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The Predictive Value of Admission Qualifications on the Academic Performance of First-Year Medical Students in Pamantasan ng Lungsod ng Maynila (PLM) College of Medicine

Rose Anna R. Banal[1], Maria Cielo B. Malijan[1], Fernando P. Solidum[1], Merry M. Clamor[1] & Phylis C. Rio[1]

[1] Pamantasan ng Lungsod ng Maynila, Manila, Philippines

Correspondence: Rose Anna R. Banal, Pamantasan ng Lungsod ng Maynila, Manila, Philippines.

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Abstract

Well-designed admission criteria can predict the likelihood of students succeeding in the medical program. This study aims to evaluate the predictive capability of the admission qualifications used in the Pamantasan ng Lungsod ng Maynila (PLM) College of Medicine concerning the academic performance of first-year medical students. Data from 1,203 students were analyzed, revealing that premedical general weighted average (GWA) and National Medical Admission Test (NMAT) scores significantly correlate with academic performance in the first year, whereas Medical College Admission Test (MCAT) scores do not. The interview, when combined with GWA and NMAT scores, can also predict the students' final GWA at the end of their first year. Premedical school and courses are also potential predictors of academic success. This study holds significant implications in refining the admission criteria in this university that would ensure academic success of the students.

Keywords: medical school admission criteria, NMAT, MCAT

1. Introduction

Medical education plays a pivotal role in shaping the future of health care, impacting the quality and effectiveness of health care professionals who, in turn, affect the well-being of the population. The process of admitting students to medical schools is rigorous and selective, with institutions employing a diverse range of criteria to identify and admit the most promising candidates. These admission qualifications are considered essential gatekeepers to ensure students have the necessary knowledge, skills, and attributes to succeed in the demanding field of medicine.

Medical schools use a multifaceted approach to evaluate applicants' qualifications. These criteria may include factors such as the institution where premedical education was pursued, the specific premedical courses taken, the general weighted average (GWA) or general point average (GPA) achieved during premedical education, scores on standardized tests like the National Medical Admission Test (NMAT) or the Medical College Admission Test (MCAT), and performance in interviews. Each of these variables is regarded as influential determinants of admission, and these specific qualifications not only reflect an applicant's academic rigor and potential but also provide insights into their background, experiences, and suitability for a medical career.

The success of students in a medical school is predicted by both noncognitive (interviews) and cognitive (GWA, NMAT, or MCAT) admission tools (Sladek et al., 2016). It is particularly demonstrated in this study that GPA or GWA is the single most consistent predictor of academic performance. Standardized tests, including the NMAT and MCAT, are integral components of the admissions process. According to a meta-analysis, performance on admission tests is a moderate predictor of success in medical school (Donnon et al., 2007).

Premedical education, notably the choice of premedical school and courses, impacts an applicant's readiness for medical education. A health-related undergraduate degree results in better academic performance, whereas students from state-funded schools perform better than independent schools (Aston-Mourney et al., 2022; Kumwenda et al., 2017). Noncognitive attributes, such as interview performance, also play a pivotal role in predicting academic success. The interview, which largely evaluates communication skills, focuses more on the abilities needed for studying and practicing medicine, making it more valuable in clinical years (Sladek et al., 2016; Wilkinson et al., 2008).

In PLM College of Medicine, the criteria for admission includes the following: premedical GWA, NMAT and

MCAT scores, and an interview. Given the rigorous nature of medical education, it is essential to comprehend the relationship between these criteria used in the admission process and the subsequent academic performance of first-year medical students. This research aims to bridge this knowledge gap by exploring the extent to which these specific admission qualifications correlate with academic performance, both individually and in combination. The results of this study will also give us a deeper understanding of how these qualifications predict early academic success and how they might shape the trajectory of future health care professionals.

The significance of this study cannot be overstated. Understanding the predictive value of admission qualifications is not only crucial for admissions committees but also for medical educators and policymakers. It holds the potential to refine admissions processes, enhance the development of curricula that meet the specific needs of students, and inform the implementation of support programs designed to address potential gaps in academic performance.

Furthermore, this research contributes to the broader discourse on medical education, emphasizing the link between admission qualifications, educational outcomes, and the quality of care provided by medical graduates. By exploring this intricate interplay, the research endeavors to make significant contributions to the advancement of medical education and the overall enhancement of health care services.

2. Methods

The study subjects were first-year medical students in PLM College of Medicine from 2013 to 2023. Excluded were students from Academic Year 2019–2020 because the students from this batch did not have a numerical grade (final GWA) at the end of the academic year owing to the academic situation during the pandemic. Data on specific admission qualifications were collected from admissions records of the college, including premedical school, premedical courses, premedical GWAs, NMAT scores, MCAT scores, and interview scores. Academic performance data (first-year grades) were obtained from the college and the university registrar.

The demographic profile of the students was summarized. Descriptive statistics on the preadmission qualification variables were calculated. Correlation and regression analyses were used to determine the relationship between each specific admission qualification and academic performance. Multiple regression analysis was used to assess the predictive value of the admission qualifications on the academic performance of the first-year medical students. ANOVA analysis was performed to assess the academic performance of students based on their premedical course and premedical school. In cases where statistically significant differences were observed, post hoc tests were subsequently employed. All statistical analyses were performed using SPSS software version 25.

3. Results

This study involved a total of 1,203 students. The average age was 22.6 years, with 65.3% females and 34.7% males. Figures 1 and 2 shows the premedical schools and courses of the first-year medical students accepted in the program. Forty-three percent of students had their premedical degree from national government-funded universities, 17.29% from local government-funded universities, and the remaining first-year students got their degree from private universities. In terms of premedical courses, nearly half of the students are graduates of biology/microbiology (49.1%), with medical technology (12.9%) and nursing (11.6%) following. Other courses with clinical exposure, such as physical therapy and public health, make up 9.6% of the first-year student population.

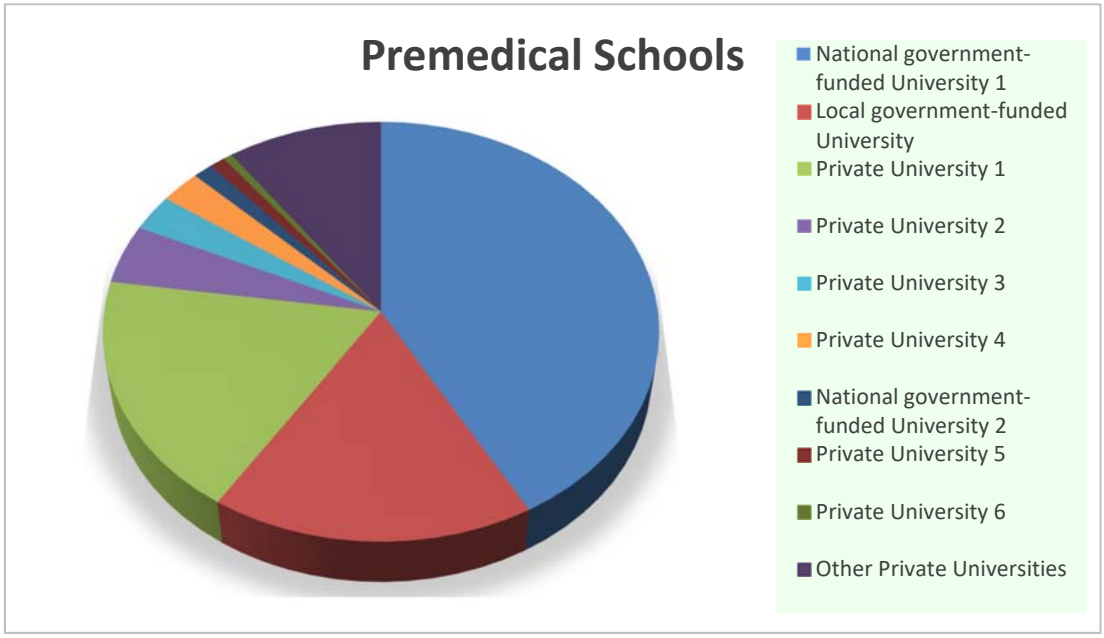

Figure 1. Premedical schools of first-year medical students

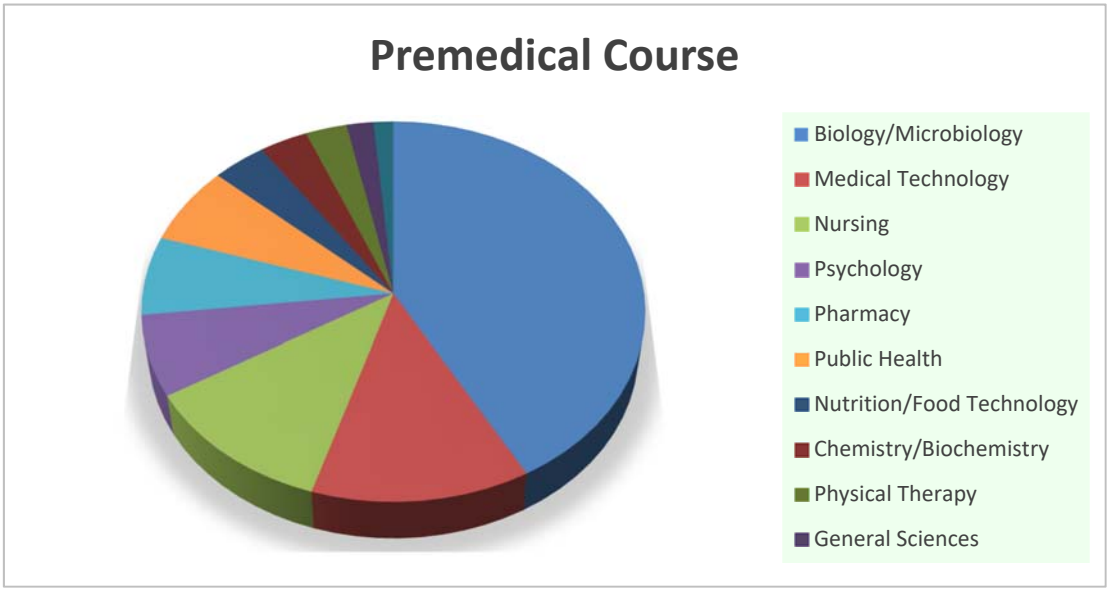

Figure 2. Premedical course of first-year medical students

The distribution of the first-year medical students' final GWA is shown in Figure 3, with a mean and standard deviation of 79.52 and 4.13, respectively. The mean premedical GWA and NMAT were 1.85 and 89.62, respectively (Table 1). Correlation analyses revealed a statistically significant, weak-to-moderate relationship between these two admission variables and the final GWA of the first-year medical students ($p < .05$). Premedical GWA and students' final GWA were found to be negatively correlated ($r = -0.299$), meaning that as the premedical GWA increases, the student's final GWA decreases. This is because most universities use a five-point scale, where the highest grade is a 1.00 and the lowest is a 5.00 (failing mark). The mean MCAT score is 109.87, with a very high standard deviation of 40.68. No significant correlation was found between MCAT scores and final GWA of the students ($r = 0.022$).

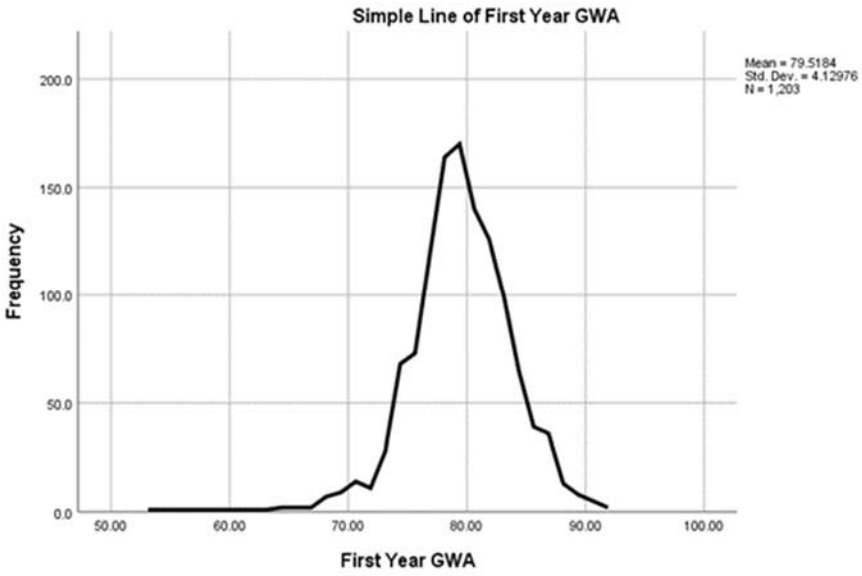

Figure 3. Distribution of the final GWA of first-year medical students.

Table 1. Correlation between premedical GWA, NMAT, and NMAT with the final GWA of first-year medical students

	Mean	Standard Deviation	Pearson's *r*	*p*-value
Premed GWA	1.85	0.29	−0.299	0.000
NMAT	89.62	9.14	0.307	0.000
MCAT	109.87	40.68	0.022	0.462

Regression analyses were also performed to determine how each of these quantitative variables predict the final GWA of the students (Table 2). Results showed that only the coefficients of premedical GWA and NMAT are statistically significant from 0 (zero), whereas the coefficient of MCAT is too close to zero. A scatterplot of the significant relationship between the three variables with the final GWA is shown in Figure 4.

Table 2. Univariate regression analyses between premedical GWA, NMAT, and NMAT with the final GWA of first-year medical students

	(Constant)	Coefficient	*p*-value
Premed GWA	87.33	−4.215	0.000
NMAT	67.07	0.139	0.000
MCAT	79.27	0.002	0.462

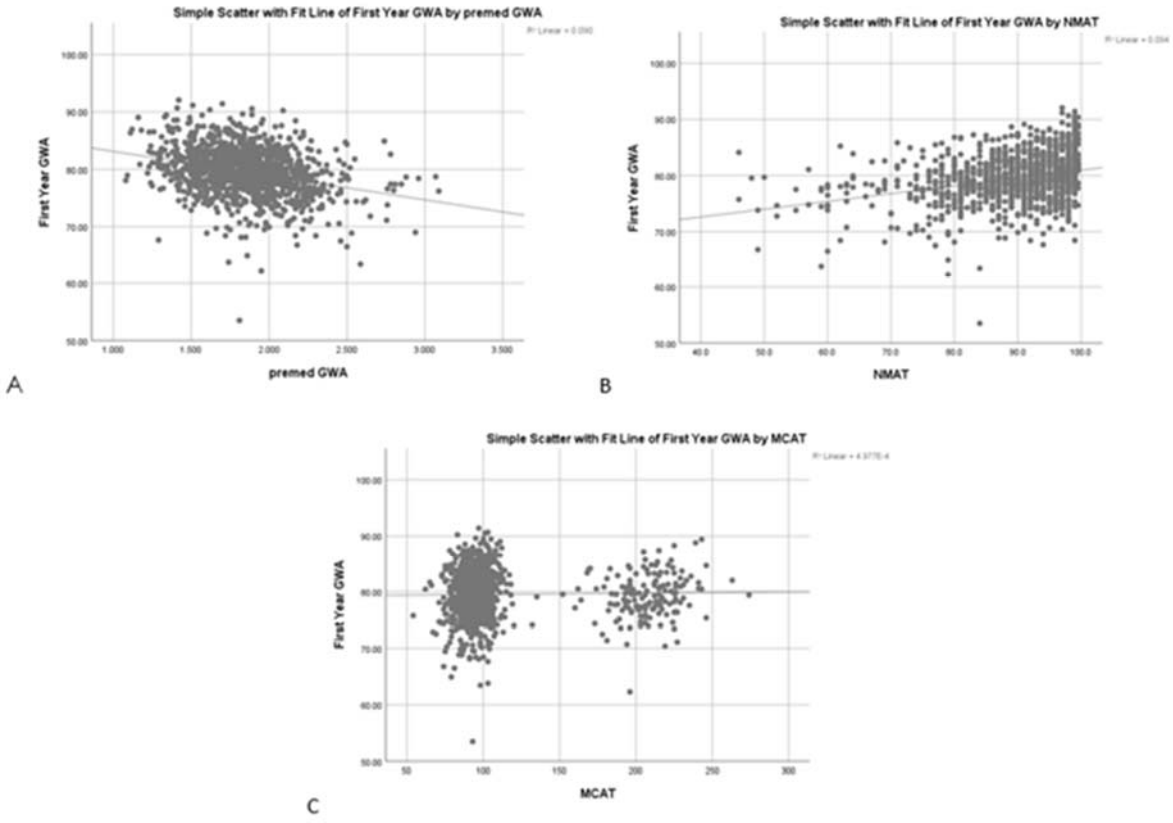

Figure 4. Scatterplot of final GWA of students against premedical GWA (A), NMAT (B), and MCAT (C).

Table 3. ANOVA[a] for the overall regression model of admission variables as predictor of final GWA.

	Sum of Squares	*df*	Mean Square	*F*	Sig.
Regression	3654.471	3	1218.157	88.737	.000[b]
Residual	14867.195	1083	13.728		
Total	18521.666	1086			

Note. a. Dependent variable: First-Year GWA; b. Predictors: (Constant), MCAT, premed GWA, NMAT.

A multivariate regression was also run to predict the final GWA from premedical GWA, NMAT, and MCAT (Table 3). These variables altogether statistically significantly predicted the final GWA as shown in the analysis of variance (ANOVA) in Table 3 below, with $F_{(3, 1083)} = 88.74$, $p < .000$, and $R^2 = .197$. This indicates that the overall regression model is a good fit for the data. However, in testing for statistical significance of each of these admission variables, only premedical GWA and NMAT added significantly to the prediction with $p < .05$ (Table 4). Thus, premedical GWA and NMAT are consistently significantly associated with academic performance of first-year medical students.

Table 4. Estimated model coefficients in multivariate regression analysis of premedical GWA, NMAT, and MCAT as predictor of final GWA of first-year medical students.

	Coefficient	*p*-value
(Constant)	74.71	0.000
Premed GWA	−4.456	0.000
NMAT	0.153	0.000
MCAT	−0.006	0.053

The final GWA was also correlated with interview scores. However, Pearson's $r = .041$ and $p = .174$ indicate that there is no statistically significant association between these two variables. The interview score was also taken into

consideration as a potential predictor of the final GWA in the multiple regression carried out along with the premedical GWA and NMAT (Table 5). The combination of the three independent components produced a statistically significant prediction of the final GWA, with a slightly greater variance of 21% compared to a variance of 19.7% when MCAT is added to NMAT and GWA in the regression analysis.

Table 5. Multivariate regression analysis of premedical GWA, NMAT, and interview as predictor of final GWA of first-year medical students

	Coefficient	*p*-value
(Constant)	73.5	0.000
Premed GWA	−4.553	0.000
NMAT	0.152	0.000
Interview	.102	0.000

To ascertain whether there is a significant difference between the premedical school and courses based on the academic performance of the first-year medical students, ANOVA was carried out. Results showed statistically significant differences in premedical school and courses, $F_{(10, 1192)} = 6.845$, $p < .000$ and $F_{(11, 1191)} = 6.348$, $p < .000$, respectively (Table 6). The groups are homogenous when Levene's test was employed. Post hoc analyses revealed that the final GWA of graduates of one national government-funded university and one private university differed significantly from the majority of institutions for premedical schools. Physical therapy graduates outperformed most other course graduates in the premedical course. Comparatively speaking, psychology course graduates did poorly.

Table 6. One-way ANOVA between premedical schools and courses

	F-value	*p*-value
Premed School	6.845	0.000
Premed Course	6.348	0.000

Two-way ANOVA was also carried out, which showed an interaction effect between these two variables (p = 0.036). This indicates that, in addition to the independent effects of premedical school and course on the final GWA of the students, there is a synergistic interplay between these two factors (Table 7).

Table 7. Two-way ANOVA *(B)* between premedical schools and courses

	F-value	*p*-value
Premed School	2.276	0.000
Premed Course	3.616	0.000
Premed School * Premed Course	1.425	0.000

4. Discussion

The findings in this study show that the undergraduate or premedical GWA (GPA) and NMAT scores of the students are positively correlated with their performance in the first year of medical studies at PLM College of Medicine. This is the same as the findings in a local study conducted at Adventist University of the Philippines (Mendoza & Antonio, 2019). Similar studies performed in other countries have demonstrated that cognitive ability (GWA and admission tests) is a moderate predictor of success in undergraduate medical training (Agahi et al., 2018; Lim, 2017; Magzoub et al., 2013). A systematic review on the correlation between admissions variables and success in medical schools equally indicated a moderate strength of association between cognitive ability and academic success (Ferguson et al., 2002).

GWA alone is said to be the most consistent predictor of academic performance in the first few years of a medical program (Al-Mazrou, 2008; Catabijan et al., 2017; Cunanan, 2020; Ferguson et al., 2002). Furthermore, these studies showed that the premedical GWA is a useful predictor of the academic performance of the students in their clinical years and the likelihood of students completing the program. Although GWA is widely acceptable as an accurate indicator of academic performance, different criteria are used by institutions to assign course grades,

resulting in a national variation of grades in higher education. This can be considered a flaw that may lower its validity and reliability.

As previously stated, the NMAT is also a strong predictor of academic success of first-year medical students. This positive correlation was also demonstrated in another local study by Cristobal (1999) at the Zamboanga Medical School Foundation (ZMSF). In University of the Philippines (UP), the NMAT scores were even predictive of the students' final GWA in the program and performance in the licensure examination, and it had a greater predictive value in student performance than other variables analyzed (Catabijan et al., 2017). National admission tests in other countries similarly effectively predict the performance of medical students (Althewini & Al Baz, 2022; Baker et al., 2000; Casey et al., 2015; Dabaliz et al., 2017; Hendi et al., 2022; Wiley & Koenig, 1996). Because these admission tests are standardized, their validity and reliability in predicting academic success would be somewhat higher than that of the GWA.

The PLM College of Medicine was established in 1983. Initially, the MCAT was the sole qualifying exam in assessing its applicants' readiness for the medical degree program. When the Board of Medicine of the Professional Regulatory Commission (PRC) instituted a unified admissions test for all medical schools in the form of the NMAT in 1985, applicants to the PLM College of Medicine eventually had two test sources for assessing its applicants.

The results of the students on the PLM-administered admissions exam, the MCAT, did not predict their performance at the end of the first year of medical school. Studies in other medical schools showed that their specific admission tests had varying degrees of predicting student performance. The admission test at the ZMSF is moderately correlated with students' academic performance, but the essay examination is shown to be the best predictor of future academic success (Cristobal, 1999).

Studies conducted abroad also demonstrated varying results regarding the predictive value of specific admission tests for academic performance. In Bandung, Indonesia, a study found a moderate association between the admission test and grade point average (GPA) in the second and third years, but no correlation in the first and fourth years (Irasanti et al., 2018). Similar studies at the University of Split in Croatia and in Ethiopia showed that the entrance exam scores of students predicted their graduation with a medical degree (Bekele et al., 2023; Zuljevic & Buljan, 2022). Conversely, a study by Alamoudi et al. (2021) showed no significant correlation between admission exam scores and students' academic achievement. Overall, the variability in these studies may reflect the variability of the design of admissions tests designed by the medical schools. Medical schools may design their admissions tests according to the qualities being looked for in their applicants.

Between the NMAT scores and the medical admissions tests, the local studies are more consistent in showing the value of the NMAT results in terms of predictability of medical student performance compared to other medical admissions tests. In comparing the coverage of categories being tested in the NMAT with those of the MCAT, there are similarities and differences in test coverage. The NMAT includes tests of mental ability and of academic proficiency. The subtests under tests for mental ability include verbal, inductive reasoning, quantitative, and perceptual acuity, whereas tests to assess academic proficiency include biology, physics, social science, and chemistry (Center for Educational Measurement, 2023). Moreover, the PLM MCAT includes an assessment of mental alertness, where comprehension, judgement, and arithmetic skills are tested, and an assessment of correlation of relations, where logical selection, analogies, and classification are measured. Both the NMAT and the PLM MCAT contain assessments of mental abilities, but the NMAT had the advantage over the MCAT in being expansive in assessing academic achievement. These additional subtests for academic achievement may have significantly impacted the applicant's readiness and academic performance while in medical school, hence making the NMAT a much better predictor of performance compared to the MCAT.

This study also demonstrated that students of certain baccalaureate degrees and of certain academic institutions performed better compared to other undergraduate courses and to other schools. Academic performance was higher in premedical courses with clinical exposure, especially physical therapy, public health, nursing, and medical technology. Academic performance in biomedical science courses—such as chemistry and biology—is inferior to courses on health. In a study done at University of Santo Tomas, graduates of nursing, physical therapy, and occupational therapy garnered higher scores in their medical GWA compared to other courses (Cunanan, 2020). The same findings were observed in foreign studies, where health-related premedical degree results in the best performance throughout medical school (Aston-Mourney et al., 2022). This study also emphasizes the significance of premedical schools in predicting academic success. National government-funded institutions outperformed almost all private or independent universities in terms of performance. This makes sense given that these state-funded universities have stricter admissions requirements. Currently, there are no local studies indicating which local schools predict medical students' academic performance.

In terms of noncognitive abilities, this study observed that, when combined with the GWA and NMAT, the interview performance of applicants had the potential to predict the grades of students in their first year of the medical program. Foreign studies also showed an association between the interview scores and the medical students' grade point average (GPA; Liberty et al., 2022; Wilkinson et al., 2008). Notably, interview scores showed stronger correlation with students' performance in clinical years (Sladek et al., 2016; Zhang et al., 2008). However, a study at UP revealed a weak correlation between these variables (Catabijan, 2017), which aligns with findings from Bodger et al. (2011) where interview scores were not correlated with academic achievement. These variations in results could be influenced by the interview questions and interrater variability. Despite these conflicting findings, including the interview as one of the admission criteria remains important because it serves as a valuable tool for evaluating nonacademic qualities such as communication skills, critical thinking, compassion, and resilience, which might not be evident in other admission criteria.

The results of this study can assist university administrators in developing suitable admission criteria for the College of Medicine, with the aim of selecting students who are likely to excel and successfully complete the program. This could involve refining the selection process to identify candidates with the qualities necessary for success in medical education. This approach not only benefits individual students by providing them with the best chance of success but also contributes to the overall quality and reputation of the College of Medicine.

5. Conclusion

In the assessment of potential applicants to the degree of doctor of medicine, it is of utmost importance to consider both the academic and nonacademic qualities of the applicants. In this study, the assessment of readiness using academic preparation criteria based on the applicant's premedical degree and school of origin, undergraduate GWA, and NMAT score are relevant to ensure the success of an applicant in pursuing a medical degree at the PLM College of Medicine. The interview scores potentially predict academic performance in the first year when combined with the GWA and NMAT. Among the factors analyzed, the MCAT was not predictive of a first-year student's performance. This finding related to the MCAT may be used as a guide for the noninclusion of the PLM MCAT in succeeding cycles of application. Based on the results, there are enough factors in place in choosing applicants to the PLM College of Medicine.

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Authors' contributions

Dr. Rose Anna R. Banal – study design, methodology, data collection, statistical analysis and revision of drafted manuscript; Dr. Maria Cielo B. Malijan – data collection and drafting of manuscript; Dr. Fernando P. Solidum – data collection and drafting of manuscript; Dr. Merry M. Clamor – study design, methodology and data collection; Dr. Phylis C. Rio – study design and drafting of manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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