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A CONTROLLED TRIAL ON EFFECTIVE INTRODUCTION OF CASE STIMULATED LEARNING IN AYURVEDA CURRICULUM

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ABSTRACT

Background: The quality of Ayurveda education has been a debated question since long. Though CCIM has implemented various educational regulations to ensure standards of education, problem is still persisting. Poorly structured and poorly regulated education is the factor leading to this quality interference. Main factors to be considered for solution are either a curriculum reform or teaching reform. If application oriented teaching methodology like 'case stimulated learning' is adopted, learning can be made more effective and effortless. **Objectives**: To evaluate the effectiveness of case stimulated learning. **Materials and Methods:** Based on the screening test students were grouped into two. Author introduced lecturing method for one group of students and case stimulated learning for the second group. Learning outcome was assessed by test scores. The groups were swapped thereafter and instructional methods were interchanged. **Results:** Significant improvement in learning, in case stimulated learning than the lecturing method in modern topics. (p =0.041) No significant improvement in learning in case stimulated learning than the lecturing method as far as Ayurveda topics are concerned. (p=.657). **Conclusion:** Learning improvement was observed in students who taught with case stimulated learning

Keywords: Case stimulated learning, Ayurveda, Curriculum

INTRODUCTION

For quite a long period of time; quality of Ayurveda education is questionable. As Ayurveda incorporates the modern pattern of institutionalization, some of the merits of ancient *Guru Kula*, the traditional teaching and learning system, seem to have been compromised.

Caraka samhitha gives a clear view about quality of teacher and student. A good teacher is the one who is *paryavadasrutham* (well-grounded in scriptures), *paridrishtakarmam* (equipped with practical knowledge), *dakshyam* (wise), *anupaskruthavidyam* (whose knowledge is not

overshadowed by the knowledge of other scriptures), *kleshakshamam* (who is hardworking), *shishyavatsalam* (who is affectionately disposed towards his disciples) and *jnapanasamartham* (is capable of expressing his views with clarity)[1].Acharya says that a preceptor possesses such qualities infuses good medical knowledge to a good disciple .

The quality of good student as per Acharya Caraka is, *dhruti* (perseverance), *medha* (presence of intelligence), *vitharkasmrutysampannam* (power of reasoning and memory), *tatvaabhinivesham* (inquisitiveness for truth), *arthatatvabhavakam* (ability to understand the real meaning of things), *adhyayanaabhikamamarthavijnane karma darshane* (uninterrupted taste for the theory and practice of the science) [2].

Generally, the teaching and learning process in education institutions of Ayurveda are more of a conventional, didactic, teacher centered method. As a part of curriculum, students have to study a lot of portions from modern medical science and Ayurveda. Students sometimes miss the link between contemporary medical science and Ayurveda. They face so many difficulties to cover the whole syllabus within limited time span. All these may contribute the quality interference in Ayurveda education. Main factors to be considered for solution are either a curriculum reform or teaching reform. In 2008, a nationwide survey was conducted from more than 30 Ayurveda institutions spread across 18 states of India, showed that teaching methodology was the area that needed immediate attention [3-5]. So, in order to achieve the goal of effective as well as effortless learning, alternative teaching methodologies like case stimulated learning can be adopted which is already popular in other medical fields.

Objectives of the study
To find out the effective teaching methodology to teach *kriyasareera*.

MATERIALS AND METHODS
Forty students from first year BAMS were selected. The criterion of grouping was based on the scores of I.Q test. Dr. C.M. Bhatia's battery of performance tests of Intelligence was used for measuring I.Q of subjects.

Bhatia's battery of performance tests of Intelligence was constructed by Dr. C.M. Bhatia in 1955. (Bhatia C M Performance Tests of Intelligence Under Indian Condition, Oxford University Press, Bombay -1955). The "performance test of intelligence" consist of Alexander pass along test (test 1), koh's block design test (test 2), pattern drawing test (test 3), immediate memory test (test 4) and picture construction test (test 5).

Scoring was done as per the procedure laid down in the manual. Total time taken for Dr. C.M. Bhatia's battery of performance tests of Intelligence to a single individual was less than an hour. Maximum marks an individual could score for the complete test is 95. Maximum marks for Alexander pass along test, Koh's block design test, Pattern drawing test, Immediate memory test, Picture construction tests are 20, 25, 20, 15 and 15 respectively. In the present study maximum score obtained by the student was 78.

Computations of I.Q
In manual of Bhatia's battery of performance test of intelligence, age correction table is available. Based on the table; student's age was corrected. By using corrected age and scores obtained from the battery; corresponding I.Q scores were obtained from manual for each stu-

dent. Maximum I.Q obtained for student in the present study was 130.

Grouping of students

There were 40 students participated in the study. On the basis of scores obtained from the screening test; they were grouped into two. Mean score of IQ was same in both the groups; since all the 40 students of the class were qualified in the screening test. Each group contained 20 students.

Table 1: IQ range of students in two groups
Criteria for selecting *Kriya sareera* and nervous system as study subject and topic

The syllabus adopted for first year Ayurveda students are very vast. Ayurveda philosophy, *Ithihasa,* Sanskrit, Anatomy and Physiology are learnt by first year BAMS students. These subjects taught in I year BAMS, are very novel to them especially after present plus two curriculums. Students find comparatively easy to learn Anatomy because majority of facts are learned by direct models, cadaver dissection etc. But they find it very difficult to learn *kriyasareera*. So, the use of newer teaching methodologies is very essential today and it is becoming one of the major contemporary requirements as well.

Nervous system, as such is a vast and complex topic to understand. If a student doesn't learn the topic along with its practical applicability, it would not be easily assimilated by them. So, in order to make the student understand the significance of nervous system for clinical evaluation, that particular topic was chosen.

For both the groups introduction of nervous system was taken. Main topics fixed in this interventional study were types of nerve fibers, ascending tract, pyramidal tracts, trigeminal nerve, facial nerve, basal ganglia and concepts of *vata*

like *sthana, Chaya prakopa prasama avastha, guna, upakrama, vrudhi kshaya lakshana* etc.

First group subjects had classes with lecturing method and the second group subjects with Case stimulated learning. Pictures, diagrams were shown to both the groups. It was taken care that the investigator herself took every class so that uniformity of the teaching was strictly maintained throughout the study. Care was also taken to cover all topics with equal details for both the groups so that no group missed out any important information.

Case stimulated learning is a derivative form of the classical problem based learning. [6,7]. In case stimulated learning, a brief history of patient, presenting complaints and investigation report should be given first. After that a brief discussion about the concerned Physiology was presented before students. At the end of the session, the student was expected to figure out relation between complaints and normal physiology [8,9].

Case stimulated learning method can be adopted for Ayurveda as well as modern syllabus. For e.g.: (1) A case could be presented with *vataprakopalakshana* like *shoola, kampa, maamsadhaatusosha* along with seasonal aggravation of *vatadosha*. *Indriya pareeksha* should also be presented before the students. Once the students recognize the case as *vatavikara*; the etiology of *vatavikara*, sign of *vatavikara*, treatment protocol etc. should be gently introduced. Students should be asked to come up with choice of treatment employed for the particular case. Once the students thoroughly understand the *guna* and the employment of *vipareetaguna* in *chikitsa*, the corresponding *sloka* can be taught. Here following points can be elicited from the students by revising the teaching method.

- *Vatavikara* in *vardhakya* (*vayoho….*)
- *Vataprakopakala* -season (cold climate)
- Sign of normal *vatalakshna*s-skin characters, symptoms–*kampam, cheshtapravarthanam, utsaahanasam* (weakness)
- Treatment protocol *swedanam, snigdham, sthanam-vasti (pakwasayam)*

(2) Similarly, if the teacher wants to take the topic on ascending tracts, he needs to introduce the functional anatomy of spinal cord. Then the name of the tracts with origin, course, insertion, function should be presented before the students with diagrams and charts. After that, the physiology can be taught beginning with a case. Thus, a case with a patient showing left leg analgesia, thermoanesthesia, loss of tactile sensation with positive Romberg's sign can be presented before them. The students should be made to identify the lesion involved in the spinal cord tracts which is responsible for patient's condition. After the session, the students become equipped to identify the exact tracts connected with presenting complaints of the patient. Total 10 hours classes were conducted for each group.6 hours were allotted for modern topic and 3 hours for Ayurveda. One hour was given for final assessment. After every class a questionnaire was given and it consists of four objective questions (1 mark each) and one descriptive question (5 marks). 10 minutes were given for answering the question. Final assessment was done after 2 months. Answers were evaluated by faculties with clear evaluation guidelines. Analysis was done by using independent sample t test. Analyzed results are shown below.

The groups were swapped thereafter and instructional methods were interchanged so that no group missed out on any vital piece of information.

Table 2: Independent t test table on total modern topic analysis

Table 3: Independent t test table on total Ayurveda topic analysis

Table 4: Independent t test table on analytical question

Table 5: Table on long term assessment

RESULTS

- Significant improvement in learning, in **case stimulated learning** than the lecturing method in **modern topics.** (p =0.041)
- No significant improvement in learning in **case stimulated learning** than the lecturing method as far as **Ayurveda topics** are concerned. (p=.657).
- Power of analysis is enhanced by case presentation method. (p=.027).
- The aptitude to answer descriptive type of questions is improved by case stimulated learning.
- Long term memory of students' is enhanced by case stimulated learning than conventional lecturing method.

DISCUSSION

The quality of Ayurveda education has been a matter of concern since long. The curriculum according to central council of Indian medicine (CCIM) recommended a lot of portions from modern medical science as well as from Ayurveda. For the first-year students of BAMS, this syllabus is very vast. Students have to learn subjects like *Padarthavijnana, Ithihasa* and a new language Sanskrit. All these are novel to them especially after present plus two curriculums.

The reason for quality interference of Ayurveda education may be inadequate exposure to basic clinical skills, poorly structured curriculum, and mushroom growth of colleges and lack of modification in syllabus. [10-17]. Generally, teaching in Ayurveda education institutions are more in a conventional, didactic, teacher centered method. Besides, the teaching and learning is more memory oriented than understanding and application oriented. Subjects like Anatomy and Physiology are very vast. Students find it easy to learn Anatomy because majority of the subject matter are learned by direct models. While considering *Kriya sareera*, they face so many difficulties in memorizing the details of different topics as syllabus is vast and majority of the topics are beyond the scope of simple teaching aids like diagrams and models. By hearting and reading become important learning strategies in *kriya sareera* (Physiology in Ayurveda), so that students have to go for rote learning of the subject. With the intention of filling the lacunae in teaching methodologies and to make the learning more effective and interesting, alternative teaching methodologies are to be tested.

Discussion based on results
Physiology of learning behind teaching methodologies
Lecturing method is a teacher oriented method. Students are passive listeners. Here the way of input is through auditory and visual senses. Auditory is by listening to teacher's words and visualization is by the accessory supports like overhead projector, diagrams made in the black board and power point presentation used by the teacher. In fact, auditory input is more predominant in lecturing.

In case stimulated learning; besides auditory input, visual input is also aiding in students learning because student is seeing the original/real case. Auditory input is by listening to teacher's words and visualization is by seeing the original case and usage of accessory supports like overhead projector, diagrams made in the black board and power point presentation.

Primary visual area, area 17 perceives visual impulse. Like this primary auditory area, area 41, 42 perceive auditory impulse. Visual information conveyed by words is channeled through angular gyrus (visual association area) to Wernicke's area which is the sensory interpretation area. Like this auditory information are conveyed from primary auditory area to Wernicke's area which helps in the interpretation of sound. Because of these modalities a person is able to recognize the thought that is conveyed by visual or auditory sensation.

Here, in addition to physiology of Wernicke's interpretation, limbic association area also operates. Limbic association area provides the motivational drive for the process of learning. By being exposed to human emotions and feelings, students get a clear understanding of the case. Brain has a natural tendency to neglect negative memories which are of no significance due to habituation. The remembrance will be more in positive memory due to sensitization. Sensitization provided by the innocuous stimuli (pleasure or pain associated with a case) in case stimulated learning increase that particular type of memory in students. Rehearsal has also a role in increasing memory.

In case stimulated learning, the novelty of teaching method ensures the active participation in learning and thus enhances the memory. Active participation increases one's attention to subject matter; which increases activity of prefrontal cortex also.

The hippocampi have a role in critical decision-making neuronal mechanism, determining the importance of incoming sensory signals. Hippocampus decides whether a neuronal input is important, then the information is likely to be committed to memory. It provides the drive that causes transformation of short term memory into long term memory. It also has a role in case stimulated learning.

Basal ganglia are involved in selecting and enabling various cognitions that are stored in cortical association areas. In case stimulated learning, the emotion or cognition associated with a case is selected by basal ganglia in order to convert it into motor action as a consequence of thought generated in mind. This 'cognitive control of motor activity' of basal ganglia was reflected in learning through 'case stimulated learning' [5, 6, 7, 8].

Case stimulated learning becomes more effective in enhancing learning and memory, as it is able to provide multiple and relevant sensory stimuli to students at the time of learning and also due to inclusion of more cortical regions like the association area, involvement of limbic system as reward or punishment center, rehearsal mechanism of brain, of knowledge which capture the mind, basal ganglia's involvement in cognitive control of motor activity and hippocampus's role in consolidation. Hence effective application of teaching methodologies like case stimulated learning can improve the students learning in Ayurveda curriculum.

In first year classes, *vatadosha* is taught with a philosophical view in *Padarthavijnana*. When the modern topics were taught, *kriyasareera* department was solely responsible for imparting the physiology related to tracts of spinal cord, basal ganglia, facial nerve etc. So, the significance was observed in modern topic's analysis.

But the topic *vatadosha* was previously introduced into learner's brain before the actual classes for *vatadosha* held by *kriyasareera* department. This prior exposure of the subject hampered the result of case stimulated learning in Ayurveda topics.

CONCLUSION

General improvement of memory happens in subjects who were taught with case stimulated learning.

LIMITATION
- The sample size of the study was only forty.
- Teaching hours allotted for the study was only 10 hours.
- Teaching methodologies like brain storming, team based learning etc. was not tested.

RECOMMENDATIONS
- Study can be conducted with higher sample size.
- Study can be conducted in multicentric way.
- Long term follows up regarding the application of knowledge can be conducted.

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TABLES

Table 1: IQ range of students in two groups

I.Q range	Frequency group 1	Frequency group 2
80-95	4	6
95-110	11	8
110-135	5	6

Table 2: Independent t test table on total modern topic analysis

Modern topic analysis			
Group	Mean	SD (standard deviation)	p value
1 (lecturing method)	83.14	9.479	.041
2 (case stimulated learning)	88.62	6.59	

Table 3: Independent t test table on total Ayurveda topic analysis

Analytical Question (given in annexure)	Group	Mean	SD (standard deviation)	P value
1	1((lecturing method)	.421	.50726	.027
	2(case stimulated learning)	.778	.42779	
2	1(lecturing method)	.5556	.3321	.033
	2(case stimulated learning)	.8824	.5113	
3	1(lecturing method)	.52632	.513	.029
	2(case stimulated learning)	.85	.3663	

Table 4: Independent t test table on analytical question

Analytical Question (Given in annexture)	Group	Mean	SD (Standard Deviation)	P Value
1	1(lecturing method)	.421	.50726	.027
	Case stimulated learning)	.778	.42779	
2	1(lecturing method)	.5556	.3321	.033
	Case stimulated learning)	.8824	.5113	
3	1(lecturing method)	.52632	.513	.029
	Case stimulated learning)	.85	.3663	

Table 5: Independent t test table on analytical question

Long term assessment			
Group	Mean	SD (standard deviation)	P value
1(lecturing method)	70.9045	21.74311	.322
2(case stimulated learning)	76.489	12.07093	

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