Selection of students for admission to a medical school in Sri Lanka

NR de Silva[1], A Pathmeswaran[2] and **HJ de Silva[3]**

(Index words: Achievement, admission criteria, undergraduate medical education)

Abstract

Objectives To assess the extent to which selected entry point factors predicted success in a Sri Lankan medical school.

Methods The study sample consisted of all students in two consecutive entry cohorts. Marks obtained at the national university entrance examination in physics, chemistry, botany and zoology; the aggregate marks of these four subjects (the only academic criterion used in selection); the district of entry (the other, non-academic criterion); and gender, were identified as entry point variables. Success in a medical school was measured in five ways, including whether a student had passed all examinations in the medical faculty at first attempt or not. Multiple logistic regression was used to assess the extent to which the selected entry point factors could predict variability in outcome measures.

Results Of 331 students, 6.6% were merit quota admissions, and 19.4% were from 'underprivileged' districts; 46.8% were women. Of the entry point factors, being female and obtaining an aggregate of ≥280 (of a possible 400) were the only independent predictors of success in all outcome measures. Obtaining at least grade B in zoology was also an independent predictor of passing all examinations at first attempt. The aggregate score alone accounted for only 2–5% of variance in a medical school performance. There was no association between admission from an underprivileged district and any of the outcome measures.

Conclusions The one and only measure of academic performance used for selection of students admitted to our medical schools, is a very weak predictor of success in a medical school.

Introduction

Competition for admission to medical schools in Sri Lanka is intense [1]. The cost incurred by the state in training medical students is high. Local students do not pay any tuition fees and only a nominal fee for hostel accommodation. The majority are supported by state-funded bursaries. Competition for admission makes it essential that selection criteria are applied fairly, but justification of public expenditure also demands that selection criteria be demonstrably related to success on the medical course, with minimal drop-out and failure rates.

The annual selection of 850–900 new entrants to the six state medical schools in Sri Lanka is centrally administered, with a policy that has remained basically unchanged for several decades. Selection is based on two

[1]Department of Parasitology, [2]Department of Community and Family Medicine, [3]Department of Medicine, Faculty of Medicine, University of Kelaniya, Sri Lanka.
Correspondence: NR de S, *e-mail: <nrdes@sltnet.lk>* *(Competing interests: none declared). Received 23 March 2004 and revised version accepted 25 May 2004.*

criteria, one academic and the other non-academic. Academic ability is measured by a single score derived from marks in designated subjects at the national General Certificate of Education Advanced Level examination (GCE A level). The single non-academic criterion is the student's district of residence, intended to give students from less developed areas a fairer chance of entry to a medical school. At present, 40% of seats are awarded on the sole basis of the GCE A level aggregate score ('merit quota'), and 55% is divided among the 25 districts of Sri Lanka. The balance 5% is reserved for 13 'educationally underprivileged' districts. Selection of these 'district quota' students is made on a combination of the district of residence and GCE A level marks. Students are allowed up to three attempts at the GCE A level examination for university admission, and no distinction is made between those taking the examination for the first, second or third time.

A recent meta-analysis of factors associated with success in medical schools in many countries found that previous academic performance is a good, but not perfect predictor of achievement in medical training [2]. The investigators reported that previous academic performance (including medical college admission tests, GCE A level, and grade point average) accounts for 23% of the variance in performance in undergraduate medical training.

Previous studies of the relationship between the GCE A level aggregate score and performance in medical school in Sri Lanka, have yielded conflicting results. In one study, only 20% of students admitted to the Peradeniya medical faculty, with GCE A level score less than 200 (of a maximum possible 400), were found to pass the first examination in the medical school at first attempt and 50% of students who failed to complete this exam even at the third attempt had a score of 200 or less [3]. Others found the correlation between GCE A level aggregate score and performance in the first examination in the medical school to be weak; the correlation declined further for subsequent examinations [4]. The latter study also found that students admitted to a medical school on the basis of their first or second attempt at the GCE A level performed significantly better in medical schools than those admitted at their third attempt.

We did this study to examine the effectiveness of measurable entry point factors as predictors of success with regard to students in our medical school. We considered not only the current selection criteria, but also other measurable factors such as performance in individual GCE A level subjects and the student's gender.

Methods

Study sample

The study sample consisted of all students who were admitted to our medical school in two consecutive years. Cohort 1 appeared in their GCE A level examination in 1994, were registered as students in 1997 and graduated in 2002. Cohort 2 appeared in their A level examination in 1995, registered in 1998 and graduated in 2003.

Entry point factors

Marks obtained by each student at the GCE A level examination in physics, chemistry, botany and zoology, were obtained from the Department of Examinations. For the purpose of this study, marks of each subject were classified as follows: A=75–100; B=65–74; C=50–64; D=35–49. When these cohorts were selected for medical school admission, the aggregate of the four subject marks was used as the single indicator of academic ability. Data regarding the admission quota and district of residence of each student were obtained from the University Grants Commission. Records on whether an individual student's admission was based on the first, second or third attempt at the GCE A level were not available at either the Department of Examinations or the University Grants Commission.

Outcome measures

Our MBBS course is based on a traditional, discipline based curriculum. After the first five terms students take the 2nd MBBS examination, which consists of anatomy, physiology and biochemistry. Students cannot go to the third year of study until they have passed all the three subjects. At the end of the third year, students take the 3rd MBBS (Part I) examination (microbiology, parasitology and forensic medicine); and at the end of the fourth year, the 3rd MBBS (Part II) examination (pathology, pharmacology and community and family medicine). Students cannot go on to the final year of study until they have passed these subjects. The final MBBS examination, at the end of the fifth year, consists of medicine (including psychiatry), surgery, paediatrics and obstetrics and gynaecology. Classes are awarded to students who pass all subjects and obtain an average mark of at least 60% in their first attempt at any of these three examinations. The results obtained by each student in the the first attempt at the 2nd, 3rd and final MBBS examinations, as well as data on whether students who were referred in any subject fell behind their entry cohort, were obtained from the Dean's office.

Correlation of predictors and outcome measures

To examine the relationship between entry point factors and performance in medical school, we dichotomized examination results in several ways. With regard to the GCE A level, students were dichotomised according to whether they had an aggregate mark of >280 (of a maximum possible 400, and equivalent to two As and two Bs) in the GCE A level or not. Since data analysis showed that the average marks in physics and zoology were less than the average marks in botany and chemistry, students were also dichotomised according to their obtaining at least grade B in physics or zoology; and obtaining grade A in botany or chemistry.

Five outcomes were used as a measure of success in the medical school. First, students were dichotomised according to whether they passed the 2nd MBBS examination at first attempt or not, and whether they passed the

2nd MBBS examination with a class or not. Next, students were dichotomised according to whether they passed the final MBBS examination at first attempt or not; or passed the final MBBS examination with a class or not. Finally, the results of the 2nd, 3rd and final MBBS examinations were considered together, to compare students who passed all examinations at the first attempt with those who were referred or failed in one or more examinations.

Multiple logistic regression was carried out using the aforementioned five outcome measures in relation to GCE A level results, along with gender, year of examination, and district of admission, as predictors of performance in the medical school. The proportion of variation in the outcome that was accounted for by the predictors was assessed using the Nagelkerke R^2 statistics. Data entry was done on MS Excel and analysis on SPSS Version 10.

Results

There were 331 students in the study sample: 183 students in Cohort 1 and 148 in Cohort 2. Table 1 compares the entry point factors in the two cohorts. Although the GCE A level aggregate scores were not significantly different in the two cohorts, there were significant differences in the physics, botany and zoology marks, as well as in the proportion admitted on the 'merit quota'. Only 22/331 students (6.6%) had been admitted on the 'merit quota'. The study population included students from 14 districts; 65 (19.6%) were from five 'educationally underprivileged' districts. Performance at medical school examinations was not significantly different between the two cohorts (data not shown). Both cohorts had an approximately equal sex ratio. GCE A level aggregate scores were not significantly different between the sexes, but as shown in Table 2, performance in the medical school was significantly different.

Table 1. **Entry point factors in the two student cohorts**

Entry point factors	*Cohort 1 (n=183)*	*Cohort 2 (n=148)*	*Statistics*
M:F ratio (% males)	101: 82 (55.2%)	75: 73 (50.7%)	$Chi^2 = 0.67$, p=0.41
Physics marks: mean (SD)	59.5 (6.6)	63.9 (6.7)	Kruskal Wallis H = 34.6, p<0.001
Chemistry marks: mean (SD)	72.7 (7.1)	73.3 (5.1)	Kruskal Wallis H = 0.016, p=0.899
Botany marks: mean (SD)	70.5 (4.6)	77.5 (3.8)	Kruskal Wallis H = 147.3, p<0.001
Zoology marks: mean (SD)	71.9 (4.1)	62.4 (4.5)	Kruskal Wallis H = 192.3, p<0.001
AL aggregate score: mean (SD)	274.6 (13.3%)	276.9 (10.4%)	Kruskal Wallis H = 2.7, p=0.1
AL aggregate score >280	73/183 (39.9%)	57/148 (38.5%)	$Chi^2 = 0.07$, p=0.79
'Merit quota' admissions	17/183 (9.3%)	5/148 (3.4%)	$Chi^2 = 4.6$, p = 0.03
'Underprivileged district' admissions	37/178 (20.8%) (5 districts)	26/147 (17.7%) (2 districts)	$Chi^2 = 0.49$, p=0.48

Table 2. **Medical faculty examination results by gender**

	Women	*Men*	*Total*
2nd MBBS examination	n=155	n=176	n=331
Passed with first or second class honours (%)	45.2	33.5	39.0
Ordinary pass (%)	31.0	29.0	29.9
Referred or failed (%)	22.5	34.1	28.7
Fell behind entry cohort (%)	1.3	3.4	2.4
Final MBBS examination	n=151	n=156	n=307
Passed with first or second class honours (%)	39.1	19.2	29.0
Ordinary pass (%)	43.7	42.9	43.3
Referred or failed (%)	15.9	32.1	24.1
Fell behind entry cohort (%)	1.3	5.8	3.6
Overall performance	n=155	n=176	n=331
Passed all examinations with honours (%)	25.1	13.6	19.0
Ordinary pass at all examinations or honours pass in only one or two examinations (%)	34.2	21.6	27.5
Referred or failed in one or more examinations (%)	36.8	47.7	42.6
Fell behind entry cohort (%)	3.9	17.1	10.9

Only 46.5% (154/331) students passed all medical school examinations at their first attempt. Academic difficulties caused about 10% of students to fall behind their entry cohort at some point, so that their stay in medical school was extended by at least another year. Multiple logistic regression showed that of the entry point factors, being a woman, and obtaining a GCE A level aggregate score of >280 were the only independent predictors of all five measures of success used in this analysis (see Table 3). Obtaining at least grade B in zoology was also an independent predictor of passing all examinations at the first attempt, and in obtaining a class at the 2nd MBBS examination.

Different models were constructed to assess the extent to which variables measured at the point of entry could predict performance in the medical school. In the model that gave the highest correlation, three predictors (gender, zoology and GCE A level aggregate score) accounted for 22% of variation in the outcome as measured by passing all examinations at first attempt (Table 3). Construction of the model for this outcome measure without the GCE A level aggregate score reduced the correlation coefficient from 0.22 to 0.17, i.e. the GCE A level aggregate score alone accounted for only 5% of variation in the outcome. Neither district nor year of admission showed a significant association with any of the measures of success, but all the models included them in order to adjust for these two factors. There was also no significant association (positive or negative) between admission from an underprivileged district and any of the measures of success in the medical school.

Discussion

The GCE A level aggregate score, used as the only measure of academic performance for medical school admission in Sri Lanka, appears to be a weak predictor of performance in a medical school. It has a much lower predictive value (accounting for only 2–5% of variability in medical school performance) than the 23% found in the meta-analysis carried out by Ferguson et al. [2]. Our results indicate that it may be possible to improve the predictive value of previous academic performance by taking individual subject marks (e.g. zoology) into consideration. Analysis of academic predictors of success on the Nottingham undergraduate medical course also found that a high grade at A-level biology predicted success at their final examination [5]. However, it must be noted that less than 10% of our students were 'merit quota' admissions, resulting in underrepresentation of medical students with the highest GCE A level aggregate scores. Restriction in the range of this variable could have reduced its predictive value. It is also possible that our GCE A level is a poorer measure of the academic abilities required of medical students, than those used in other countries.

Of the four GCE A level subjects, we found that a good grade in zoology was a significant predictor of consistent success in a medical school. This may be because zoology lays a foundation for the subjects studied in a medical school, and also because the highest variation in subject marks was seen with zoology (see Table 1). It is possible that the lack of variation in the marks in other

Table 3. **Significant independent predictors of success after adjusting for district and year of admission**

Criteria of Success	*Predictor*	*Odds ratio*	*(95%CI)*	*Nagelkerke R^2**
Passed 2nd MBBS at first attempt (228/331, 69%)	Women	2.3	1.3–3.9	
	Aggregate 280 and over	2.0	1.0–4.4	
				0.19 (0.17)
First or second class in 2nd MBBS (129/331, 39%)	Women	1.9	1.2–3.2	
	Aggregate 280 and over	2.1	1.1–4.2	
	OR			0.18 (0.16)
	Women	2.2	1.3–3.7	
	At least grade B in physics	2.1	1.2–3.7	
	At least grade B in zoology	2.5	1.2–5.0	
				0.20 (0.16)
Passed final MBBS at first attempt (222/331, 67%)	Women	3.6	2.0–6.5	
	Aggregate 280 and over	2.2	1.0–4.9	
				0.18 (0.16)
First or second class in final MBBS (89/331, 27%)	Women	3.4	1.9–6.1	
	Aggregate 280 and over	3.3	1.5–7.2	
				0.22 (0.18)
Passed all exams at first attempt (154/331, 46.5%)	Women	2.7	1.6–4.4	
	At least grade B in zoology	2.5	1.2–5.1	
	Aggregate 280 and over	1.9	1.0–3.7	
				0.22 (0.17)

*Nagelkerke R^2 values are given for the final models. Values within brackets are for models without the A-level marks.

subjects prevented them from being effective outcome predictors.

The systematic review [2] also found, as we did (see Table 2), that women tended to perform better than men in their medical training. Among our students, we found that women were almost three times as likely as men to consistently pass all examinations in the medical school at first attempt, whereas having a GCE A level aggregate score of >280 only doubled the likelihood of this achievement (Table 3). This reinforces the results of a previous study on an earlier cohort of students in our medical school [6].

Non-availability of data prevented assessment of two factors that could be of importance as predictors of success in medical schools: number of attempts at the GCE A level examination and proficiency in English. The latter is likely to be of importance because all teaching in medical schools is conducted in English, whereas almost all our students had their secondary education and GCE A level examination in Sinhala or Tamil.

Identification of reliable predictors of performance in medical schools is important. It has even been suggested that if 'right' candidates are selected, the majority will become good doctors regardless, or even in spite of, what they are subjected to in their undergraduate programme [7]. At present, progress through medical school appears to be a difficult process for our study population, involving several re-sits for over half the students. Academic difficulties cause about 10% of students to fall behind their entry cohort, and to repeat an extra year. These findings may be applicable to other medical schools in Sri Lanka because students are selected through the same process. However, we recommend a more comprehensive study, which should include the number of attempts at the GCE A level examination and students admitted to all six medical schools, which may suggest means of improving current selection criteria.

Acknowledgements

We thank the Commissioner General of Examinations and the Chairman, University Grants Commission, for granting permission for release of data from their respective institutions; Mr. Sanath Pujitha, Mr. Tissa Nandasena and Ms Chandrika Godage for providing us with relevant extracts from their databases. We acknowledge with thanks the assistance provided by the late Prof. S Rupasinghe of the Faculty of Education, University of Colombo.

References

1. Rupasinghe S. Is the GCE (AL) Bioscience stream a dead end to many? An analysis of education opportunity in the Bioscience stream. *Ceylon Journal of Medical Sciences* 2002; **45:** 13–24.

2. Ferguson A, James D, Madeley L. Factors associated with success in medical school: systematic review of the literature. *British Medical Journal* 2002; **324:** 952–7.

3. Amerasinghe DM, Basnayake V. Student performance at the second examination for medical degrees in the Faculty of Medicine at Peradeniya, related to the GCE (A level) selection process. *Proceedings of the Kandy Society of Medicine Annual Sessions* 1987; **10:** 66–8 (abstract).

4. Senanayake N, Weerasinghe V. Does the advanced level aggregate score reflect subsequent performance of a student in the medical faculty? *Proceedings of the Kandy Society of Medicine Annual Sessions* 1996; **19:** 38 (abstract).

5. James D, Chilvers C. Academic and non-academic predictors of success on the Nottingham undergraduate medical course 1970–1995. *Medical Education* 2001; **35:** 1056–64.

6. de Silva NR, Thabrew MI, Saparamadu PAM, Jayawardena DKRC, Aarachchige AA, et al. Gender differences in undergraduate medical examination results in Sri Lanka. *Ceylon Medical Journal* 2000; **45:** 119–22.

7. Searle J, McHarg J. Selection for medical school: just pick the right students and the rest is easy! *Medical Education* 2003; **37:** 458–63.