THE 'A' LEVEL AGGREGATE AND MEDICAL SCHOOL EXAMINATION PERFORMANCE

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SUMMARY

The value of A level results as predictive indices of likely performance in the various professional examinations taken by undergraduate medical students has been investigated. Performance in the MB II, MB III and Part II examinations was found to correlate closely with the A level aggregate attained. Students with the best A level aggregates achieved significantly better results in these examinations than those with weaker aggregates, ($p < 001$, $p < 0.001$ and $p < 0.01$) respectively. In contrast, no significant correlation was found with the Part I examination results.

INTRODUCTION

Medical schools, traditionally, have recognised the importance of academic aptitude in selecting medical students. In line with trends elsewhere, admission of students to the University of Ghana Medical School has been determined almost exclusively on the results achieved at the A level examination or its equivalent. In recent years only those students with an A level aggregate score of 9 or less have been called for interview. However, in view of the increasing number of applicants with good A level results, the chances currently of gaining admission with an aggregate of even 8 are quite slim. Pre-admission academic predictors have been extensively studied in relation to satisfactory performance both in medical school and in residency[1,2]. If performance in the A level examination is virtually the sole criterion upon which the students' aspiration to become a doctor rests, it is pertinent to determine the reliability of the A level aggregate as a guide to performance in the Ghana Medical School course. Do those students with the best aggregates fare any better than those with more modest achievements? In order to address this question, students' performances in the various major examinations leading to the award of the MB, Ch B Degrees were analysed. This paper presents the results of these analyses.

MATERIALS AND METHODS

The initial stimulus for carrying out these studies was to test the correlation between the A level performance in chemistry and the students' subsequent performance in biochemistry[3]. Records of students admitted to the Medical School since 1976 only were studied, since one investigator had ready access to the MB II biochemistry examination data for all years from 1977 onwards. The study subsequently was extended to analyze student performance data in respect of all major examinations i.e. the MB II, MB III and Final Part I and II examinations.

In analysing the A level data, the aggregates were categorised into 4 groups. A high performance group including individuals with A level aggregates from 3 to 5, two intermediate groups corresponding to aggregates 6 or 7 and 8 or 9 respectively and a low performance group corresponding to aggregate 10 and above. (It has to be noted that, although students with such low aggregates currently have virtually no chance of admission to the Medical School, in pervious years a substantial number gained admission).

The performances of students in any of the several examinations were classified into one of four groups according to their examination result, viz., pass with distinction or credit, pass, referred or failed. Furthermore, in analysing the Part II examination data, the actual marks obtained in each of the three subjects examined (medicine, surgery and community health) were used to categorise the students into 5 groups, based upon their performance in each subject, viz: group 1, a mark of 65 or better (distinction or credit), group 2, marks ranging from 60 to 64, group 3, marks ranging from 55 to 59, group 4, marks ranging from 50 to 54 and group 5, a mark below 50 (failure). The scores for each of the three subjects were then combined and grouped into three classes, those with combined scores between 6 and 9, those between 10 and 12 (excluding a score of 5, i.e., a failed score and those with scores greater than 12 (inclusive of any with better totals but which include a score of 5. The chi-square test was used to test the hypothesis that A level performance and performance in the major Medical School examinations are independent.

In analysing the Part I examination data, the numbers failing or referred were combined to give a 4 x 3 contingency table. Analysis of the data derived from the Final Part II examination results, when tested by means of a 4 x 3 contingency table, yielded expected values of less than 5 in several cells. Therefore, the numbers of distinctions, credits and ordinary passes were combined as also were the numbers for those failing or referred, thus reducing the data sets to a 2 x 4 contingency table.

RESULTS

The relationship between the MB II examination results and the pre-admission A level aggregates of 608 students writing the MB II examination between 1977 and 1988 is shown in Table 1. Similar relationships between the MB III, Final Part I and Final Part II examination results and the A level aggregates for 403,354 and 307 students respectively are shown in Tables 2, 3 and 4. The number of credits and distinctions and failures recorded in all subjects examined at the four professional examinations are given in Table 5, whilst Table 6 shows the relationship between the combined Final Part II score and the A level aggregate. The various data sets tested and the chi-square values yielded from appropriate null hypothesis testing of these data are given in Table 6. The contingency table format used is shown and also, where appropriate, the major contribution(s) to the overall value of X^2.

DISCUSSION

The M.B. II Examination

Chi-square analysis of the MB II examination results (Table 1) showed conclusively that the performance of students in the MB II examination correlates closely with their performance at the A level examination ($X^2 = 70.203$, $p < 0.001$).

The largest contribution to the total X^2 comes from the results obtained by those students with the best performance at the A level examination. Among 111 students who obtained a pass with credit or distinction, 48, more than twice the expected number (25.4), were students with A level aggregates ranging from 3 to 5 ($X^2 = 20.168$). Among 139 students who had A level aggregates ranging from 3 to 5, only 14 failed or were referred at the MB II examination, less than one third of the expected number (46.6, $X^2 = 22.80$).

Among the 204 students who either failed or were referred, 131 (64.2%) had A level aggregates above 7. Of the 90 students with A level aggregates of 10 or worse, 43 (47.8%) failed or were referred. Clearly the weaker students, as adjudged by their A level results, also perform less well at the MB II examination. This comes as no surprise as this examination in basic sciences is the most academically rigorous in the medical school curriculum and the value of pre-admission academic variable as moderately good predictors of preclinical performance has been cited previously[4,5].

The M.B III Examination

The results of the MB III examination, when analysed, tell a similar story to that of the MB II. Chi-square analysis of the results for 403 students (Table 2), yields value of 27.044 ($p < 0.001$). As with the MB II results, the largest contribution to the overall X^2 value comes from the results obtained by those students (98) with A level aggregates between 3 and 5. Among these, 29 (29.6%), almost twice the expected number (15.6) gained a credit or distinction ($X^2 = 11.601$). Six candidates only were referred, less than half of the expected number (14.3), whilst 6, approximately the expected number, failed the examination. Among the 88 students failed or referred, 48 (54.5%) had aggregates above 7, a considerably lower proportion than that found in the MB II examination.

TABLE 1: RELATIONSHIP BETWEEN THE MB II EXAMINATION RESULTS FOR 608 STUDENTS AND THEIR "A" LEVEL AGGREATES

"A" Level Aggregate	No.	Credit or Distinction	Passed	Referred	Faield
3 - 5	139	48 (34.5) *	77 (55.4)	9 (6.5)	5 (3.6)
6 - 7	186	34 (18.2)	93 (50.0)	33 (17.7)	26 (14.0)
8 - 9	193	21 (10. 9)	84 (43. 5)	52 (26.9)	36 (18.7)
10+	90	8 (8.9)	39 (43.3)	25 (27.8)	18 (20.0)

* Percentage given in parentheses

TABLE 2: RELATIONSHIP BETWEEN THE MB III EXAMINATION RESULTS FOR 403 STUDENTS AND THEIR "A" LEVEL AGRREGATES

"A" Level Agrregate	No.	Credit or Dostinction	Passed	Referred	Failed
3 - 5	98	29 (29.6)*	57 (58.2)	6 (6.1)	6 (6.1)
6 - 7	122	20 (16.40	74 (60.7)	21 (17.2)	7 (5.7)
8 - 9	129	12 (9.3)	84 (65.1)	22 (17.1)	11 (8.5)
10 +	54	3 (5.6)	36 (66.7)	10 (18.5)	5 (9.2)

* Percentage given in parentheses.

The Final Part I Examination

Analysis of 354 Final Part I examination results (Table 3) afforded an interesting if somewhat surprising result. The result yielded a X^2 value of 7.037, a non significant value. The conclusion then that can be drawn from the available Part I results is that the students' performance in this examination and attainment at the A level examination are independent of each other. The good correlation found in the case of the preclinical and paraclinical subject examination is entirely lacking. We may speculate as to why this should be so. The subjects examined in the Part I examination are obstetrics/gynecology and

paediatrics. Whilst academic ability is an important factor determining achievement in clinical sciences, other factors also have been shown to have a strong influence on performance. One personal attribute which has been identified as being of importance in this context is the degree of introversion/extroversion. Introversion particulary favours achievement in the basic science subjects whereas extroversion is a desirable characteristic favouring achievement in clinical sciences[6]. The latter probably reflects the importance of skill in personal communication between the student and examiner and also between student and patient. It will be of interest to try to identify what other qualities play a significant role and to devise some means of quantifying them in order to test other hypotheses.

The Final Part II Examination

Analysis of the Final Part II examination results for 307 students (Table 4), when tested by means of a 2 x 4 contingency table, yielded a chi-square value of 12.154, a result which again is significant ($p < 0.01$). This time, the largest contribution to X^2 is not due to differences between the numbers of students gaining distinction or credit but rather comes from the difference between the observed and expected number of candidates with A level aggregates of 3 to 5 who failed or were referred in the Part II examination. None of these candidates failed and only 2 were referred, far fewer than the expected number (10.2, $X^2 = 6.594$). The finding of significantly superior performance by those with the best A level results is in accord with the findings from the MB II and MB III examinations. However, it is worth noting also that among those candidates with the poorest A level grades, there was only a single failure. Whilst academic ability is always likely to be an important determinant of success in any examination, it would seem that it may not necessarily be the principal factor involved in achieving success in the clinical subject examinations.

Open or Close Marking

It was clearly evident from the various data analyses carried out that there is a large discrepancy between the number of credits and distinctions awarded by the preclinical and paraclinical departments when compared with the clinical departments. The percentage of students achieving a credit pass or better in the basic science subjects examined at the end of the preclinical course ranges from 6.6 to 11.0% (mean = 8.8%) and in the paraclinical subjects ranges from 5.0 to 9.5% (mean = 7.9%). In the Part I examination the range is considerably lower, 1.9 to 2.7% (mean = 2.3%). In the Part II examination the range is even lower, from only 0.03 to 1.1% (means = 0.4%).

It seems illogical that so many students who perform well in the basic and paraclinical sciences are unable to do so well in the clinical subjects. What could be the reason for this? Could it be that those students with the best academic ability do not necessarily have the aptitude required to achieve success in clinical subjects? This may or may not be so. What is clear is that hardly any of the students, regardless of their academic abilities, are measuring up to the standards expected by the clinical departments for the award of a pass with credit or distinction.

Applying the scoring criteria used for classifying students' performances in medicine, surgery and community health, we find that only a single student, from a total of 307, had a combined Part II score better than 6. Chi-square analysis of the reclassified data yielded a value of 22.921 ($p < 0.001$) providing further confirmation that performance at the Part II examination is not independent of the A level aggregate. Among 54 students who had A level aggregates between 3 and 5, 25 (46.3%) had combined Part II scores between 6 and 9, almost twice the expected number (14.1, $X^2 = 8.491$). In fact, as is the case in the pre- and paraclinical subjects, it is the better students academically who achieve the best marks in the Part II examination, although

TABLE 3
RELATIONSHIP BETWEEN THE FINAL PART I EXAMINATION RESULTS FOR 354 STUDENTS AND THEIR "A" LEVEL AGGREGATES

"A" Level Aggregate	No.	Credit or Distinction	Passed	Referred	Failed
3 - 5	79	4 (5.1) *	72 (91.1)	3 (3.8)	0 (0.00)
6 - 7	111	5 (4.5)	91 (82.0)	14 (12.6)	1 (0.09)
8 - 9	114	7 (6.1)	98 (86.0)	8 (8.0)	1 (0.09)
10+	50	1 (2.0)	43 (86.0)	5 (10.0)	1 (2.0)

TABLE 4
RELATIONSHIP BETWEEN THE FINAL PART II EXAMINATION RESULTS FOR 307 STUDENTS AND THEIR "A" LEVEL AGGREGATES

"A" Level Aggregate	No.	Credit or Distinction	Passed	Referred	Failed
3 - 5	54	3 (5.6)	49 (90.7)	2 (3.7)	0 (0.0)
6 - 7	92	2 (2.2)	74 (80.4)	15 (16.30	1 (1.1)
8 - 9	113	2 (1.8)	82 (72.6)	25 (22.1)	4 (3.5)
10+	48	0 (0.0)	37(77.1)	10 (20.8)	1 (2.1)

TABLE 5
CREDITS OR DISTINCTIONS AND FAILURES RECORDED IN ALL SUBJECTS EXAMINED AT THE MB II, MB III, FINAL PART I AND FINAL PART II EXAMINATIONS

Examination	Subject	No. of Candidates	Credit or Distinction	Failed
MB II	Anatomy Biochemistry Physiology	654	58 (8.9)* 72 (11.00) 43 (6.6)	132 (20.2) 148 (22.6) 94 (14.4)
MB III	Microbiology Pathology Pharmacology	422	40 (9.5) 39 (9.2) 21 (5.0)	36 (8.5) 35 (8.3) 69 (16.3)
Part I	Obstetrics Gynaecology Paediatrics	371	10 (2.7) 7 (1.9)	23 (6.2) 15 (4.0)
Part II	Medicine Surgery Community Health	324	1 (0.03) 2 (0.06) 5 (1.5)	28 (8.6) 23 (7.1) 19 (5.9)

* Perecentage given in parentheses.

TABLE 6:
SUMMARY OF RESULTS OF CHI-SQUARE DATA ANALYSIS BY MEANS OF CONTINGENCY TABLES

Examination Results Tested	Contingency Table	X^2	P	d.f
M B II	4 x 4	70.203 (22.800)* (20. 108)	< 0.001	9
MB III	4 x 4	27.044 (11.601)	< 0. 001	9
Final Part I	3 x 4	7. 037	N S	6
Final Part II	2 x 4	12.154 (6. 594)	< 0. 01	3
Final Part II (Combined Scores)	3 x 3	22.921 (8.491)	< 0. 001	4

*major contribution(s) to the overall value of X^2 given in parentheses.

generally they are not considered to be credit material.

One possible explanation for this state of affairs could be that the clinical departments are using a system of "modified close marking" of students rather than the open marking which is used in the basic sciences and paraclinical departments. Close marking systems work well enough when the question asked is simply "should the candidate pass or fail?" Close marking however, necessarily compresses the overall marks and it becomes more difficult for the good candidate to rise above the common herd. At the same time, the candidate who may be notoriously weak is rewarded with a marginal failure which does not reflect the true situation.

Not withstanding the relative merits of open or close marking systems, our study has shown clearly that academic excellence, as adjudged by students' performance in the A level examination, is, in general, well correlated with performance in Medical School examinations. The A level aggregate is seen to be a reliable indicator of a student's likely ability to cope successfully with the arduous programme of work which constitutes the course leading to the medical degrees. This is a comforting thought, especially for those whose task it is to select the privileged few who will gain admission to the Medical School each year from among the many qualified applicants.

Medicine is a science. However, it is also an art. A matter of great concern to many people is the question of whether, having selected students of high academic excellence to be trained as doctors, those students really turn out to be good doctors in future practice. What or who is a good doctor? What are the most important qualities we should look for in a good doctor? Expectations of the medical profession expressed by governments, patients, health administrators, sociologists and social commentators, allied health professionals and doctors themselves have been identified[7]. In summary, the doctor is expected to be able to develop an effective relationship with his/her patient, should be technically competent and should also display good professional, social and economic responsibility. The opinion is frequently voiced that the best doctors are generally but not always, not those of great academic prowess. Academic excellence per se is not a sufficient guarantee, indeed, there are some who suspect that a negative correlation is more likely to be found between high academic achievement and "success" in clinical practice as judged from the patient's point of view. Are we producing the doctors we deserve? This question should concern all of us. An attempt to answer this leading question will constitute the next phase of our studies.

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