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Factors affecting performance of first year medical students in Bhopal, India

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ABSTRACT

There has been a rapid growth of private medical colleges with wide disparity in student performance. We tried to identify the weak performers and their difficulties early in the academic year. 57 male and 78 female 1st MBBS students appeared for a part completion test and answered a questionnaire on factors that may affect performance. The marks scored by the students were compared in three categories of attendance (good, moderate and poor) and two categories of the other factors. There was significant difference in marks with respect to attendance (One way ANOVA. F statistic was 7.8 with $p < 0.01$). Multiple group comparison showed there was significant difference only between students with good and poor attendance ($p < 0.01$). 76.1% of the students with good, 71.4% of the students with moderate, but only 42.1% of the students with poor attendance could score more than 75% marks. ($p < 0.05$). Two independent sample t test showed that categories scoring better marks were females ($p < 0.01$), younger age group ($p < 0.05$), better pre-admission caliber ($p < 0.05$) and satisfactory English comprehension ($p < 0.01$). The odds ratio was highest for females over males, followed by those with better English comprehension, younger age and better pre-admission caliber. Females and younger age showed significant association with pre-admission caliber. Multiple linear regression showed only female gender ($p < 0.001$) and English comprehension to be significant predictors of performance ($p < 0.05$). The difference in average marks of females compared to males was 3.023 and the difference in average marks of those with better to poorer English comprehension was 1.187. The study shows the changing social equation reflected by the superiority of female students. It emphasizes early identification of the difficulties of the weak performers.

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INTRODUCTION

The economic liberalization initiated by the Government of India in the nineties brought the private sector into the field of medical education. Government subsidy kept fees affordable but lack of government resources restricted the number of such colleges for India's enormous population. Post-liberalization, there has been a rapid growth in the number of private medical colleges in India [1]. Our institute is one amongst them. The rapid growth of private colleges has posed challenges in maintaining uniformity [2] and quality of education [3]. In our state, half the students in the private colleges are selected by an entrance exam (MPPMT) which is conducted by the state government. Fees of private colleges are approximately six times

that of the government colleges, hence students prefer government colleges. The remaining half of students admitted in private colleges are selected by a single entrance examination (DMAT) conducted by all the private dental and medical colleges of the state. Both entrance examinations require 50% marks in the qualifying XIIth board examinations. The Medical Council of India, under the Central Government, conducts regular inspections to ensure fulfilling of infrastructure and faculty requirements. Barkatullah University, under the state government, monitors the academic activities and examinations of the college. Two formative and one summative internal assessment examinations are held in an academic year to monitor

and prepare the students. Small group discussions are held to plug gaps in student knowledge. As students in the private colleges are mostly those who fail to find a place in the state funded government colleges, it is not unusual for them to have academic problems. However, the higher cost of education in these private colleges is expected to increase their motivational levels to overcome these problems. While that is true for some but overall there is wide disparity in student performance. Hence, we attempted to understand the reasons behind their varying performance. Association of student attendance with performance has been widely reported world over [4,5]. While investigating the same in our setting, we tried to identify some additional factors that could also be affecting the performance of the students [6].

MATERIALS AND METHODS

The study was carried out on 57 male and 78 female first term 1st MBBS students of 2012 batch at LN Medical College, Bhopal. The study was granted permission of the Institutional Ethical Committee and informed consent was obtained from the students.

The study was preceded by a series of eight lectures on amino acid and protein chemistry, plasma proteins and immunoglobulins. The study comprised of a part completion test of 25 marks on these topics along with a structured questionnaire asking for information about possible factors that may affect performance. The information collected, marks scored in the examination and attendance recorded in the eight lectures were analyzed by SPSS 16.

We divided the students into three groups based on attendance i.e. poor attendance (up to 50%), moderate attendance (51-75%) and good attendance (above 75%) in the lectures on the test topics. We saw the effect of attendance on marks by applying a one way ANOVA followed by a multiple comparison test with Bonferrini correction for comparisons of one group with another. A cross tab was done to see the distribution of students scoring more than 75% marks in the three categories of attendance. The strength of association between attendance and marks was tested by the Chi Square test.

Factors other than attendance that may also be affecting performance were analyzed by applying the student t test. The factors and their categories were - sex (female / male), age (teenager / older), pre-admission caliber (XIIth marks > 75% / XIIth marks < 75%), home location for studying homesickness (away from Bhopal / at or near Bhopal), English comprehension (satisfactory / not satisfactory), sitting preference-as an indicator of subject interest (front benches / not in front benches) , preclinical subject liked most -also as an indicator of subject interest (Biochemistry / not

Biochemistry) and mode of admission (MPPMT/DMAT) . We also looked at the odds ratios as a measure of association of these factors with good performance (marks> 75%).

Distribution of male and female students as well as distribution of teenage and older students in the significant categories was looked at applying a Chi Square to test the association.

A multiple regression analysis of average marks as the dependent variable and attendance as the independent continuous variable along with factors found significant by two independent sample t test as indicator covariates was done. The model fit was checked by the adjusted R square. The average change in marks for a unit change in attendance and the difference in marks between the categories of the indicator variables was measured by the regression coefficient.

RESULTS

The average attendance of the students was 86.23%, females 90.03% significantly more than males 80.67% ($p < 0.05$). There was significant difference in marks across the three categories of attendance (one way ANOVA-F statistic was 7.8 with $p < 0.01$). Multiple group comparison suggests that only students with good attendance scored significantly more marks than the students with poor attendance ($p < 0.01$). Comparison of the other groups (good with moderate and moderate with poor –attendance) did not show significant difference (Table 1). 76.1% and 71.4% of the students with good and moderate attendance respectively scored more than 75% marks, but only 42.1% of the students with poor attendance could score more than 75% marks (Table 2). Significant association was found between marks and attendance ($p < 0.05$).

The other factors apart from attendance which significantly affected student performance were gender, age, pre-admission caliber and English comprehension.(Table 3) Comparing mean marks in the two categories of each factor, females scored significantly more mean marks than males ($p < 0.01$), teenagers scored more than the older students ($p < 0.05$), students who did better in their qualifying XIIth board examinations did better in the test as well ($p < 0.05$) and students with satisfactory English comprehension did better than those who had language problems ($p < 0.01$). However, homesickness, preference for Biochemistry over other preclinical subjects, preference for sitting in front and mode of admission did not show significant difference. The odds ratio was highest for females over males, followed by those with better English comprehension, younger age and better pre-admission caliber (Table 4).

There was significant association of female gender with pre-admission caliber. ($p < 0.01$). However, males and females did not differ significantly in English comprehension or in age categories (Table 5).

There was significant association of younger age with pre-admission caliber. ($p < 0.05$). However, pre-admission calibre did not differ significantly with English comprehension (Table 6).

The multiple regression model with attendance, sex (female), XIIth performance ($>75\%$), English comprehension (satisfactory) and age (teenagers)

explained 37% of the variation in average marks (adjusted R square 0.37). There was significant positive correlation of marks with attendance (correlation coefficient 0.532, $p < 0.05$). However, attendance and age category (being teenager) were not significant predictors of marks ($p > 0.05$). Female gender ($p < 0.001$) and English comprehension ($p < 0.05$) were the two significant predictors of performance. The difference in average marks of females compared to males was 3.023 and the difference in average marks of those with better to poorer English comprehension was 1.187 (Table 7).

Table 1. Comparison of marks between groups with good, moderate and poor attendance

| Attendance | Mean difference | Standard Error | 95% confidence interval | p- value | Significance |
|------------------|-----------------|----------------|-------------------------|----------|-----------------|
| Good vs Moderate | 1.484 | .650 | -0.09 to 3.06 | 0.072 | Not Significant |
| Good vs Poor | 2.749 | .758 | 0.91 to 4.59 | 0.001 | Significant |
| Moderate vs Good | -1.484 | .650 | -3.06 to 0.09 | 0.072 | Not Significant |
| Moderate vs Poor | 1.265 | .890 | -0.89 to 3.42 | 0.473 | Not Significant |
| Poor vs Good | -2.749 | .758 | -4.59 to -0.91 | 0.001 | Significant |
| Poor vs Moderate | -1.265 | .890 | -3.42 to 0.89 | 0.473 | Not Significant |

Table 2. Distribution of marks for good, moderate and poor attendance

| Marks | Attendance | | | Total |
|-------------------|---------------|---------------|---------------|---------------|
| | Good | Moderate | Poor | |
| Marks $>75\%$ | 67 (76.1%) | 20 (71.4%) | 8 (42.1%) | 95 (70.4%) |
| Marks $\leq 75\%$ | 21 (23.9%) | 8 (28.6%) | 11 (57.9%) | 40 (29.6%) |
| Total | 88 (100%) | 28 (100%) | 19 (100%) | 135 (100%) |

Table 3 Comparison of marks in categories other than attendance by the student t test

| Factors | Groups | Mean Marks | Mean Diff | 95% CI | p-value | Significance |
|---------------------------|-------------------|------------|-----------|----------------|---------|--------------|
| Sex | Female | 17.13 | 2.91 | 1.95 to 3.88 | 0.001 | Sig |
| | Male | 14.21 | | | | |
| Age | Teenager | 16.36 | 1.82 | 0.58 to 3.06 | 0.004 | Sig |
| | Older | 14.55 | | | | |
| Pre-admission calibre | Marks $>75\%$ | 16.73 | 1.81 | 0.59 to 2.98 | 0.003 | Sig |
| | Marks $\leq 75\%$ | 14.92 | | | | |
| Home Location | Away | 16.17 | 0.52 | -0.68 to 1.71 | 0.392 | Not Sig |
| | At/near Bhopal | 15.65 | | | | |
| English comprehension | Satisfactory | 16.73 | 2.42 | 1.35 to 3.48 | 0.001 | Sig |
| | Unsatisfactory | 14.31 | | | | |
| Sitting preference | In front | 16.53 | 0.76 | -0.38 to 1.89 | 0.191 | Not Sig |
| | Behind | 15.77 | | | | |
| Preclinical subject liked | Biochemistry | 16.11 | -0.43 | -1.81 to 0.945 | 0.536 | Not Sig |
| | Other | 16.54 | | | | |
| Mode of admission | MPPMT | 16.53 | 0.90 | -0.65 to 2.15 | 0.141 | Not Sig |
| | DMAT | 15.63 | | | | |

Table 4. Comparison of performance in categories other than attendance by the odds ratio

| Factor | Category | Odds Ratio | 95%CI | p-value |
|---------------------------|----------------|------------|---------------|---------|
| Sex | Female | 5.31 | 2.37 to 11.88 | 0.001 |
| | Male | | | |
| Age | Teenager | 2.73 | 1.18 to 6.29 | 0.030 |
| | Older | | | |
| Pre-admission caliber | Marks>75% | 2.47 | 1.05 to 5.81 | 0.036 |
| | Marks<=75% | | | |
| Home Location | Away | 1.83 | 0.79 to 4.12 | 0.151 |
| | At/near Bhopal | | | |
| English comprehension | Satisfactory | 4.05 | 1.84 to 8.91 | 0.001 |
| | Unsatisfactory | | | |
| Sitting preference | In front | 1.74 | 0.39 to 4.23 | 0.263 |
| | Behind | | | |
| Preclinical subject liked | Biochemistry | 0.55 | 0.18 to 1.66 | 0.284 |
| | Other | | | |
| Mode of admission | MPPMT | 1.94 | 0.65 to 4.36 | 0.121 |
| | DMAT | | | |

Table 5. Distribution of male and female students in significant demographic categories.

| Factor | Category | Overall distribution | Gender based distribution | p-value |
|-----------------------|----------------|----------------------|---|---------|
| Age | Teenager | 94 (70%) | Males- 37 (65% of all males) Females 57 (73% of all females) | 0.308 |
| | Older | 41 (30%) | Males- 20 (35% of all males) Females 21 (27% of all females) | |
| Pre-admission caliber | Marks >75% | 72 (53%) | Males- 20 (35% of all males) Females 52 (67% of all females) | 0.001 |
| | Marks<=75% | 63 (47%) | Males- 37 (65% of all males) Females 26 (33% of all females) | |
| English comprehension | Satisfactory | 60 (44%) | Males- 23 (40% of all males) Females 37 (47% of all females) | 0.413 |
| | Unsatisfactory | 75 (56%) | Males- 34 (60% of all males) Females 41 (53% of all females) | |

Chi Square applied to test strength of association between gender and demographic categories.

Table 6. Distribution of teenage and older students in significant demographic categories.

| Factor | Category | Overall distribution | Age based distribution | | p-value |
|-----------------------|----------------|----------------------|------------------------|---------------------------|---------|
| Pre-admission caliber | Marks >75% | 72 (53%) | Teenager | 56 (60% of all teenagers) | 0.028 |
| | | | Older | 16 (39% of all older) | |
| | Marks<=75% | 63 (47%) | Teenager | 38 (40% of all teenagers) | |
| | | | Older | 25 (61% of all older) | |
| English comprehension | Satisfactory | 60 (44%) | Teenager | 42 (45% of all teenagers) | 0.933 |
| | | | Older | 18 (44% of all older) | |
| | Unsatisfactory | 75 (56%) | Teenager | 52 (55% of all teenagers) | |
| | | | Older | 23 (56% of all older) | |

Chi Square applied to test strength of association between age and demographic categories.

Table 7. Regression coefficients for marks versus factors affecting performance.

| Model | Coefficient B | Standard error | t | p-value | 95%Confidence Interval |
|-----------------------|---------------|----------------|-------|---------|------------------------|
| Constant-alpha | 11.000 | 1.130 | 9.733 | 0.000 | 8.759 to 13.241 |
| Attendance | 0.471 | 0.345 | 1.365 | 0.175 | -0.213 to 1.154 |
| Female | 3.023 | 0.528 | 5.728 | 0.001 | 1.976 to 4.069 |
| Pre-admission caliber | 0.745 | 0.507 | 1.468 | 0.145 | -0.261 to 1.751 |
| English comprehension | 1.187 | 0.602 | 1.970 | 0.041 | -0.008 to 2.381 |
| Teenagers | 0.440 | 0.598 | 0.736 | 0.464 | -0.745 to 1.625 |

DISCUSSION

State funded medical education models have been investigated extensively internationally [7], while in India the focus has shifted to the privately funded medical education model [8]. The problems of rapid population growth, inadequate government medical colleges and rapid growth of private colleges are not unique to India. They have been reported by others in South Asia [9]. It has thrown up challenges to maintain uniformity of educational standards. Our study attempted to find out early in the academic year the factors which affected student performance for timely remedial.

Our finding that poor attendance affects academic performance is in agreement with other studies, both international [10] and national [11]. However, moderate attendance may have been compensated by other factors like student caliber and self regulated learning of motivated students. The higher cost of education did not impact motivation levels and performances uniformly.

The weaker performance of the older students agrees with the findings of many other international studies [12,13] which cited motivational problems, low pre-admission caliber and other responsibilities as some of the reasons. Feil D et al however found older students do just as well as younger students [14]. In our study, the older students showed significantly low pre-admission caliber.

Our study found English language comprehension to be a significant predictor of performance, which is in agreement with other studies in India [6]. Linguistic difficulties were similar for both genders and all age groups. The Medical Council of India has also advocated English elective classes for students coming from non-English medium schools.

The strongest predictor of performance was female gender. Many international [15,16] and national [6] studies have reported better performance by female students, attributing reasons like aggressive or unprofessional behavior being more in males. In our

study, females had better attendance and pre-admission caliber, indicating greater motivation and professionalism in them. In our study, female students were more than males, indicating medicine emerging as a popular career choice for females in India. This is similar to the finding of Herbert et al who reported the rise of females in medical schools of US from a mere 3% in 1964 to 40% in 1994 [17].

Simonsohn et al reported computer based learning programs to help improve learning of older male students [18]. Wehrwein et al reported multimodal instructional technique for improving male student learning [19]. Mann MP reviewed the role of faculty mentors for counseling and monitoring student progress [20]. Our institute too has recently adopted the latter technique.

In conclusion, our study identifies students with poor attendance, poor English comprehension and weaker pre-admission caliber early in the academic year as groups needing timely specific attention. Males and older age group who had weaker pre-admission caliber continued their weaker performance post-admission. Female students were dominant reflecting the changing social and gender equations in the country.

Conflict of Interest

We the authors, Shubho Subrata Biswas and Vaishali Jain declare that there is no conflict of interest.

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