Original Research Article

Preadmission profile and academic performance: Are we selecting the best students for medicine?

Sheetal Kotgirwar [1], Rekha Lalwani [1], Sunita Arvind Athavale [1,*]

[1] Dept. of Anatomy, All Indian Institute of Medical Sciences, Bhopal, Madhya Pradesh, India

ABSTRACT

India has the largest number of medical colleges in the world. Selection process for entry in these colleges is through entrance examination only. The present study was an attempt to explore such factors in pre admission profile of students that can predict the academic performance of the students. This observational cross-sectional study was carried out on 149 students who appeared for the university examination for first year MBBS of tertiary care teaching and research medical institute of Government of India, Bhopal. A prevalidated, pretested, structured questionnaire was used to collect information from the students regarding their sociodemographic and academic profile. Relationship between the study parameters and academic performance of students was explored statiscally.

Majority of the study participants belonged to english medium, urban private schools. Almost 85% hailed from higher socioeconomic strata. Study parameters like performance of students in class X and XII, were positively statistically significantly correlated, while number of attempts taken to clear the entrance was negatively correlated to academic performance. Parameters like socioeconomic status, language, proficiency, place of stay and type of school did not show any relation with the academic performance. The entrance examination was found to be skewed towards students from one particular school board, urban, english medium students from higher socioeconomic strata. Possibility of adding scores of class XII and limiting the number of attempts in entrance examination needs to be considered. A level playing field needs to be provided for students across all school boards and across all the socioeconomic, linguistic and geographic backgrounds.

1. Introduction

Selection of appropriate candidates for medical education is a challenging task. There is a continuous search for appropriate factors that are valid, reliable, cost effective and less time consuming. The most important being, what criterion if applied, can select the best candidates as future doctors.[1]

Many studies across the world have tried to explore various cognitive and non-cognitive predictors which influence academic performance of medical students.[1–4]

In Indian medical education scenario, admission to Medical colleges across India is by any one of the following three methods i) Via All India institute of medical sciences entrance for admission to seven (AIIMS) (conducted by AIIMS New Delhi), ii) Jawaharlal Nehru Institute of Medical sciences Pondicherry entrance for admission to JIMPER(conducted by the same institute) and iii) Via National eligibility cum entrance test (NEET) for admission to around 450 medical colleges across India conducted by Central board of Secondary Education (CBSE). All these examinations prescribe syllabi that do not conform to any particular school board and utilize the sole criteria (score in

* Corresponding author.
E-mail address: sunita.anatomy@aiimsbhopal.edu.in (S. A. Athavale).

entrance test) for admissions to medical colleges.

There has been no research or experimentation regarding the ability of this entrance examinations to choose appropriate candidates who shall achieve the competencies of all domains (that is cognitive, psychomotor and affective) and shall serve the community at large.

The present study was aimed at exploring various cognitive and non-cognitive variables that can predict performance of medical students studying in tertiary care teaching and research medical institute of Government of India, Bhopal. This institute has the status of Institute of National importance. The institute draws students by a national eligibility cum entrance test conducted by AIIMS New Delhi. These admissions are considered very coveted as around 4 lac students compete for some 700 seats every year.[5] These students had cleared AIIMS entrance to secure admission to the institute.

The study was aimed at exploring such criterion which may have sufficient predictive strength so as to consider them for intake of medical students, or may show a window of opportunity in predicting potential under achievers so as to initiate a counselling or intervention programme early.

2. Methodology

This observational cross-sectional study was carried out on students who appeared for the university examination for first year MBBS at Tertiary care centre Bhopal. 147 students participated in this pilot study. The study was granted permission by institutional ethical committee and informed consent was obtained from the study A prevalidated, pretested, structured questionnaire was used to collect information from the students (Annexure I). The questionnaire contained questions seeking information on predictor variables (preadmission factors) that may be related to academic performance of the MBBS students.

The questionnaire also enquired about the dependent variables that were the percentile of marks scored in university examination of first year MBBS. The responses of the study participants to the entire questionnaire were recorded. Socioeconomic status of student's family was assessed by modified Kuppuswamyscale[6]based on parent's occupation, income and number of family members.

Statistical analysis was performed using statistical package SPSS 20. Standard tests for descriptive statistics were applied.

The relationship of study variables whose responses were on continuous scale, with academic performance were analysed by Pearson's correlation followed by regression analysis. Independent sample T test and one way ANOVA was applied for analysing the relationship of study variables whose responses were categorised in two groups and three or more groups respectively. Value of less than 0.05 was considered to be statistically significant.

3. Results

Table 1 Sshows frequency distribution of various study variables. Of the 147 study participants, about two-thirds were male. About two-thirds were more than 18 yrs of age at the time of their entry into the medical college. Two third students were selected in first attempt in entrance examination. While two thirds of the students studied in Central Board of Secondary Education (CBSE) in their tenth standard, this proportion increased to three fourth in twelfth standard. The increase was at the cost of decline in students choosing to study ICSE board in favour of CBSE. Majority of the students hailed from schools with English as medium of instruction. This proportion increased from primary to higher secondary schools. Majority of the students belonged to urban areas. A gradual shift of students from rural to urban settings was observed as they progressed from primary, secondary and higher secondary schooling. Majority of the students studied in private schools. Almost 85 percent students hailed from upper or upper middle class socioeconomically. The All India ranks of students in AIIMS entrance examination ranged from 58- 8829 (median of rank 486.5). Of the study participants 54.4% were selected via general category and remaining were selected from reserved category for socially backwards (An affirmative scheme for up liftment of socially backwards) (OBC- 31.3%, SC -10.2% & ST- 4.1)

The mean marks scored by students in X standard were 90.84% ±7.057 and in XII standard marks scored were 90.36%±6.88.

About 2/3 students had entered the medical profession by their own choice. Almost all students attended coaching for entrance examination for at least one year besides their routine schooling. Eighty three per cent students attended regular school and 16.2% attended a dummy school. (A dummy school is a term used for such schools which though are registered as regular schools but permit absenteeism to facilitate the student to attend coaching/ study for entrance examination).

Table 2 shows correlation of study parameters on continuous scale with that of academic performance of students. Significant positive correlation was observed between marks obtained in tenth and twelfth standard with academic performance. The strength of correlation was more with class XII marks. However significant negative correlation was observed with number of attempts taken to succeed in entrance examination. The performance of students did not significantly correlate with their respective ranks in entrance examination and duration of coaching.

Table 1: Showing frequency of distribution of various study parameters

S.No	Parameters	Groups	Frequency	Valid Percentage
1	Sex	Female	101	68.7
		Male	46	31.3
2	Age	18 years	53	36.1
		>18 years	94	63.9
3	Attempts		97	66
			46	31.3
			03	2.0
			01	0.7
4	10th Board	State	33	22.4
		CBSC	100	68.0
		ICSC	14	9.5
5	12th Board	State	33	22.4
		CBSC	112	76.2
		ICSC	02	1.4
6	Reservation	General	77	52.4
		OBC	48	32.7
		SC	16	10.9
		ST	06	4.1
7	Medium in school (Primary)	English	122	83.0
		Vernacular	25	17
8	Medium in school (Secondary)	English	131	89.1
		Vernacular	16	10.9
9	Medium in school (Higher Secondary)	English	136	92.5
		Vernacular	11	7.5
10	Place of stay (Primary)	Metro	17	11.6
		District	62	42.2
		Tehsil	22	15.0
		Village	46	31.3
11	Place of stay(Secondary)	Metro	20	13.6
		District	73	49.7
		Tehsil	17	11.6
		Village	37	25.2
12	Place of stay(Higher Secondary)	Metro	21	14.3
		District	85	57.8
		Tehsil	13	8.8
		Village	28	19
13	Schooling (Primary)	Government Non Residential	32	21.8
		Government Residential	0	00
		Private Non Residential	109	74.1
		Private Residential	06	4.1
14	Schooling (Secondary)	Government Non Residential	31	21.1
		Government Residential	9	6.1
		Private Non Residential	99	67.3
		Private Residential	08	5.4

Table 1 continued

15	Schooling (Higher Secondary)	Government Non Residential	36	24.5
		Government Residential	7	4.8
		Private Non Residential	86	58.5
		Private Residential	8	12.2
16	Kuppuswamy Scale *4.1% of students did not mention the household income, hence could not calculate.	1-Upper class	61	41.5
		Upper middle class	63	42.9
		Lower middle class	16	10.9
		Upper lower	0.1	0.7
17	Duration of coaching	None	03	2.0
		One year	52	35.4
		One and half year	02	1.4
		Two years	68	46.3
		Three years	18	12.2
		Four years	04	2.7
18	Sports and extracurricular	Basic level	54	9.5
		Advance level	79	53.7
		Not attempted	14	36.7
19	Joining of profession	Own choice	96	65.3
		Others choice	04	2.7
		Mixed choice	47	32.0

Table 3 show multiple linear regression analysis of predictor variables (on continuous scale) with respect to dependent variable i.e. theory and practical percentile. Relationship between predictor variables with academic performance was analyzed by independent sample T Test for the variables which showed normal distribution in two groups (Table 4).

To explore relationship of predictor variables grouped in more than two categories, one way ANNOVA was applied. The results showed that these variables did not have any significant relationship with academic scores of students except with type of school attended in Higher Secondary (Table 5).

4. Discussion

Academic performance in medical schools may be influenced by large number of factors. The present study chose to explore the relationship of preadmission factors like sociodemography, prior academic performance, schooling and related issues with the performance of students in Medical college. There is a debate worldwide, whether or not preadmission factors affect student's performance.[6–8] Also there is an on-going debate as to what might be the best method to select best talents for medical training.[9,10]

4.1. Prior academic performance

There are many studies which endorse that the prior academic performance of the student strongly and positively influences the performance in universities.[2,11–16] Some studies however claim that no such relationship exists.[17] The present study found significant positive correlation between academic scores of students in class X and XII. Stronger correlation was observed with scores obtained in class XII. Authors are of the opinion that scores of class XII should be given weightage for admission to medical institutes. This would avoid overemphasis on a single entrance examination, as is now the case, and shall also reinforce the importance of well-established school examination system. This would also check the coaching institutes which have become informal parallel teaching machinery, with no checks and balances, created just to crack an entrance examination. The challenge in doing this is to equate scores of different school boards, across the country.

4.2. Socio economic status

Many studies report a strong influence of socioeconomic status of parents on educational outcomes of students. It is a common belief that low social economic status negatively affects academic achievement because low social economic status prevents access to vital resources.[18–20] Considine and Zappala state that, in families where the parents are advantaged socially, educationally and economically foster a higher level of achievement in their children.[21] They also found that these parents provide higher levels of psychological support for their children through environments that encourage the development of skills necessary for success at school. On the contrary Pedrosa et al. and Mohammad et al, in their study on educational and socio-economic background, found that students coming from disadvantaged socioeconomic and educational homes perform relatively better than those coming from higher socioeconomic and educational strata.[22,23] Lumb and Vali and Mohammad et al have also reported no relationship of students performance in medical course to socioeconomic status.[2,23]

Interestingly the descriptive statistics revealed that almost 85% students came from high socioeconomic strata (upper and upper middle class). In the present study the performance of students did not show any relationship with the socioeconomic status as calculated by Kuppuswamyscale. This may be because the college provides an equal opportunity for learning to all students which create an insulated facilitatory environment for all students equally. However, the entrance examination is highly skewed in favour of students from high socioeconomic status.

4.3. The socially backward

Government of India reserves up to 50% (recently increased to 60% to include economically backwards also) of the total seats in state run Medical colleges for socially backward class (scheduled class, scheduled tribes and other backward classes).[24] This is a form of affirmative action that attempts to compensate for the social inequality once prevalent in the form of caste system in India. However, as was observed in the study, the performance of socially backward students selected utilizing the facility of reservation, generally on scores lower than the unreserved group, did not affect the academic performance in medical college. Ironically almost 85% students from the reserved category (socially backward as per Government guidelines) came from higher socioeconomic status (upper and upper middle class) as per Kuppuswamy scale. This contradiction indicates that the facility of reservation is availed more often by the better offs in their respective category than the real needy ones.

4.4. Rural urban divide

Most of the studies conducted around the world confirm that students coming from rural background underperform compared to their urban counterparts. This is primarily because of lack of instructional resources.[25–27] However a counterview is that it does not make any difference.[28] The present study observed that though the entrance test was very heavily skewed towards students from urban areas,

Table 2: Showing correlation of study parameters on continuous scale with that of academic performance of students

		Total Theory Percentile	Total Practical Percentile
Rank	Pearson Correlation	-.116	-.136
	Sig.(2 tailed)	.195	.132
	N	126	124
Attempts	Pearson Correlation	-.330	-.294
	Sig.(2 tailed)	.000*	.001*
	N	129	127
Marks (Tenth)	Pearson Correlation	.351	.335
	Sig.(2 tailed)	.000*	.000*
	N	129	127
Marks(Twelfth)	Pearson Correlation	.438	.403
	Sig.(2 tailed)	.000*	.000*
	N	129	127
Duration of coaching	Pearson Correlation	-.015	-.213
	Sig.(2 tailed)	.864	.016
	N	129	127

*Statistically significant

Table 3: Showing multiple linear regressions of predictor variables with respect to dependent variable for total theory and practical percentile

Model	Unstandardized Coefficients				Standardized Coefficients		t		Significance	
	B		Standard Error		Beta					
	T	P	T	P	T	P	T	P	T	P
(Constant)	-76.143	-54.403	38.475	34.315	-	-	-1.979	-1.585	.050	.115
Rank	.000	-.001	.001	.001	-.026	-.053	-.327	-.666	.744	.506
Attempts	-7.326	-6.335	3.965	3.537	-.163	-.160	-1.847	-1.791	.067	.075
Tenth	.257	.198	.372	.332	.068	.059	.691	.596	.490	.552
Twelth	1.208	1.074	.461	.411	.307	.309	2.619	2.611	.010*	.010*
Duration of coaching	1.980	3.664	2.645	2.359	.058	.122	.748	1.553	.455	.123
@12E	.021	-.086	.226	.202	.010	-.044	.094	-.428	.925	.669

* Statically Significant; T- Theory; P- Practical

there was no relationship between the residence of students and their academic performance in Medical College, meaning thereby that students from both backgrounds performed equally. As per the census of India 2011, the rural –urban proportion of population is 68.84% & 31.16%.[29] It is indeed appalling to note that he entrance examination leaves out a large section of population as 'not fit' to be doctors.

4.5. Language barrier

India being a multi-cultural society has many regional languages and no particular language is considered as National language. While at the school level students have an option of studying in different vernacular languages whereas the admission test for admission to AIIMS is conducted in only two languages i.e. English and Hindi. As per census of India 2011, there are only 0.02% citizens speaking English as their first language and 12.18% as second or third language.[30] The medical education in India is primarily in English language, might be as a vestige of British colonial rule. A study by Moulsey et al observed that English language competence has a significant correlation with academic performance in Saudi Arabia, as the professional course is taught in English language.[31] Whereas Mohammad M et al. did not find any correlation in medical students of UAE.[23] Similar observation was reported from Gautam et al in a study of Medical students at Nepal.[1] The present study found no relationship between the performance of students in medical college vis a vis their language of instruction during schooling. This implies that the students from any vernacular medium cope reasonably to instructions in English and that it does not affect their performance. The reason might be that in a professional course there is less emphasis on correctness of language than the technical component. However, as is evident from the descriptive statistics of the students, the exam seems

Table 4: Showing relationship between study variables (which showed normal distribution in two groups) total theory and practical percentile as assessed by independent sample t test

Factors	Groups	N	Mean Marks and Standard Deviation		T test of equality of means		df value		95% Confidence level		P value	
			T	P	T	P	T	P	T	P	T	P
Sex	Male	101	47.56 ±28.05	47.72±25.61	-2.37	-2.14	145	145	-20.49 to –1.86	-17.50 to –.70	.019	.034
	Female	46 / 53	58.74 ±22.67	56.82 ±19.54								
Age	18 yrs	53	51.98 ±27.21	52.94 ±25.09	.310	.892	145	145	-7.72 to10.60	-4.50 to 11.92	.757	.374
	> 18 yrs	94	50.54 ±26.88	49.23 ±23.69								
Type of school attended	Regular	124	51.05 ±26.63	51.18 ±24.21	-.002	.712	145	145	-12.13 to 12.10	-6.95 to 14.79	.998	.477
	Dummy	23	51.07 ±29.01	47.26 ±24.32								
Coaching institute attended	Yes	142	51.87 ±26.42	51.22 ±23.59	3.126	3.315	143	143	17.59 to 78.11	18.30 to 72.35	0.002*	0.001*
	No	03	4.02 ±2.92	5.90 ±4.65								
	Not responded	02										
Sports and extracurricular activity	Basic	79	49.80 ±27.57	49.11 ±24.77	-.896	-1.32	131	131	-13.36 to 5.03	-13.69 to 2.69	.372	.186
	Advance	54	53.97 ±24.40	56.61 ±22.35								
	Not responded	14										
Medium in school (Primary)	English	122	52.78 ± 26.24	50.83 ±23.46	1.724	.288	145	145	-1.48 to 21.71	-8.99 to 12.06	.087	.773
	Vernacular	25	42.66 ±29.08	49.29 ±27.95								
Medium in school (Secondary)	English	131	52.09 ±26.48	50.50 ±23.32	1.331	-.094	145	145	-4.58 to 23.51	-13.31to 12.09	.185	.925
	Vernacular	16	42.62 ±29.80	51.11 ±31.29								
Medium in school (Higher Secondary)	English	137	52.56 ±26.54	51.40 ±24.13	2.552	1.561	145	145	4.97 to 39.18	-3.27 to 27.89	0.12*	.121*
	Vernacular	10	30.47 ±24.47	39.10 ±23.13								

*Statistically significant; T- Theory; P- Practical

Table 5: Showing relationship between study variables (distributed in more than two groups), total theory and practical percentile as assessed by one way ANNOVA test

		Sum of Squares		df		Mean Square		F		Significance	
		T	P	T	P	T	P	T	P	T	P
Board X	Between Groups	28.628	24.344	90	86	.318	.283	1.119	.841	.328	.772
	Within Groups	15.917	20.200	56	60	.284	.337				
	Total	44.544	44.544	146	146						
Board XII	Between Groups	16.329	18.163	90	86	.181	.211	.837	1.230	.776	.198
	Within Groups	12.133	10.300	56	60	.217	.172				
	Total	28.463	28.463	146	146						
Reservation	Between Groups	69.467	64.917	90	86	.772	.755	1.385	1.267	.095	.166
	Within Groups	31.200	35.750	56	60	.557	.596				
	Total	100.667	100.667	146	146						
Place of stay (Primary)	Between Groups	101.877	84.327	90	86	1.132	.981	1.110	.788	.341	.846
	Within Groups	57.117	74.667	56	60	1.020	1.244				
	Total	158.993	158.993	146	146						
Place of stay (Secondary)	Between Groups	89.991	80.207	90	86	1.000	.933	.922	.794	.639	.838
	Within Groups	60.717	70.500	56	60	1.084	1.175				
	Total	150.707	150.707	146	146						
Place of stay Higher (Secondary)	Between Groups	78.610	74.627	90	86	.873	.868	.946	.935	.599	.617
	Within Groups	51.717	55.700	56	60	.924	.928				
	Total	130.327	130.327	146	146						
Schooling (Primary)	Between Groups	67.366	69.899	90	86	.749	.813	.958	1.183	.578	.246
	Within Groups	43.750	41.217	56	60	.781	.687				
	Total	111.116	111.116	146	146						
Schooling (Secondary)	Between Groups	67.333	69.117	90	86	.748	.804	.898	1.074	.680	.388
	Within Groups	46.667	44.883	56	60	.833	.748				
	Total	114.000	114.000	146	146						
Schooling (Higher Secondary)	Between Groups	76.304	105.137	90	86	.848	1.223	.705	1.903	.931	.005
	Within Groups	67.383	38.550	56	60	1.203	.643				
	Total	143.687	143.687	146	146						
Joining of Profession	Between Groups	71.800	73.133	90	86	.798	.850	.814	.953	.809	.585
	Within Groups	54.867	53.533	56	60	.980	.892				
	Total	126.667	126.667	146	146						

T- Theory; P- Practical

to favour students from English medium as compared to vernacular background.

4.6. Background of school

Different types of schooling systems operate in India. These include government run schools, which are mostly poorly equipped and financed but the education is subsidized. Another group is private run schools which are believed to impart better education at higher costs and hence are preferred by socioeconomically well of sections of society.

These schools operate under different school boards namely Central board of Secondary education (CBSE), Indian certificate of secondary education (ICSE), and boards of different states of India (e.g. Maharashtra state board, Tamilnadu state board). The norms of CBSE and ICSE are more stringent and hence only better financed and better equipped schools can affiliate to them.[32,33] Most other schools affiliate with respective state boards. These boards have different curricula and assessment patterns and hence equating scores of different boards is debatable. Although lakhs of students take entrance examination from different schools and boards the selected candidates, as is evident from descriptive statistics, majority of the students selected, and come from CBSE board. This is also evident from shift of students from ICSE board and vernacular boards to CBSE board during higher secondary.

Also, the number of students selected from private schools is disproportionately more.

While many studies claim that type of schools attended did not affect the performance of students[11,34] while other's claim the contrary.[2] The present study did not show any relationship between school boards and academic performance. The significant values as obtained between schooling in Higher secondary and performance in practical examination is to be taken with caution due to chances of error due to small numbers in different groups.

4.7. The best predictor

In pursuit of selecting the best talent for medical course many universities use multiple predictors. There is overwhelming evidence that use of combination of predictors is better indicator of student's performance in medical school/ university.

In a socio-demographically unequal, culturally diverse, country with gross educational inequality like India, it is indeed challenging to pick such predictors which are significant, practical, uniform and objective at the same time and are representative of the society at large. Authors feel that overreliance on one entrance examination, which seems to be primarily choosing urban, English speaking students from CBSE board belonging to high socioeconomic backgrounds, should be avoided.

The entrance test should be tailored to have representation of larger population of the country.

This is partly addressed by reservation policy for socially backwards; however very large representation of socioeconomically high strata in this category also seems to be defeating the purpose.

5. Conclusion

1. The entrance examination was found to be highly skewed towards urban, english medium students, coming from high socioeconomic strata studying in CBSC board schools, although these factors did not show any relationship to academic performance in medical college.
2. An admission index/score can be prepared which takes into account class XII scores and attempts taken to clear entrance examination. As these factors have significant relationship with academic performance.
3. Policy makers need to seriously consider to make the entrance examination more inclusive for students of various linguistic backgrounds, different socioeconomic strata, and different geographic backgrounds and across all school boards.

6. Source of Funding

7. Conflict of Interest

None.

8. Acknowledgement

None.

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Author biography

Sheetal Kotgirwar, Associate Professor   https://orcid.org/0000-0002-8321-0147

Rekha Lalwani, Associate Professor   https://orcid.org/0000-0002-3927-6069

Sunita Arvind Athavale, Additional Professor   https://orcid.org/0000-0003-3003-1257