Original Article

CORRELATION BETWEEN GRADES IN THE MEDICAL BASIC SCIENCE COURSE AND SCORES ON THE COMPREHENSIVE BASIC SCIENCES EXAM IN IRAN

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Abstract

Introduction: Medical students in Iran are required to undertake a Basic Sciences Comprehensive Exam (BSCE) at the end of their BS course in order to progress to the next stage of medical education. BSCE results are widely used to evaluate medical education programs among different medical universities. The aim of this study is to explore the correlation between BSCE results and students' mean BS course scores.

Methods: A cross-sectional study, using secondary data analysis, was carried out in 2007 in Hormozgan University of Medical Sciences (HUMS) in Iran. Data from the 20th BSCE (held in 1998) to

the 36th BSCE (held in 2006) was collected. All medical students who took these exams and for whom the mean results of the BS course and the BSCE were available were eligible for inclusion in the study. For each medical student, data were obtained regarding age at the time of participation in BSCE, together with sex, entrance year, zone as categorised by the national quota system, mean BS course scores, BSCE result, duration of BS course (number of semesters) and number of failed semesters. Students whose data was not complete were excluded from the study. Data was analysed by using SPSS 15 (SPSS Inc., Chicago, Illinois, USA) software.

Results: 372 students undertook the BSCE during the research study period. Complete data was available for 365 medical students (98.1%). Among the participants, 224 (61.4%) were female and 141 (38.6%) were male. The mean age at the time of sitting the BSCE was 22.01±1.22. Mean BSCE scores were higher among students who had not previously failed a semester and who also finished the BS course within five semesters. Students with higher BS course scores had higher BSCE scores (P=0.000).

Conclusions: Students' BS course scores were found to correlate to BSCE results. Hence it may be prudent to identify medical students with low BS course scores, in order to provide additional educational support to improve their medical knowledge and thereby enhance their performance on the BSCE.

INTRODUCTION

Medical students in Iran are required to pass a Basic Sciences (BS) course of study in order to progress on to the next stage of their educational curriculum (1-6). The duration of the BS program usually is five semesters, during which time students must pass Biochemistry, Histology, Pathology, Parasitology, Medical Terminology, Physiology, Anatomy, Microbiology, Embryology, Nutrition, Psychology, Medical Physics, Genetics, Hygiene and Immunology modules (3). After completion of all these courses, each student must pass the Basic Science Comprehensive Exam (BSCE) in order to progress with their medical education (1, 2, and 3).

The BSCE is the first exam in a series of comprehensive exams that Iranian medical students must take (3). It is set by the National Ministry of Health to be given every six months. The BSCE includes 210 multiple choice questions that are related to topics that comprise the curriculum of the BS program. The BSCE is similar to the U.S. exam known as the U.S. Medical Licensure Examination (USMLE) Step-1. Factors of demographics, scores, faculty grades in clinical rotations and results of preclinical standardized tests are shown to be significantly in correlation with USMLE scores (7). By correlating identifying factors with USMLE scores among students, it is possible to predict those at risk for low scores in these exams (8). It is important to identify students at risk for low scores in order to provide proactive educational support for them (9).

BSCE results have been used to rank the medical education performance of institutions of higher learning. One university suggested that grades in Chemistry have the highest predictive validity for the future performance of medical students (1). BSCE results have also been used to evaluate different departments within universities. For example, in Qazvin University, results of the 12th to the 24th BSCE revealed that the highest scores were

found among students enrolled in the Microbiology, Embryology, Anatomy, Histology, Nutrition and Psychology departments. An improvement in student scores for students enrolled in courses in the Biochemistry, Medical Physics, and Physiology departments was seen during the research study period. Grades in English, Genetics, Hygiene, Pathology, Immunology and Parasitology were found to be less than satisfactory (2).

Previous studies have examined the effects of various demographic factors on BSCE results. One such factor is the 'zone' a medical student originates from, as categorised by the national quota system in the university entrance exam (3). Zone 1 includes students in larger cities with more facilities; Zone 2 includes medium-sized cities; and Zone 3 includes disadvantaged cities and rural areas. Analysis of BSCE results at Zahedan University from 206 medical students who undertook the exam between August, 1999 and February, 2000 showed that parameters such as age, marital status, quota system (including zones), mean BS scores, and duration of the BS course (number of semesters), along with the score in Microbiology, Parasitology and Physiology; Part 2 best predicted BSCE results (3).

At Kermanshah University, to assess whether success in a subject was related to the students' evaluations of their teachers, BSCE results in particular subjects were compared to the scores that students awarded their teachers in those subjects. Nevertheless, the authors concluded there was not any relationship between BSCE scores and the teacher-evaluation scores (4). The aim of the current study was to explore the relationship between BSCE results and the mean BS course scores of students at Hormozgan University of Medical Sciences (HUMS).

MATERIALS AND METHODS

After approval of the research proposal by the research committee at Hormozgan University of Medical Sciences (HUMS), this cross-sectional study, using secondary data analysis, was undertaken in 2007.

HUMS is located in the city of Bandar Abbas, which is the center of Hormozgan province in the southern part of Iran. Data from the 20th BSCE (held in 1998) to the 36th BSCE (held in 2006) was collected. All medical students who undertook these exams, and for whom the mean results of the BS course and the BSCE were available, were eligible for inclusion in this study. Students whose data was incomplete were excluded. For each medical student, the following data were collected: age at the time of participation in the BSCE; gender; entrance year; zones as categorised by the national quota system; mean BS course scores; BSCE score; duration of BS course (number of semesters); and number of failed semesters. This information was obtained from records in the education office of HUMS. The student data was anonymised by the education office staff members, who removed students' names from their corresponding data and replaced it with a code.

Data was analyzed by using the SPSS 15.0 for windows (SPSS Inc., Chicago, Illinois, USA) software. Demographic information was analyzed using descriptive statistics— frequency, mean, and standard deviation. An independent sample T-test was used to compare BSCE results between male and females; also, a one-way ANOVA was used

to compare BSCE results according to the quota system.Spearman`s Correlation was used to identify correlation between BSCE results and mean BS scores. Since the duration of the BS course only includes five or six semesters, and also the number of failed semesters includes (0, 1, 2 and 3), we compared BSCE results using a one-way ANOVA test. The P-value of less than 0.01 was assumed significant.

RESULTS

372 students undertook the BSCE during the research study period.

Table1. Summaries of students' entrance, national quota, duration of BS course and number of failed semesters

	Year	Number	Percent
entrance	1997	46	12.6%
	1997	53	14.5%
	1998	51	14.0%
	1999	41	11.2%
	2000	36	9.9%
	2001	26	7.1%
	2002	37	10.1%
	2003	40	11.0%
	2004	35	9.6%
National quota	First zone	69	18.9%
	Second zone	231	63.3%
	Third zone	58	15.9%
	Others	7	1.9%
BS duration	5 semesters	340	93.2%
	6semesters	23	6.3%
	7semesters	1	0.3%
	8 semesters	1	0.3%
NO of failed semesters	0 semesters	306	83.8%
	1 semesters	43	11.8%
	2 semesters	9	2.5%
	3semesters	7	1.9%
Total		365	100%

Complete data was available for 365 medical students (98.1%). Among the participants, 224 (61.4%) were female and 141 (38.6%) were male. The mean age was 22.01 ± 1.22, and was similar for both males and females. Other demographic data is summarized in Table 1. Mean BSCE scores were higher among students who had not previously failed a semester and also among students who passed their BS set of courses within five semesters. (P<0.01) Students entering the program in the years 1997 and 2003 had the highest mean BSCE scores (Table 2).

Table2. Comparison of BSCE score according to different variables

	Year	Mean BSE score	Test
Gender	Male	134.36	Independent sample t-test P<0.136
	Female	131.77	
Entrance	1996	123.83	One-Way ANOVA P<0.000
	1997	137.34	
	1998	129.55	
	1999	134.10	
	2000	130.33	
	2001	136.00	
	2002	135.76	
	2003	140.58	
	2004	134.89	
National quota	First zone	134.33	One-Way ANOVA P<0.190
	Second zone	133.20	
	Third zone	133.84	
	Others	124.71	
BS duration	5 semesters	134.21	Independent sample t-test P<0.000
	6semesters	121.87	
NO of failed semesters	0 semesters	135.64	One-Way ANOVA P<0.000
	1 semesters	122.35	
	2 semesters	121.78	
	3semesters	116.14	

The BS scores of students were correlated with BSCE results. (r=0.678; P=0.000) (Table 3).

Table3. Correlation between BS score and BSCE results according to different variables

	Year	n	r	P value
Gender	Male	224	0.704	0.000
	Female	141	0.617	0.000
Entrance	1996	46	0.110	0.465
	1997	53	0.713	0.000
	1998	51	0.692	0.000
	1999	41	0.725	0.000
	2000	36	0.734	0.000
	2001	26	0.746	0.000
	2002	37	0.745	0.000
	2003	40	0.673	0.000
	2004	35	0.878	0.000
National quota	First zone	69	0.596	0.000
	Second zone	231	0.689	0.000
		58	0.720	0.000
	Third zone Others	7	0.613	0.144
BS duration	5semesters	340	0.680	0.000
	6semesters	23	0.302	0.162
	7semesters	1	-	-
	8semesters	1	-	-
NO of failed semesters	0semesters	306	0.667	0.000
	1semesters	43	0.392	0.009
	2semesters	9	0.259	0.500
	3semesters	7	0.411	0.359

DISCUSSION

The aim of the current study was to explore the relationship between BSCE results and the mean BS course scores of students at Hormozgan University of Medical Sciences (HUMS). In summary, we found that higher mean BS scores were achieved by students who showed a shorter duration of the BS course, and by students with a lower number of failed semesters. Similar results have been found in studies of USMLE scores, in which students who have failed previous steps had increased risk of failure in the USMLE (7). However, no statistically significant difference was observed among BSCE results according to variables such as age, sex, and zones. Studies on USMLE scores showed a significant negative correlation between increasing age and USMLE scores (7). However factors such as gender and race have not found to be correlated with USMLE score.

Thus, among students attending HUMS, it appears that BS scores can be used to predict BSCE results. This conclusion concurs with other studies which have shown that performance in previous standard exams is correlated significantly with USMLE scores and can be used to predict students at risk for failure on the USMLE (8, 9).

Mean BSCE results were statistically different among different entrance years. This may be due to a variation in the difficulty level of the BSCE in different years. The base score for passing the BSCE in each year is different and is set according to the difficulty level of the exam. So variations in mean BSCE score results among different entrance years may be of little importance in practice. Although these results demonstrated that, overall, students' BS scores are related to BSCE results, there was not a statistically significant correlation between BS scores and BSCE results for the 1996 entrance group of students. We were unable to explain this finding. Also, the correlation wasn't significant in the case of students who passed the BS course in six semesters and who failed classes for two or three semesters. However, this fact may be due to the small numbers of students to whom these particular circumstances

applied. This study was limited by incomplete data sets, for example, missing information regarding marital status. In addition, separate student scores for each BS unit were unavailable, so only the mean BS scores could be examined.

Noting the significant correlation between BS course scores and BSCE results, university directors and faculty members should be encouraged to take note of students' BS course scores and should use these to identify students who may need more help in order to be successful on the BSCE. Students at risk of failure need additional support to succeed in exams (9).

Our results are comparable to other similar studies. At Zahedan University, mean BS scores and duration of the BS program were related to BSCE results (3, 6). In Kermanshah University, the number of failed semesters and duration of the BS program, (4) and at Birjand University, duration of the BS program, were related to BSCE results (10). In contrast to this study, some researchers have previously reported relationships between demographic variables and BSCE results. Previously identified associations have been sex and the quota system at Babol University (11); age, marital status, and the quota system at Zahedan University (3); age and marital status at Kermanshah University (4); and the quota system at Kurdistan University. (12) The sample size of our study was larger than that in any of the aforementioned studies. For example, 206 student results were examined at Zahedan University (3), and 150 or fewer were examined in other studies (10, 11, and 12).

CONCLUSION

As a result of the association between BS course results and BSCE results identified by this study, we suggest that medical students with lower scores in the BS program should be identified and provided with additional educational support in order to improve their medical knowledge and thereby increase their performance scores on the BSCE. Further research could address the limitations of this study (for example, incomplete data sets), and this information could provide university directors with more useful information about the efficacy of their educational programs.

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