Predictive Validity of the Medical College Admission Criteria for Academic Performance: Results from the four MBBS batches of Karachi Medical and Dental College

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Abstract

Objective: To assess the predictive validity of the secondary school certificate (SSC), higher secondary certificate (HSC) and IBA admission test for academic performance of MBBS students at KMDC.
Methodology: Data based study using the results of first four batches of KMDC, which graduated in 1997, 1998, 1999 and 2000. Data was entered on SPSS-8, ANOVA, correlation and step-wise linear regression analysis was done using effect models. A total of 166 students record were used for analysis.
Results: The average IBA score was 65 for all the batches with a significant difference (p=0.000) amongst the four batches of KMDC. Similarly the scores of all the four batches varied significantly for HSC (p=0002), first professional (p=0,002), third professional (p=O.000) and the final professional (p0.001) exams. The IBA scores had significantly positive weak correlation with second (p0.009) and third (p=0.003) professional marks of the medical students. When the scores of HSC were combined with the IBA test scores, the predictive ability increased for first (pOO3l) second (p0.032) and third (p=0.011) professional academic performance of medical students. The results of SSC had no effect on the academic performance of medical students.
Conclusion: BA scores combined with HSC marks can predict academic achievement of medical students for the first three to four years. It however does not predict the performance in the final year, which is where the exit competencies are acquired by the graduates necessary for practicing medicine. The admission criteria lacks the testing of non-cognitive attributes and learning abilities necessary for a medical graduate to practice skillfully. Hence a valid instrument for testing the positive attributes, which could predict good performance of medical doctors, should be designed (JPMA 51:312,2001).

Introduction

The purpose of administering an entrance/admission test for admitting students to medical colleges is to select the most appropriate candidates who are willing to practice ethically. These candidates should be bright, empathetic, committed, humane and willing to communicate in the best possible way, as they have to be five star doctors in the future[1]. In Pakistan conventionally the test scores of HSC, which is after 12 years of schooling were used to develop a merit list and top students were admitted to the colleges. Internationally an entrance/qualifying exam generally designed by the institution itself is used and has been found to be a better predictor of academic performance of graduates compared to their other school college exam scores[2-5]. ln some US studies that medical college admission test (MCAT) was a good predictor of the performance of medical graduates in the first two years of college[6-8]. The same trend was seen in the clinical years where the students who did well in the MCAT did well in The clinical years as well as the residency program[9,10].
Aga Khan University (AKU) was the first private medical institution of the country that started admitting students on the basis of a written admission tests and interview both conducted in-house. This could be due to their innovative curriculum and the teaching methodology however the fact that their process of student selection was different cannot be ignored.
Baqai and Ziauddin Medical Universities also started admitting students on the basis of an admission test. which is in-house, prepared and administered by the institute itself. Their selection procedures

besides admission test also include an interview where the attitude of the students is also taken into consideration[11] Moral reasoning has been found to be associated with better clinical skills that could be assessed during interview as well[12]. A valid instrument for testing the right attitudes for a medical graduate is yet to be developed as so far the instruments using non-cognitive items have not been able to predict academic success however they may add to positive characterization of the medical graduate[13].

Karachi Medical and Dental College came into being in 1991 and to ensure transparency of the procedure the first batch of 50 medical and 10 dental graduates was selected on the basis of admission test conducted by institute of Business Administration (IBA). The reason for selecting IBA was that it has developed a repute of being fair and its assessment instruments are reliable and valid. The test given to the pre-medical students uses questions that are at level of an HSC pre-medical student with a section on general knowledge. The students of KMDC did well in all the professional exams even though their intermediate scores were lower that the other public sector medical college students[14].

In the year 2000 the public sector medical colleges decided to select their students on the basis of IBA admission test scores with weightage given to HSC and SSC exam scores. It is important at this point in time to see that the IBA test was a better predictor of academic performance compared to HSC and SSC marks. If it is good predictor then it should be used but at the same time appropriate weightage should be given to HSC and SSC marks if they are also good or moderate predictors of academic performance. The decision should be based on scientific evaluation of the predictive validity of all the three (IBA, HSC and SSC) major qualifying eaminations that the students have to take before entering medical college. However if the predictive validity of IBA test is not significantly different from HSC and SSC scores then the effort is probably not feasible. A lot of money, effort and human resources go into administration of the IBA test that is a burden on the overall economy if it is not able to select good doctors of the future. This study is an attempt to look at the predictive ability of the IBA test HSC and SSC scores for academic performance of medical students.

Material and Methods

Four batches of KMDC have graduated and this study has utilized the marks of all the professional examinations and scores of HSC, SSC and IBA admission test for predicting the performance of medical graduates. The SPSS-8 computer software was used for comparing (ANOVA used) the results of the four batches in all the various pre-medical and professional examinations. The results of students who had dropped out in any year and where any of the result was not available were not included in the analysis. Out of 166 students only 20 had appeared in O or/and A level examination. Some of the students from the first three batches had withdrawn their documents from the college hence their results were not available for analysis. The students who had taken 0 and/or A level examinations, their marks of biology, physics, chemistry and mathematics were converted to percentage totaled and equated with the SSC and/or HSC marks and then used for analysis.

For predictive ability, Pearson's correlation and stepwise regression analysis was done, using the fixed effect models were used to get the significance. The variables not predicting the outcome or not significantly correlating with the dependent variable were excluded in the final analysis.

Results

The total number of students in the first four batches of MBBS was 166 and the marks of their professional examination scores were significant ly different (table 1).

Table 1. Average Scores of the Professional Exam of MBBS taken by KMDC students.

Batch	Mean first professional	Mean second Professional	Mean third Professional	Mean Final Professional	N
1 (1997)	596.00+98.02	360.89+45.08	601.38+60.80	1623.89+128.39	45
2 (1998)	618.61+118.67	364.90+45.40	586.39+47.69	1726.77+288.08	31
3 (1999)	669.30+90.62	364.16+45.17	564.27+42.04	1758.57+108.58	44
4 (2000)	644.39+69.99	343.22+29.62	544.20+35.96	1713.15+98.99	46
Total	633.06+96.94	357.61+42.07	572.90+52.13	1703.54+167.02	166
P-Value	0.002	0.052	0.000	0.001	

Similarly the result of the IBA test score and HSC marks were also significantly dilierent amongst the four batches of students (table 2).

Table 2. Average IBA test, HSC and SSC marks of all the four batches of KMDC.

Batch	Mean IBA scores	Mean HSC scores	Mean SSC scores	N
1 (1997)	65.60+3.54	743.20+36.03	664.89+68.01	45
2 (1998)	66.55+4.44	740.77+39.37	651.97+51.69	31
3 (1999)	72.11+3.64	753.95+35.07	667.61+51.94	44
4 (2000)	56.35+3.88	768.63+33.74	373.43+40.78	46
Total	64.94+7.03	752.64+37.17	666.40+40.78	166
P-Value	0.000	0.002	0.283	

The results of SSC were used to predict the performance of students in HSC and IBA test scores in addition to the academic performance at the professional exams. The results indicate that except for the HSC marks, the SSC marks had a weak correlation with the IBA test scores and all the professional; examinations. In the professional examination the B was negative meaning that for every one unit increase in the marks of SSC there was a decrease in the academic performance with insignificant 95% confidence interval. As none of these results were statistically significant hence they cannot be generalized to the overall results of the students (table 3).

Table 3. Predictive ability of SSC (Matric) Marks for HSC, IBA test and professional exams results of linear regression and Pearson's correlation.

The dependent variable	Data. based on SSC scores	Confidence Interval 95%		R	R-Square	P-value
HSC score	0.162	0.60	0.265	0.237	0.056	0.002
IBA scores	-8.761	-0.029	0.011	0.068	0.005	0.387
First Professional	0.188	-0.086	0.462	0.105	0.011	0.177
Second Professional	-8333	-0.202	0.036	0.107	0.012	0.168
Third Professional	3.212	-0.116	0.180	0.033	0.001	0.669
Final Professional	1.044	-0.464	0.485	0.003	0.000	0.965

When HSC marks were used to predict performance of students in IBA test and professional examinations significant effect was seen. The correlation between the HSC marks and the outcome variables was non-significant (table 4).

Table 4. Predictive ability of HSC (Intermediate) marks for IBA test and professional exams results of linear regression and Pearson's correlation.

The dependent variable	Data. based on HSC scores	Confidence Interval 95%		R	R-Square	P-value
IBA scores	-2.685	-0.056	0.002	0.142	0.020	0.068
First Professional	0.316	-0.083	0.715	0.121	0.015	0.120
Second Professional	-5.11	-0.225	0.123	0.045	0.002	0.564
Third Professional	3.048	-0.186	0.247	0.022	0.000	0.781
Final Professional	0.115	-0.578	0.808	0.026	0.001	0.743

IBA test alone was found to have statistically significant positive weak relationship with 2nd. 3rd. and final professional performance of students. The test was found to be a significant predictor of 2nd and 3rd professional examinations, although the estimated change was not much (table 5).

Table 5. Predictive abiling of IBA test score for academic performance in professional exams results of linear regression and Pearson's correlation.

The dependent variable	Data. based on IBA scores	Confidence Interval 95%		R	R-Square	P-value for R
First Professional	2.015	-0.090	4.119	0.146	0.021	0.060
Second Professional	1.215	0.312	2.119	0.203	0.041	0.009
Third Professional	1.675	0.561	2.789	0.226	0.051	0.003
Final Professional	3.603	-0.019	7.225	0.023	0.023	0.051

Stepwise regression analysis was done by using various combiQations of the predictor's vis- a- vis SSC marks. HSC marks and IBA test scores. When all the three predictor variables were combined significant effect was seen from first through the professional exam with nonsignificant effect on the

final professional marks (table 6).

Table 6. Combined Effect of IBA test score, SSC (Matric) and HSC (Intermediate) results for prediciting academis performance in Professional exams.

The dependent variable	Anova F	P-value for F	R	R-square	Adjusted R-square	Std. Error of the estimate
First Professional	2.785	0.043	0.221	0.049	0.031	95.41
Second Professional	2.847	0.039	0.224	0.050	0.032	41.38
Third Professional	3.163	0.026	0.235	0.055	0.038	51.13
Final Professional	1.399	0.245	0.159	0.025	0.007	166.42

In first through professional as can be seen by R-square estimates almost 50% of the variation in the results that can be explained on the basis of these three predictors combined. A model using SSC and HSC scores was utilized to predict academic performance and the results detected no significant effect on any of the professional examinations. When a fixed model was used to predict academic performance using IBA test and HSC marks combined, it discovered a significant effect on the results of first second and third professional marks. This effect was significantly more that the predictive ability of IBA test and HSC marks alone (table 7).

Table 7. Predictive ability of IBA test score combined with HSC for academic performance in professional exams.

The dependent variable	Anova F	P-value for F	R	R-square	Adjusted R-square	Std.error of the estimate
First Professional	3.562	0.031	0.205	0.042	0.030	95.47
Second Professional	3.528	0.032	0.204	0.041	0.030	41.44
Third Professional	4.648	0.011	0.232	0.054	0.42	51.01
Final Professional	2.111	0.124	0.159	0.025	0.013	165.90

Although the results of IBA test alone were significantly predicting performance in first through third professional exams but when combined with HSC this was enhanced. Whereas the HSC marks alone were not predicting significant effect on the professional exam scores of the medical graduates (Table 4.5,6 and 7).

Discussion

Although these results are from one college with a small number of students, nevertheless the experience of one college with four batches of students is valid for comparison. The SSC exam was not positively related to the academic performance as was seen in previous studies internationally[2-4]. The SSC is significantly related to the HSC scores as the tutors, teaching learning methods. curriculum and the assessment techniques are similar. Whereas neither the SSC nor the HSC results significantlv correlated with the IBA.s medical college admission test. that is again in conformity with the international studies[3-5].

The IBA result did significantly correlate with the second and third professional marks and not with the final professional marks as observed in other international studies[6-8]. However when IRA test results were combined with SSC and HSC scores the predictive ability of academic achievement for the first second and third professional scores became more significant. This is because the learning in the first four years of medical college in Pakistan is based on factual information and recall and SSC and HSC test recall of the students. This same effect was not seen for the final professional scores probably because this examination also has long and short cases and viva voce, which to a certain extent measure the problem solving abilities of the students.

These results show that IBA test is a good predictor of performance for the first to the third year professional examinations of medical college. At the same time if HSC marks are given adequate

weightage then the predictive ability is enhanced but only for the first second and third professional examinations. It may be assumed that in the final year examinations, probably the assessment instruments have test items with higher level of cognition. If that is the case then besides the present criteria ofadmitting students to medical colleges another method should be added which tests critical, skill learning and problem solving abilities of the entering medical graduates as has been tried internationally[12,13]. As the medical practitioner of tomorrow not only needs to be cognizant of health problems but should also have the skills to solve, manage and prevent these problems. In addition to skills of management. the future doctor should also have the attitude of a humane and empathetic health professional capable of working with a multi-professional team.

It is concluded that IBA test with weightage given to HSC marks can predict academic performance for the first three professional examination but does not predict the student performance in the final year. Hence for selecting the medical students besides the cognitive test the medical student's admission criteria should also include non-cognitive assessment methods inclusive of learning abilities fbr selecting the most suitable candidates.

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