COMPARISON OF BASELINE KNOWLEDGE OF UNDERGRADUATE AND POSTGRADUATE MEDICAL STUDENTS: EXPLORING THE CAUSES OF ITS DETERIORATION

Rehan uddin, Chaudhry Aqeel Safdar, Ayesha Khokhar, Amina Ahmad

Combined Military Hospital/CMH Medical College Lahore, College of Physicians and Surgeons, Lahore

ABSTRACT

Objective: To compare baseline general and scientific knowledge between undergraduate and postgraduate medical students and to explore reasons for its deterioration, if any, over time.

Study Design: Sequential mixed method.

Place and Duration of Study: Combined Military Hospital and CMH Medical College Lahore; and Dermatology Departments of Mayo Hospital, Services Institute of Medical Sciences and Ganga Ram Hospital, Lahore, Pakistan from Aug to Sept 2011.

Material and Methods: Thirty undergraduate medical students and 30 postgraduate medical students were selected on the basis of purposive convenience sampling, after taking informed consent and ensuring confidentiality and anonymity. In the first phase, a questionnaire consisting of 50 general and basic scientific questions was distributed among 30 first year medical and 30 postgraduate students of dermatology. Two examiners marked these questionnaires using the same key and awarded marks from 1 to 5 for each question. In the second phase 5 postgraduates, who secured minimum marks, were invited for a confidential structured interview to explore reasons for their low score. Quantitative data was analyzed using SPSS version 20 and the interviews were analyzed through quasi-statistical approach.

Results: The mean score of postgraduate students was 151.60 as compared to 170.96 for undergraduates. Out of all framed questions, the postgraduates passed only in 35% of questions whereas undergraduates passed in 59%. There was no question in which all postgraduates could pass whereas there were 6 questions in which all undergraduates passed. There were 10 questions in which more than 80% of postgraduates had failed but there were 7 questions in which more than 80% of undergraduates could not do well. During the interview, 100% of postgraduates blamed mainly themselves for their low scoring and 75%, in addition held the system of rote learning responsible. Also 100% of the interviewees admitted, lack of habit of revising previously learnt concepts.

Conclusion: The basic and important general and scientific concepts deteriorate in medical students with advancing level of their respective postgraduate studies, which may lead to hampered construction of knowledge for future studies. A better and rational system of concept building, by improving instructional strategies may help these students to retain important knowledge for future construction of knowledge.

Keywords: Concepts, Decay, Learning, Medical students, Memory.

INTRODUCTION

One major pillar of theory of adult learning is activation of prior knowledge[1,2]. The literature of medical education keep on emphasizing and reminding the importance of prior knowledge[3] for future learning. Good discussions draw on students prior knowledge and allow them to share what they know. To take part effectively in discussions, students must recall information and use their metacognitive knowledge to link and sequence new ideas[4].

However, most of the faculty involved in postgraduate training feel that the basic prior knowledge of postgraduate students was contrary to expectations. Majority of postgraduate students, when asked simple scientific principles required for understanding complex physical and medical phenomenon, fail to explain the basis of this happening[5]. One of the reasons may be the existing didactic teaching and an assessment which encourages rote learning;

Correspondence: Brig Rehan uddin, Consultant Dermatologist, CMH Lahore.
Email: ralvi@yahoo.com
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hence the demand to bring a change in instructional strategies to encourage critical thinking and problem solving[6].

The decay theory suggests that the passage of time is responsible for forgetting[7]. In order to document and evaluate loss of prior knowledge and forgetfulness in postgraduate students, we assessed and compared basic scientific as well as general background knowledge of students with undergraduate students. Hence, we designed this study to report the evidence of decay theory, which asserts that new learning involves the creation of a neurochemical memory trace, which eventually disintegrate. We visualized, that study will not only endorse this phenomenon but also help to analyze possible reasons based on the learners suggestions. This may help extrapolate evidence based changes in our existing instructional strategy to counter the effects of time responsible for this disintegration of important information and serial positioning effect[8].

MATERIAL AND METHODS

This sequential mixed method study was conducted at CMH and Medical College, Lahore; and dermatology departments of Mayo Hospital, Services Institute of Medical Sciences and Ganga Ram Hospital, Lahore, between August and September 2011. The inclusion criterion for undergraduate group was students of CMH Lahore Medical College who volunteered to participate in the study. For the second group we included post graduate trainees available in different hospitals of Lahore with at least two years of post graduate training. The unwilling students were excluded. After taking permission from concerned ethical committees and informed consent, 30 medical students of CMH Lahore medical college and 30 postgraduate trainees were selected using non-probability purposive sampling.

They were administered a questionnaire (annexure-I available separately) which comprised of 50 questions on basic general and scientific knowledge. The selected questions were based on concepts essential to understand topics pertaining to medical science and of general awareness. The criterion for inclusion of the questions was subjective, as there could not be any unified, universally accepted group of such questions for this purpose. The content validity of the test was ensured by consulting various recommended text books, whereas the construct validity of questions was improved by technical vetting by subject specialists in the relevant fields. All the authors discussed and agreed to the questions included.

While filling the questionnaire,the students were instructed to rate their response using Likert scale from 1= no idea, 2 = forgotten, 3 =

Table-1: The demographics of participants of both groups and analysis of the results of the administered questionnaire.

Parameters	Undergraduates (n=30)	Postgraduates (n=30)	*p*-value
Mean score of students in all 50 questions	170.966 Range (138-203)	151.60 Range (114-225)	<0.001
Pass percentage of participants	80%	20%	<0.001
Number of questions in which all students passed	6 (12%)	0 (0%)	0.011
Number of questions in which all students failed	12 (24%)	10 (20%)	0.629
Number of questions in which mean score was less than 2.5	12 (24%)	17 (34%)	0.271
No of student who did not score passing marks in any question	Nil (0%)	3 (10%)	0.076

remembering the words only, 4 = can explain the concept, 5 = know the application in real life. The same exercise was repeated on 30, conveniently purposively selected postgraduate dermatology students from Mayo, Ganga Ram and Services hospitals, Lahore.

The filled questionnaires were later assessed by two separate examiners who marked each question from 1 to 5 marks using the key provided. In the qualitative phase, the students of postgraduate group who secured minimum marks were invited for interview to generate qualitative data about the cause of their poor knowledge. Semi structured written questions were asked and selected participants were interviewed. The interviews were conducted at a neutral place, and the questions were phrased to encourage participants to give honest opinion. The interviews were analyzed through quasi-statistical approach. The analyses of qualitative and quantitative phases were integrated in the final interpretation to draw conclusion of the study. Data had been analyzed using SPSS version 20. Descriptive statistics were used to describe the results. Kappa test was used to compare the agreement among the two examiners, and independent samples, t-test was applied for comparison between the groups using a *p*-value < 0.05 as significant.

RESULTS

Thirty undergraduate and 30 postgraduate students were included in the study. Gender distribution was similar in both the groups i.e. 6 (20%) males and 24 (80%) females in both the groups.

Using Kappa measure of agreement between 2 examiners, no significant statistical moderate agreement was observed between the 2 examiners with Kappa value of 0.498 (p <0.001).

Comparison of total score and of different questions is given in table-1. These results showed that undergraduate students had significantly higher scores and passing percentage as compared to postgraduate students.

The results of the semi-structured interviews with the types of the questions asked with their qualitative analysis (n=5) are tabulated in Table-2.

DISCUSSION

Prior knowledge, which consists of both semantic and episodic memory, is the base of critical thinking, problem solving, creative capabilities and further cognitive growth[9]. Despite extensive review of literature, we failed to find any similar study where the basic scientific concepts were compared between groups of under and post graduate students.

The matching studies include that of Claessen and Boshuizen[10] who studied recall of medical information by students of different years of study and medical schools, and a few doctors. They found typical cases were not reproduced better than atypical cases, nor did the amount of recall differ significantly in different subject groups.

Grant and Mardsen[11] studied the structure of memorized knowledge in students and clinicians for diagnostic expertise and found consistent difference in the memory structures of novice and expert clinicians. They studied diagnostic performance of first and third year clinical medical students, senior house officers, registrars and consultants on four clinical problems in general medicine considering the complexity of thought content in different groups. According to them, everything can be seen in many ways and they were of the view that teaching strategies in diagnosis must help the students by enabling them to understand the personal process of thought so that on any specific occasion they can analyze why a specific thought content has arisen, or did not arise, and what to do about it.

Another matching study by Folan and Supples[12] explored visual memory and auditory recall in anatomy students comparing the performance. Van Bergen et al[13] studied relation of memory distrust and misinformation and interaction with passage of time. Their results

showed that people suffering from memory distrust accepted more misinformation. Castel et al[14] commented that selecting what is important to remember, attending to this information, and then later recalling it can be thought of in terms of the strategic control of attention and the efficient use of memory. Ballard[15] reported an analysis of the concept of forgetfulness as it applies to older adults. Palmer and Devitt[16] broadly measured the absolute amount of knowledge retained by the candidate and the ability of the candidate to use that knowledge to reason through and evaluate clinical problems using MCQ and MEQ.

Ibabe and Sporer[17] investigated memory accuracy and confidence for details of an event as a function of question forms, type of content and centrality of information. They found accuracy was higher for central than peripheral information, and higher for action details than for descriptive details. Central action details were remembered better than peripheral action details whereas centrality made no difference for descriptive details. Woods et al[18] showed that students who learn causal explanations have a more coherent understanding of the relation between diseases and clinical features which, in turn, influences recognition of words or phrases describing 'encapsulated knowledge' and the ability to maintain performance under speeded conditions and concluded that causal understanding leads to more coherent understanding of clinical conditions, which in turn leads to expert-like behaviour.

Our study endorses the significant decay of prior knowledge of basic scientific concepts in postgraduate students as compared to undergraduate counter parts. This loss may result in poor construction of further knowledge and hamper higher cognitive abilities like critical thinking, problem solving and creative abilities.

While analyzing the type of questions, it was found that postgraduates had minimum marks in questions related to some very basic concepts pertaining to physics and geography. We selected these questions because while addressing LASERs, skin and light interactions, radiological studies and radiation therapy, the concepts of postgraduates about basic physics were very confusing and our study has proven this observation. More over the geographical concepts

Table-2: Results of responses of semi-structured interviews of both groups.

	Students responses				
Semi structured questions	Not at all	No	Not sure	Yes	Fully agree
1. Do you think, knowing these concepts are important for you as a physician?				75%	25%
2. Do you consider that the knowledge of these facts may help in your future learning process?			25%	25%	50%
	Never	Thought	Could not find time	Tried to learn	Fully aware now
3. Did you ever try to revise / relearn these concepts after going through this test?		25%	50%	25%	
4. Open question : What is the reason for your poor performance					

Themes	Percentage
1. Take blame personally	100%
2. Blame rote system of learning	75%
3. Lacking habit of revising previously learnt concepts	100%

required to understand epidemiology and prevalence of diseases, were also observed to be poor and our study seconds this view point. One explanation of poor results in these questions could be lack of revision or lack of interest of students in the concepts learnt[19-21]. Another possibility is deterioration of memory with passage of time[23,12]. More over the post graduates having poor basic prior knowledge / concepts will soon become future teachers. This raises questions like: Can we trust specialists who lack concepts worse than a school student? Can we send our student to them for learning medicine? Could they ever be able to transfer knowledge, while lacking comprehension of basis of their own knowledge?[24,25]

In authors' view, their misconceptions may be damaging not only for themselves but also for the future generation of medical students. Their confused concepts may hamper in developing higher cognition and its further transfer[26,27].

A few more troubling questions can relate to their diagnostic skills and compassionate attitude[28]. But the most important question is, what sort of specialists are we producing? What is desirable?[29,30].

The limitation of our study was comparing the knowledge of conveniently selected sample of undergraduate and postgraduate students. The same questions set can be used on same groups of individuals to assess loss of prior knowledge after a period of a year or more as the study guides us to generate more authentic data for further validation. Hence, caution must be exercised while applying the results of this study to any individual situation. The same set of students can be assessed in later years with same questions to determine further loss or gain of prior knowledge. Further multicenter studies can be conducted for better insight into many other aspects to validate results.

CONCLUSION

The prior knowledge of basic general and scientific concepts deteriorates in postgraduate students as compared to the undergraduates. The factors involved are system of rote learning, lack of revising the previously learnt concepts and personal learning style. The instructional strategies need to be modernized drastically; otherwise huge number of hours of teaching would be wasted without achieving the desired competence of application of knowledge in postgraduate training.

Conflict of interest: The authors report no conflicts of interest.

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