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RESEARCH ARTICLE

Perception of undergraduate students towards the practical physiology curriculum: Strength and weaknesses

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ABSTRACT

Background: The primary goal of medical education is to have competent physicians. Amidst the ongoing debates of clinical utility and relevance of the content of the traditional practical curriculum, there is an emergent need of restructuring the undergraduate curriculum in medical schools. **Aim and Objective:** The present study aimed to assess the strength and weaknesses of the present physiology practical curriculum by documenting and analyzing the feedback obtained from the MBBS students. **Materials and Methods:** A structured pre-tested internally validated questionnaire was used to assess the perception of the 2nd and 3rd year medical students for the relevance of physiology practical curriculum using Likert's point scale. Data were collected using Microsoft Excel sheet and were analyzed in SPSS. **Results:** The results showed that responses of students' for the relevance of practical of physiology were 82% for clinical physiology, 59% for hematology, and 10% for experimental. More than 50% of students' in the study felt that the present physiology curriculum did not offer them learning of newer diagnostic techniques in physiology and it's relation in clinical scenarios. **Conclusions:** We conclude that the practical physiology practical curriculum should be made need based and clinically relevant to meet the global standards of medical graduates.

KEY WORDS: Practical Physiology; Feedback; Clinical Relevance; Outdated, Restructuring

INTRODUCTION

The advent of the 21st century has brought about revolutionary changes in medical education. The curriculum has been defined as: "Everything that happens in relation to the educational program."[1] It is very important to emphasize the academic need of reviewing the teaching programs from time to time and making adequate modifications, to keep pace with progress in the subject, and to cope with the requirements of the beneficiaries.[2]

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In India, there has been often repeated criticism that the medical colleges are producing graduates who are not well equipped to tackle the health-care needs of the society.[3] If we want to produce "outcome-based doctors," we need to customize medical education' to the needs of society and students. An "outcome-oriented" curriculum can produce health-care professionals with superior clinical expertise.

The recent era of medical education has witnessed a lot of turmoil in teaching-learning methodologies. Pedagogical strategies have been suggested to facilitate active learning principles with the introduction of small group sessions, problem-based learning, self-directed learning, flipped classroom simulations, virtual patients, and e-learning.[4] MCI has introduced Competency-Based Undergraduate Medical Education curriculum aimed to produce an Indian Medical Graduate, a skilled and motivated basic doctor. This innovative new

curriculum has been structured to facilitate horizontal and vertical integrations between disciplines, bridge the gaps between theory and practice, and between hospital-based medicine and community medicine.[5] The most crucial aspect of medical training is implementing of acquired knowledge and skills in a real-life scenario.[6] Basic sciences play a crucial role in the training program.

Physiology is highly relevant and important as it forms a core component of modern medicine. Dale had once stated that "a proper claim could be made for physiology, rightly presented, as pre-eminently fitted for training the mind in the conditions of accurate observation, in the meaning of quantity and measurement, in the putting of questions to nature and the appraisement of the answers obtained."[7]

Laboratory-based learning session, which is a part of practical physiology curriculum, provides students an opportunity to have hands-on experience and helps them understand the concepts better through active mode of learning, thus enhancing students learning and performance.[8] Few years later, these practical skills will be practiced by these students in their new role as a physician in primary setup, hospital, or in the community; hence, it is very important that the practical training be need based and relevant.

In a study conducted among 300 MBBS students, Goyal *et al*.[9] reported that there is an imperative need to implement radical changes in the physiology curriculum so that it should be in consonance with patient care for the doctors of tomorrow to render better health service.

There is a need of holistic approach to redesign curriculum according to the existing and emanating needs of medical education.[10]

In the process of curriculum development, students are important stakeholders yet their role is usually neglected. However, an effective and frequent feedback from students can help the teachers to plan the curriculum and improve on the teaching methodologies adopted in their institutions.[11,12] Lata and Walia[13] stated that the he students undoubtedly are in best position to comment on the effectiveness of any teaching system and they may be regarded as the best judge to assess it.

The objective of the present study was to obtain feedback from the students' about their perception of the relevance of practical teaching in the subject of physiology. We aimed to assess and analyze the strength and weaknesses of the practical physiology curriculum to improve learning in the subject.

MATERIALS AND METHODS

The present study was conducted among the 2nd and 3rd year MBBS students in the Department of Physiology in a Government Medical College of North India. The Institutional Ethical Clearance was obtained for the study by the Institutional Review Board. Verbal consent was obtained from all participating students and the purpose of the study was explained to them.

A structured internally validated and pre-tested questionnaire was designed to assess, document, and analyze the perception of the students about physiology practical curriculum. The questionnaire was distributed to the students in the lecture theater and they were asked to complete the questionnaire within 30 min without discussion. Students were asked to attempt a questionnaire without revealing their identity to facilitate free expression of ideas. Likert's point scale was used for rating the physiology practical curriculum, agreement, and relevance.

Statistical Analysis

Data were collected using Microsoft Excel sheet and were analyzed with SPSS software (24th version). Cronbach's alpha was calculated to measure internal consistency of items in the questionnaire.[14] Descriptive statistics were used for the analysis of data. Frequency was shown as percentage. Ratings of 1 and 2 on the 4-point Likert's relevance scale were combined to represent "irrelevant" while ratings of 3 and 4 were combined to represent "relevant."

RESULTS

In the present study, the mean age of the participants was 19.88 ± 2.28 years. The male-to-female ratio was 1.54:1. Out of 198 participating students, the study group had 185 students, 13 questionnaires were rejected as they were incomplete and not duly filled. Response of students' regarding statements on practical physiology curriculum is summarized in Table 1; Figure 1 shows students' perception of the relevance of physiology practical in the curriculum on Likert's scale. The relevance of specific practical of clinical and hematology practical is depicted in Figures 2 and 3, respectively. Table 2 represents students' response to comparison of teaching-learning methodology of computer-assisted learning and conventional lecture-based demonstration in experimental physiology.

The result of the study shows that among the three laboratories based on practical sessions in physiology, most of the students felt clinical practical as most relevant [Figure 1]. More than 75% of students' agreed that clinical physiology increases the understanding of physiological concepts 86% of students' believed that it helps in developing better doctor-patient relationship and 89% of students' found that it helps to apply knowledge to clinical situations [Table 1]. The clinical practical which was found to be relevant by more than 90% of students was pertaining to systemic examination

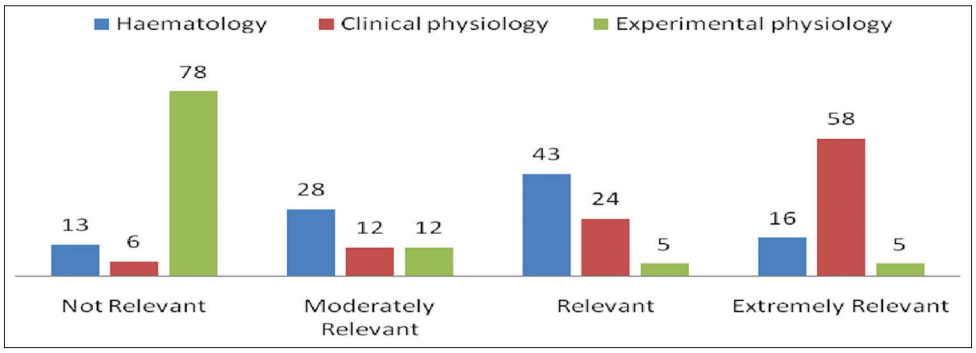

Figure 1: Pooled responses of students' of the relevance of physiology practical in the undergraduate

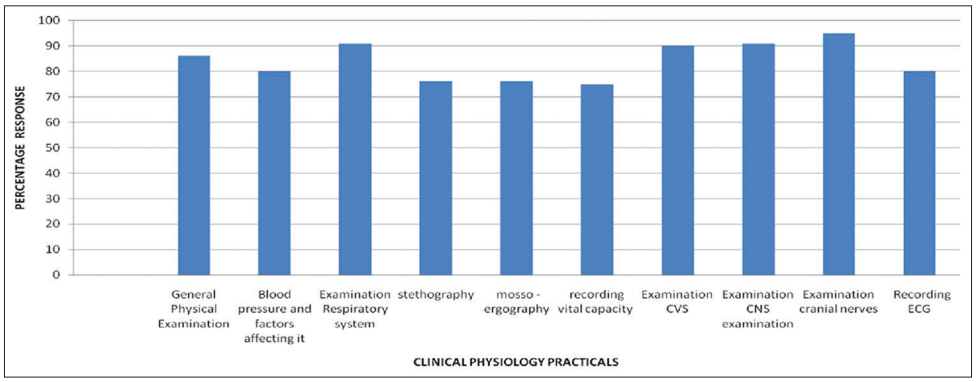

Figure 2: Pooled responses of students' of the relevance of specific practical of clinical physiology in the undergraduate curriculum

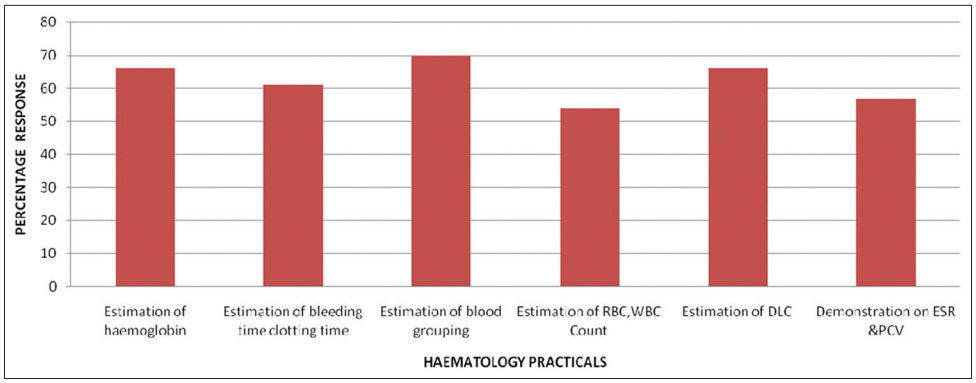

Figure 3: Pooled responses of students' of the relevance of specific practical of hematology in the undergraduate curriculum

Table 1: Students' perception of physiology practical curriculum on Likert's scale

Statements about ongoing practical curriculum	Hematology physiology practical	Clinical physiology practical	Experimental physiology practical
	Agree (%)	Agree (%)	Agree (%)
The practical curriculum helps to develop scientific approach	65	52	34
The practical curriculum promotes critical thinking and problem solving	46	48	22
The practical curriculum increases the understanding of Physiological concepts	76	76	44
The practical curriculum offers learning of newer skills, recent diagnostic techniques and it's relation to clinical application	34	44	07
The practical curriculum helps in developing doctor-patient relationship	24	86	08
The practical curriculum helps to apply knowledge to clinical situations	63	89	08

Table 2: Perception of students' on comparison of computer-assisted learning with conventional lecture-demonstration methodology in experimental physiology practical on Likert's scale

Parameter	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly disagree (%)
CAL achieved learning objectives better than conventional teaching	26	66	5	1	2
Enjoyed the learning process with CAL more than conventional teaching	40	38	10	7	5
Felt the learning process under your control with CAL	35	34	16	7	9
CAL is time saving over conventional	26	47	15	3	9
Retention is better by CAL than conventional teaching	52	34	9	12	13

SD: Strongly disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly agree, CAL: Computer-assisted learning

practical (cardiovascular system examination, respiratory system examination, CNS, and cranial nerve examination) [Figure 2].

However, less than 50% of students' felt that they were learning new techniques and processes in the present curriculum in clinical (34%), hematology (44%), and experimental laboratories (7%) [Table 1].

In recent years, MCI has recommended[15] alternative methods for teaching of experimental physiology with computer-assisted learning (CAL). We found that 92% of students' found CAL more effective in achieving the learning objectives, 78% found it more interesting, 73% more time saving, and 86% found it better retained than the traditional lecturing [Table 2]. However, practical of nerve-muscle and frog's heart experimental physiology was considered as relevant only by 10% of students'.

The result of the study showed that all the hematology practical included in the curriculum were perceived as relevant by more than 50% of students [Figure 3] and more than 75% of students felt that it increases the understanding of physiological concepts [Table 1].

DISCUSSION

The present study was aimed to assess and analyze the perception of students' about the present physiology practical curriculum. The results of the study showed that the majority of students found clinical physiology practical more relevant than the hematology and experimental physiology practical as they relate more to clinical scenarios. Majority of students' (≥75%) were in a strong disagreement to the inclusion of experimental physiology in the practical curriculum, as they will never apply or practice it in future. Besides that, another major concern of the students' was that the present practical curriculum of physiology fails to offer them the knowledge and skills about the modern diagnostic parameters and diseases. The students' also felt that in the present curriculum, they do not develop skills of clinical reasoning because of limited exposure to critical thinking and problems during skills practical sessions.

Stevens[16] found that the traditional subject-based and lecture-based curriculum has failed to accomplish the desired outcome of producing physicians for the 21st century. This growing discontent among academicians and professional organizations concerning the traditional medical education construct has accelerated in recent years.[17,18]

The traditional "course-driven" curriculum is a burden on the medical students with its excessive and unnecessary details. Based on the information gathered from the students' feedback, we found that there is a need of redesigning the practical physiology curriculum, and it should be made more "clinical relevant."

In line with our findings, Dandekar *et al*.,[3] in their study, suggested a dire need for restructuring of current undergraduate practical curriculum with an introduction of a modified curriculum with more clinical relevance. Vasundara *et al*.[19] suggested that the clinically irrelevant topics should be culled in basic sciences.

In the present study, one such practical which was perceived by students as clinically irrelevant was that of experimental physiology. The study also indicated that even though the teaching by CAL was found to be better than lecture demonstration [Table 2] yet the students found it unnecessary with no clinical relevance. This is in agreement with the study by Paralikar and Shah[11] where they found that the current experimental physiology practical failed to meet many of the objectives of the course and that most of the topics were outdated and clinically irrelevant. The researchers[12,13] have also stressed on the need to decrease the number of amphibian practical and the time spent on teaching of amphibian experiments.

On analyzing the perception of students' in the present study, we think that there is overburdening of students' with obsolete topics and lack of "must know newer topics" which are the need of the hour. We definitely suggest a

relook into the inclusion of experimental physiology practical in undergraduate curriculum as it does not offer learning in relation to their future role of physicians. Instead, we suggest that there should be learning of the newer innovative techniques in the practical curriculum. In the present scenario, where the electrodiagnostic clinical laboratories have an important diagnostic implication, it would be more relevant to provide early exposure to electromyography (EMG), sleep studies, electroencephalography (EEG), and nerve conduction studies during the practical sessions in the basic courses.

The outcome of this present study matches with the study by Goyal *et al*.[9] where majority (>50%) of the students' favored introduction of topics from recent advances in physiology: EEG (55%), EMG (52%), nerve conduction studies (71%), autonomic function tests (68%), audiometry (51%), and ophthalmoscopy (67%).

In an analogous type of findings, Gade and Chari found that physiology teachers of different medical colleges of central India suggested that practical of animal experiments can be replaced with some new practical such as cardiopulmonary resuscitation, nerve conduction studies, EMG, computerized pulmonary function tests, autonomic function tests, evoked potentials, enzyme-linked immunosorbent assay, and diffusion capacity of lungs by carbon monoxide in physiology practical curriculum for undergraduates.[20] Vella[21] suggested providing awareness to undergraduate students about the modern parameters in the diagnostic laboratories and their interpretation in relation with the clinical cases.

The lack of knowledge in the modern diagnostic processes, techniques, and interpretation can prove to be a handicap to a physician practicing in a community setting. It was revealed in a study by Watmough *et al*.[22] that the practicing doctors felt that they had not been clinically well prepared for the role of working as junior doctor, particularly the practical aspects of the job nor had enough exposure to research skills during their training in the medical schools.

Another, important aspect of the training program of undergraduates in medical schools is to foster the development of critical thinking and problem-solving abilities. The role of critical thinking can be stressed on in medical education as it eliminates the tendency toward bias, prejudice, and otherwise uninformed conclusions.[23]

However, it was revealed in this present study that laboratory sessions do not provide the students' with opportunities to form a connect between observed clinical problems and the acquired conceptual knowledge, thus limiting their critical thinking and problem-solving abilities.

Dahle *et al*.[24] found that a vertical integration between basic sciences and clinical medicine in a problem-based learning setting has been found to stimulate profound rather than superficial learning and thereby stimulates better understanding of important biomedical principles.

Consistent with the results of the present study, Patel *et al*.[25] reported that the basic science knowledge learned in a clinical context is better comprehended and more easily applied by students. We suggest that inclusion of clinical case scenarios, e-learning, and clinical rounds to increase applied knowledge of physiology can serve as adjuncts to the "content-based" and laboratory-based sessions. The curriculum modification should focus on "Processes and approaches rather than on content only."[19]

We hypothecate that there is a need of restructuring of the practical physiology curriculum in response to recent scientific advances and societal needs. This will not only help in integrating basic science courses but also provide clinical experiences early in the curriculum[26] This integration will help the undergraduates to fulfill the duties and responsibilities of a physician of the first contact in providing the preventive, promotive, curative, and rehabilitative aspects of medicine.

Limitations

The limitations of the study were few. The study was conducted in a limited sample size and in single medical college setting. Multicentric studies with larger sample size will provide better results to assess the perception of students' of the present physiology curriculum. Another limitation can be possibility of subjective bias while answering the questionnaire.

CONCLUSIONS

From the study, it can be concluded that there is an academic need for reviewing of physiology practical curriculum. The renovation of the traditional undergraduate medical curriculum should be strategically planned to bridge the gap between the conceptual knowledge and practical skills. This can be achieved by active involvement of all the stakeholders in curriculum development by the organization of seminars, symposium, or workshops. The effective feedback from stakeholders on teaching-learning methods and syllabus will help the curriculum reformers to redesign the curriculum to meet the prevailing and emanating needs of the society and medical education.

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