15	1.8	0.6	1.7	0.7	0.560	0.575		
SD = Sta	$\overline{D}$ = Standard Deviation; Z = Standard Error of difference between two mean							

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Out of 30 marks, the mean score in the pre-test (n=53) was  $14.11 \pm 7.12$  (95% CI: 7.13 - 15.49), while that in the post-test (n=53) was  $25.92 \pm 7.4.63$  (95% CI: 24.68 - 27.17), which indicates an increase in overall scores with reduction in variation of scores. The difference between the mean pre- and post-test scores was highly significant (Z=12.455; p<0.0001).

In the pre-test, the first quartile score (14 out of 30) of female students was on par with the third quartile score of their male counterparts while the third quartile score (20 out of 30) of female students was on par with the maximum score obtained by males. The pre-test result also exhibited higher variability in marks among male students. In the post-test, the overall scores of male students improved and the maximum score (30 out of 30) and third quartile (29 out of 30) were identical for students of both genders (Fig. 1). In the pre-test, the gender differences in mean scores were statistically significant for Question No. 3 (Z=2.958; p=0.003), Question No. 4 (Z=2.449; p=0.014), Question No. 5 (p=0.008), Question No. 7 (Z=3.919; p<0.0001) and Question No. 14 (Z=2.019; p=0.043). (Table-1) In the post-test, the gender differences in mean scores were not significant in any of the 15 questions. (Table-2) Similar results have been reported by other studies [25-27].

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 used when needed later. The training sessions should employ multiple contexts and situations to create retrieval "hooks" to enable retrieval. [28]. The determinants of retention of learning include time limits, stress, and individual aptitude, complexity of the task and level of prior learning [29].

### CONCLUSION

The difference between the mean overall preand post-test scores was highly significant. The gender difference in the mean scores was statistically significant only for 5 out of 15 questions in the pre-test, while it was not significant for any question in the posttest. The scores in the post-test showed less variability as compared to that in the pre-test. Extension of this study to other topics in the First-year MBBS course may enable formulation of suitable teaching-learning techniques.

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