

RESEARCH ARTICLE

Prediction of scores in pharmacology in the second MBBS university examination based on previous academic performance and gender of the students: A pilot study

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Received: January 05, 2018; Accepted: December 26, 2018

ABSTRACT

Background: Academic performance is an important reason for the stress and stress due to poor academic performance further deteriorates the academic performance of the student and it became a vicious cycle. Some predictors can be identified which can help finding the student who can be considered as potentially poor performer for future and such students can be mentored.


Aims and Objectives: This study was designed to predict the scores of pharmacology in final university examination based on the first MBBS score, first internal assessment score, and gender. **Materials and Methods:** This record-based study was done at the Department of Pharmacology, GMERS Medical College, Dharpur (Patan), Gujarat. The study was done in two steps - in step one, the prediction equation for total marks in pharmacology in the second MBBS university examination was derived through multiple linear regression on the basis of independent variables (first MBBS total marks, first internal total marks, and gender) and in the second step, the equation so obtained was tested on the second batch of the students by comparing predicted marks with the actually obtained marks in pharmacology in the second M.B.B.S. university examination. **Results:** In the first batch, total marks in the 1st year MBBS examination and total marks in the first internal assessment were moderately correlated with the total marks of pharmacology in the 2nd year MBSS ($r = 0.605$, $P = 0.00$ and $r = 0.589$, $P = 0.00$, respectively) and gender was not significantly contributing to multiple linear regression model for prediction of score. A predictive equation was derived and tested on the second batch of the students. It can be observed that for around 94% of the students' actual marks lies within plus or minus 10 marks of predicted marks. **Conclusion:** Prediction of academic performance from this technique can be a good technique to select the potential poor performers so that these students can be targeted for extra teaching or teaching by different methodology.

KEY WORDS: Gender; Pharmacology Score; Prediction Previous Academic Performance

INTRODUCTION

Training in the field of medical science is very demanding, students of medical science require knowledge and skill in

many disciplines.^[1] Entry in medical school starts a very stressful and challenging period for a medical student.^[2] Academic performance is considered as an important reason for the stress in a medical school. Stress due to poor academic performance further deteriorates the academic performance of the student and it became a vicious cycle.^[3,4] There is a need of mentoring of such students who either performed poor in the past or can be considered as potential candidate for poor performance in future. Such students can be taught by some different teaching-learning methods so that learning becomes easy.^[5] Such students should be identified early so that

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2019.9.0100526122018	

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specific mentoring or training can be started early to prevent possible poor academic performance. Some predictors can be identified which can help finding the student who can be considered as potentially poor performer for future and such students can be mentored. Despite the various factors used in pre-selection criteria, prior academic achievement to college of medicine remains the strongest predictor of success in the medical school as well other disciplines. It has been reported that students' performance in basic medical sciences (anatomy, biochemistry, pharmacology, and physiology) in the pre-clinical years can predict students' performance during clinical years. For example, performance in internal medicine rotation can be predicted by physiology and pharmacology scores, while anatomy scores can predict performance during surgery and obstetrics and gynecology rotations. These results indicate that students' performance in specific pre-clinical disciplines could be a warning sign of future poor performance in the related clinical disciplines.^[6] Keeping this objective in mind, this study was designed to predict the scores of pharmacology in final university examination based on the first MBBS score, first internal assessment score, and gender.

MATERIALS AND METHODS

This record based, retrospective, non-interventional study was conducted with the aim of prediction of pharmacology score based on previous academic performance and gender.

Ethical Approval

An ethical approval was obtained from the Institutional Ethics Committee (Ethics/Approval/2016/2). Anonymity was maintained uniformly and permission for access to the students' score sheets was obtained from the students' section as well as from the head of the department of pharmacology.

Setting

This study was conducted at the Department of Pharmacology, GMERS Medical College, Dharpur (Patan), Gujarat.

Participants

Till now, two batches of students have cleared the second MBBS examination. There were a total of 144 students in the first batch and 140 students in the second batch (year 2015 and 2016).

Data Collection

Retrospective data collection was performed. There were three independent variables or predictors, i.e., total marks in the first MBBS examination (out of 600), total marks in the first internal (out of 40), and gender. The dependent variable was total marks obtained in pharmacology in the second

MBSS university examination (out of 120). Data related to the dependent and independent variables were collected from the record available in the department and in the student section of the college. No data were collected from the students directly.

Statistical Analysis

The data collected in the form of excel sheet were checked for any error and transferred to the SPSS Statistics for Windows, version 17.0., SPSS Inc., Chicago, IL, USA, for the analysis. The study was done in two steps - in step one, the prediction equation for total marks in pharmacology in the second MBBS university examination was derived through multiple linear regression on the basis of independent variables (first MBBS total marks, first internal total marks, and gender) and in the second step, the equation so obtained was tested on the second batch of the students by comparing predicted marks with the actually obtained marks in pharmacology in the second MBBS university examination.

Hence, multiple linear regression was performed on the basis of independent and dependent variables and an equation was obtained. The equation was

$$\text{Marks } 2^{\text{nd}} \text{ MBSS} = 35.208 + \text{ITotal} \times 0.300 + \text{FYTotal} \times 0.074 + \text{Gender} \times 0.068.$$

Here, "ITotal" is total marks obtained in the first internal examination and "FYTotal" is total marks obtained in the 1st year. We were already having the data of the first internal total marks, total marks of the 1st year MBBS examination, gender, and total marks of the second MBBS examination of the second batch. To see the correctness of above formula, we calculated the predicted marks of the 2nd year MBBS university examination using the independent variables (internal total marks, gender, and total marks in the 1st year MBBS). The marks obtained through the formula (predicted marks) were compared with the marks obtained in university (actual marks).

RESULTS

Multiple linear regression was used to get the equation to predict marks obtained in the subject of pharmacology in the second MBBS university examination based on independent predictors - total marks in the 1st year MBBS, total marks in pharmacology in the first internal assessment, and gender of the student. This equation was based on the first batch of the students ($n = 144$). Of these three predictors, two (total marks in the 1st year MBBS examination and total marks in the first internal assessment) were moderately correlated with the total marks of pharmacology in the 2nd year MBSS ($r = 0.605$, $P = 0.00$ and $r = 0.589$, $P = 0.00$, respectively). These two independent factors were found to

Table 1: Coefficients and significance of predictors used in the model

Predictors	Unstandardized coefficients		Standardized coefficients (β)	<i>t</i>	Significant
	B	SE			
Constant	35.208	4.232		8.319	0
Total internal marks	0.300	0.058	0.374	5.143	0
Total 1 st year MBBS marks	0.074	0.013	0.409	5.591	0
Gender	0.068	1.020	0.004	0.067	0.947

SE: Standard error

Table 2: Analysis of variance test for the model

Model	Sum of squares	df	Mean square	<i>F</i>	Significant
Regression	4127.993	3	1375.998	41.200	0
Residual	4675.757	140	33.398		
Total	8803.750	143			

Table 3: Frequency of the students as per the difference between actual marks and predicted marks

Actual marks - predicted marks	Frequency <i>n</i> =140 (%)
±5	99 (70.7)
±10	32 (22.9)
±15	4 (2.9)
±20	2 (1.4)
±25	2 (1.4)
±30	0 (0)
±35	1 (0.7)

be contributed significantly in the full model and gender was not significantly contributing to the model [Table 1]. This three predictor model was found to be contributing around 47% ($R^2 = 0.469$) of the variance in the pharmacology total marks obtained in the 2nd year university examination [Table 2]. A predictive equation was derived on the basis of unstandardized coefficients shown in Table 1. This equation was tested on the second batch of the students. The difference between actual marks obtained in the 2nd year MBBS university examination and predicted marks are depicted in Table 3. It can be observed that for around 94% of the students' actual marks lies within plus or minus 10 marks of predicted marks.

DISCUSSION

This study was done with the aim of the prediction of pharmacology scores from previous academic performance (first professional score, first internal score of pharmacology, and gender).

The findings of this study are consistent with the other studies where previous academic performance was found to be an important predictor for future academic performance, but in this study, it was observed that contribution of previous

academic performance in variance was high as compared to other studies.^[7,8] This may be due to the addition of the first internal assessment as predictor which gives more validity or it may be due to autocorrelation between the 1st year MBBS marks and first internal marks. Gender was not a significant predictors and this study. In many published studies, it was observed that female gender associated with good academic performance, but this become significantly different only in the studies of large sample size.^[7] In this study, no effect of gender may be due to small sample size or it may be true finding. We have taken on three predictors in this study because we wanted to predict only on the basis of available variable to us for operational feasibility. Many other variables can be included by collecting the relevant data from the students and a better prediction equation with more accuracy and validity can be prepared. It is also important to understand that equation prepared at one institution may not be valid for other institution as few important factors may be influenced by local setting; hence, faculty should prepare the equation based on the students of their institution based on large sample size. This can be a good technique to select the potential poor performers so that these students can be targeted for extra teaching or teaching by different methodology.

CONCLUSION

Prediction of academic performance from this technique can be a good technique to select the potential poor performers so that these students can be targeted for extra teaching or teaching by different methodology.

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How to cite this article: Charan J, Vegada BN. Prediction of scores in pharmacology in the second MBBS university examination based on previous academic performance and gender of the students: A pilot study. *Natl J Physiol Pharm Pharmacol* 2019;9(2):183-186.

Source of Support: Nil, **Conflict of Interest:** None declared.