



Predictive validity of the special tertiary admission test in Papua New Guinea

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ABSTRACT

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The Special Tertiary Admission Test for Papua New Guinea (STAT-P) designed by the Australian Centre for Educational Research (ACER) is jointly administered by ACER, Papua New Guinea University of Technology (PNGUoT), the University of Goroka (UoG) and Pacific Adventist University (PAU) and used to admit students to these universities since 2016. STAT-P is similar to other aptitude tests conducted by ACER for universities in Australia, New Zealand, the UK, and Ireland but has been adapted to minimize cultural bias and language issues that may be peculiar to Papua New Guinea (PNG). As an admission tool, STAT-P is required to have a positive relationship with an outcome criterion. This relationship, which is often called the predictive validity of the test has not been studied since the inception of STAT-P. Consequently, the purpose of this study was to establish the predictive validity of STAT-P. A completely randomized design was used to select the 2018 cohort of first year students at PNGUoT as a sample for this study. The specific objective was to estimate the relationship between marks obtained for STAT-P and another subject titled “English Grammar and Composition” (LA101) which was taken by all the first-year students at PNGUoT. The results show that a positive and significant linear relationship ($r(475) = 0.363$ and $P = 0.00$) exists between the two subjects. This result supports the rationale for the continued use of STAT-P as a valid tool for admitting students to PNGUoT.

Contribution/Originality: This paper contributes to the ongoing debate on the effectiveness of using more holistic and inclusive assessment methods for admitting candidates into tertiary institutions especially in resource-constrained jurisdictions. The evidence provided in this paper is the first of its kind in PNG and will inform decisions of policy makers, teachers, guardians and other stakeholders in the Higher Education Institutions (HEIs) of PNG and elsewhere.

1. INTRODUCTION

In PNG and worldwide, universities sit at the apex of the higher education (HE) sector and play a crucial role in producing individuals with the necessary attitudes, knowledge and skills needed for sustainable development. This point is buttressed by the study of Collier and Dollar (2002) which indicated that higher levels of participation of the population in HE in many developing countries were positively related to higher levels of integration into the global economy and economic growth as well as improved health and income.

Universities must develop and implement processes and regulations of high standards in many operational areas, such as enrolment, teaching, learning, and assessment to deliver good quality outcomes for graduates and other stakeholders. Enrolment processes impact the quality of students who are admitted to pursue courses that are offered at a university. Given the current resources at their disposal, PNG universities can offer only limited

enrolment to the ever-growing number of applicants who wish to pursue courses at these institutions as shown in Figure 1.

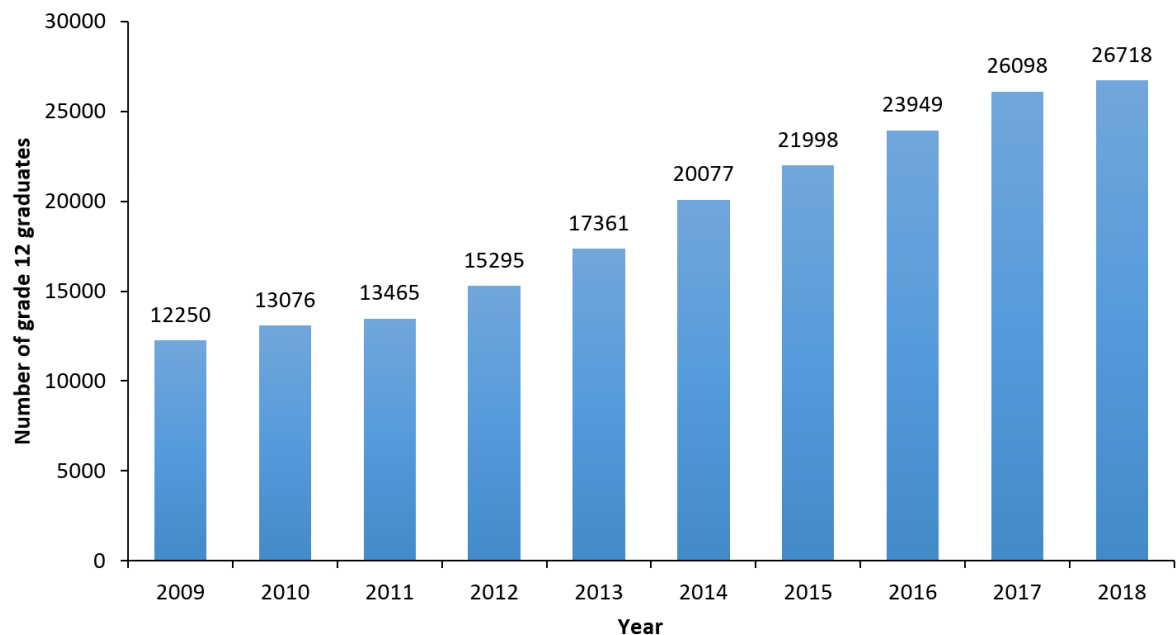


Figure 1. Number of grade: 12 graduates enrolled in higher education institutions in Papua New Guinea

Source: DHERST (2018).

At PNGUoT, only about 20% of applicants are typically offered admission to the first year of different courses each year. Universities in PNG are compelled to practicalize fair and transparent selection criteria which ensure that only the most suitable and capable candidates from among the large number of applicants are selected given the competitiveness of student admission. The [Admissions to Higher Education Steering Group \(2004\)](#) recommended that a more holistic assessment, which considers both academic achievement in relevant subjects and the potential of the applicant to succeed in a tertiary institution should be considered during the selection process. Such holistic assessment methods include generic aptitude tests which are not subject-specific. In many parts of the world aptitude tests are used either wholly or as a supplement to high school outcomes to select and admit students to university courses ([Coates, Edwards, & Friedman, 2010](#); [McManus et al., 2005](#); [Nicholson, 2005](#); [Stringer, 2008](#)). This strategy improves the diversity of entry pathways thereby making tertiary education more accessible to gifted students irrespective of educational background. [Coates et al. \(2010\)](#) found that scores of an aptitude test used to admit students to some Australian universities were not correlated with the socioeconomic status of the students.

Therefore, it would seem appropriate that the governing councils of the three universities in PNG (i.e., the PNGUoT, UoG and PAU) approved a requirement for certain categories of applicants to take an aptitude test as part of the admission process to their universities. It was hoped that the results of a well-designed aptitude test, when used as part of the selection criteria could help uncover hidden talent and potential among the applicants. Subsequently, STAT-P, an aptitude test designed and produced by ACER was approved and jointly administered by ACER and the three universities to applicants seeking admission to the same universities.

STAT-P is similar to other forms of aptitude tests conducted by ACER which are used by universities in Australia, New Zealand, UK and the Ireland ([Luc, Nguyen, & McLean, 2017](#)). However, STAT-P has been adapted and refined to minimise cultural bias and language issues that may be peculiar to PNG. According to [Luc et al. \(2017\)](#), STAT-P tests generic academic attributes using two test constructs: verbal reasoning (whose elements are understanding, reasoning and critical thinking) and quantitative reasoning (whose elements are comprehension, application, decision-making and problem-solving). Although STAT-P does not test in-depth knowledge of specific academic disciplines, it is expected to have predictive validity or positive correlation with candidates' level of

academic achievement in their future studies just like other performance-based predictive admission tests (Hamish Coates, 2008; Coates et al., 2010; Zimmermann, Klusmann, & Hampe, 2017).

1.1. Research Question and Significance

Management of the three PNG-based universities mentioned earlier implemented the decision to use STAT-P as an admission criterion based on the belief that STAT-P can provide an effective measure of the inherent capacity of applicants to succeed in their future studies at the university. The introduction of STAT-P was also seen as a quality control mechanism to protect the integrity of university education in PNG in the face of widespread media reports on pre-entry examination malpractices in the country. However, not all universities in PNG welcomed the idea, and indeed, no empirical study had been done at that time within PNG to justify the need for STAT-P and to convince other universities to join the scheme. Although other studies done elsewhere have demonstrated evidence of strong predictive validity of admissions entry tests, the scope of these studies does not necessarily include the PNG context where such tests seem to have attracted public debate. Therefore, it was thought that the relationship of STAT-P to an outcome criterion, such as the performance of the selected students could provide strong evidence to assess the value of using STAT-P as a part of the admission process to universities in the country. This study was designed to elucidate the following research question: what is the magnitude, direction and significance of the relationship between STAT-P and student performance at PNGUoT? It was envisaged that conclusions drawn from this study will contribute significantly to the debate on the use of more holistic assessment methods for admitting students to universities, especially in PNG and also satiate the interest shown by teachers, government, and the public about the necessity and importance of STAT-P.

1.2. Objectives

Guided by the research question, this study set out to establish the predictive validity of STAT-P in PNG as a basis for deciding whether it should continue to be used as an admission criterion, and an avenue through which teachers, policymakers, and the general public can be made aware of its relevance. Therefore, the specific objective of this study was to use the marks obtained by a sample of students who were admitted to PNGUoT to estimate the correlation between STAT-P and LA101, a subject taken at PNGUoT by all the students, and to interpret this correlation as a measure of the predictive validity of STAT-P.

2. REVIEW OF RELATED LITERATURE

There is little disagreement that admission processes are true predictors of students' learning abilities in post-admission studies although there is relentless debate about the importance of pre-entry university examinations as an admission criterion (Al-Hattami, 2012; Kim, 2002; Ocbian, Gamba, & Ricafort, 2015; Snyder, Hackett, Stewart, & Smith, 2003). While this may be a truism, the question of whether admission tests should be part of the admission criteria is still undergoing empirical testing to this day. Using the United States of America (USA) as a case, it is reported that the University of California (UC) voted in 2020 to discontinue admission tests, believing that they impair diversity efforts (Zwick, 2023). Before this decision, a disturbing relationship between admission test scores, and test takers' socioeconomic and ethnic backgrounds was noted (Wilner, 2020). The observation that Asian and Caucasian test takers are favored over those of Black, Hispanic, and Native American origin, and test takers from low-income families find it hard to outshine their counterparts from high-end families emerged (Zwick, 2023). While group differences do not in themselves demonstrate that a test is biased or unfair, a heavy emphasis on test scores in admissions decisions in this case may result in lower selection rates for candidates who are of Black, Hispanic, or of Native American descent and those from low-income families.

At the University of North Carolina (UNC) and Harvard, the situation is no better either. It is reported that applicants with similar academic index (i.e., a metric based on admission test scores and grade-point average) had

widely different admission rates by race with African American and Hispanic applicants being favored over White and Asian American applicants with the same scores (Students for Fair Admissions, 2023a, 2023b). While these controversial cases present opportunities to re-examine the importance of admission tests in a socially diverse environment, it is important to remember that these reported controversies only frustrate diversity efforts but do not dispute the power of admission tests in predicting students' college performance. In support of this view, former UC president Janet Napolitano remarked in 2020, *"although admissions tests measure skills needed in college work and are useful in predicting college performance, the substantial test-score differences among ethnic and socioeconomic groups are a cause for concern"* (Students for Fair Admissions, 2023a).

Unlike in the US, where many top universities have discontinued admissions tests, China is still keeping its students' noses to the grindstone after realizing that discontinuation of these tests did not help the country during the Cultural Revolution. The college entrance examinations were reinstated upon reports indicating that China was falling behind the rest of the free world in science and technology (Klitgaard, 1986). Since the restoration of these admission tests, China has been able to identify potential talents, shape their character through college systems, and deploy them after college to influence change and spur innovations upon which modernized societies and industrial-based economies hinge (Lui, 2021). This notwithstanding, some observers claim that while the importance of admissions tests cannot be over-emphasized, regional discrimination in students' enrolment has become a matter of concern throughout China (Xiong, Hailiang, & Weixing, 2016). The Local Protection Policy (LPP) that gives priority to applicants from localities where colleges are situated is faulted for being segregated and unjust. With this policy, applicants with low scores on entry tests usually obtain admission to prestigious colleges based on geographical location. Since students' scores from these tests have been found to have a close bearing on which type of universities they can attend and what areas of study they can pursue, high school teaching in China is focused on preparing learners for college entry exams instead of developing learners' abilities to their full potential (Xiong et al., 2016). Whereas this may be viewed as a systemic weakness in China's education, it cannot be used as a basis to dispute the importance of college entry tests in China, for these tests have not only helped colleges to predict applicants' college performance but are also mechanisms of spotting talents and frameworks for predicting the quality and caliber of China's workforce across disciplines (Bai, Ruixue, Hongbin, & Xin, 2021a, 2021b).

In the Philippines, the National College Entrance Examination (NCEE) remained a standardized test for university admissions until 1994. Presidential Decree No. 146 abolished college entrance tests because assessable tasks were in a foreign language which would prejudice students from rural areas (with poor foundations in English) and deny them equal access to quality education (Earl & Katz, 2006). Although the college entry exams were discontinued for inequity and political reasons, they were later reinstated in different forms (e.g., the National Secondary Assessment Test (NSAT), the National Career Assessment Examinations (NCAE), and the National Medical Admissions Test (NMAT among others) upon realizing that it was the only way to control student influx, assess applicants' cognitive abilities and determine how ready applicants were for university-level work) (Daway, Sarah, Pernia, & Ramos, 2018). Although the role of administering admissions tests was in the hands of the government and a few certified private bodies like the Philippines Psychological Cooperation for a long time, universities decided to take up this role to design admissions tests that are well aligned with the universities' philosophy, mission, and vision statements. For instance, the University of the Philippines (UP) introduced its entry exam known as, the UP College Admission Test (UPCAT) which is taken by over 100,000 students annually (UPCAT, 2024). Universities in the Philippines have a strong belief that the college entry examination framework is a suitable mechanism through which potential talents are identified early enough, enrolled, trained through the formal college system, and deployed after graduation to influence a positive change in the economic, social, political, and technological systems for sustainable development since HE is believed to be the most critical sphere that promotes personal development and economic, technological, and social change (Generose, Sawey, & Bonimar,

2022). The college entry tests in the Philippines not only have a positive and significant effect on students' academic performance but are also true predictors of students' contributions to society after graduation.

Unlike in the Philippines where the impact of admissions tests has so far surpassed the borders of education to affect the political, economic, technological, and social order, the primary importance of entry tests in Indonesian universities is limited to improving university access for less advantaged students, providing a standard measure to compare applicants, and predicting how enrolled students will perform in their respective specializations (Yamin, 2023). Although criticisms against college entry tests in Indonesia are numerous, a study by Mohamad, Natanael, Gerald, and Ari (2019) justifies the need for these tests. They state that one of the main functions of the university is to produce a labour force that is receptive to the ever-changing functions in which it is immersed, and this is mirrored in the internal processes of a university, with admissions processes being a part. Similarly, a study by Suprpto and Wahyu (2021) whose primary focus was to establish whether students' selection tests in Indonesian universities correlate with their learning achievements observed that although there is a multiplicity of confounding variables in the causal chain with potential predictive power (i.e., family background of students, teacher-student relationship, teacher-student ratio, teacher motivation among others), there is evidence that college entry tests had a positive and significant relationship with students' academic performance. However, due to the interferences from the confounding variables, they recommended that instead of subjecting applicants to a generic aptitude test, institutions must obtain a selection test criterion that is aligned with the characteristics of each study programme.

In Singapore, the University Entrance Examinations (UEE) differ from university to university, and besides the most common aptitude entry tests, most universities have other entry requirements that are specific to the main area of study (Rais, Jessica, & Kelvin, 2022). For instance, the National University of Singapore adopts a holistic admission approach that includes scores from the Singapore-Cambridge General Certificate of Education: Advanced Level (GCE A-Level), aptitude admission test scores, applicants' interest in the course (with demonstrable evidence) in addition to satisfying the subject prerequisites for the programmes they are applying for (Davie, 2016; Rais et al., 2022). This approach reflects the university's commitment to considering the broader qualities and experiences that applicants bring to the academic community (Davie, 2024). While this holistic selection approach seems to be better than the single-dimension approach (aptitude tests) commonly used by most universities, it prompts us to raise a natural question: does selecting applicants based on a multiplicity of applicants' attributes beyond aptitude test scores allow universities to better predict students' academic achievements in their respective disciplines and/or pick up individuals who will be more successful in the job market? There is sparse empirical evidence to suggest that with this approach, universities create a more diverse and innovative student body that reflects a broader range of backgrounds, experiences, and perspectives all of which are critical to their academic performance and life after college although locating suitable answers to this question from the available body of literature is a daunting undertaking (Antecol & Kiholm Smith, 2012; Bastedo, Bowman, Glasener, & Kelly, 2018; Black, Cortes, & Lincove, 2015; Grabowski, 2018).

The contexts reviewed in this literature section are intended to provide a foundation for comparison and a basis to consider these contexts as they bear on PNG. Whereas pre-entry university examinations have a long history as provided in the preceding paragraphs, it is important to mention that it is a new development in PNG. Until recently, universities in PNG relied heavily on the traditional admission approach that primarily uses secondary school leaving examination scores as the only reliable yardstick for admission (Department of Education, 2020). However, it is reported that the exponential increase in demand for HE against limited quotas in the existing universities may have unfortunately forced some high schools in PNG to indulge in examination malpractices as one sure way of securing university admission for their students (Kaiyeke, 2017; Sinebare, 2011). This becoming a national concern in 2010, a few universities embarked on introducing strict admission-selection procedures as a quality control mechanism. However, this did not eventuate until 2016, when PNGUoT and UOG signed a memorandum of understanding with an Australian-based agency, ACER, to design, produce, and administer

tertiary-level aptitude tests that are aligned to the PNG context and which could be used as a criterion for admission. The implication was that all school leavers selected by DHERST for these two universities, irrespective of their grade 12 certificate scores had to sit for the STAT-P examination to qualify for admission to a degree course in these two universities.

3. MATERIALS AND METHODS

3.1. Research Population

Data for this study were sourced from the student record system of PNGUoT, the founding university where the STAT-P test was first administered in PNG. Data were available on students who were admitted each year. Thus, the research population consisted of all yearly cohorts of students from 2016 to 2022 who took STAT-P as part of the requirement for admission to the university. At PNGUoT, only School Leavers (SLs) are required to take the STAT-P. SLs are applicants who have completed secondary or high school and have taken the national grade 12 examinations in the same year that they apply for admission to the university. Furthermore, more than 85% of candidates admitted to courses at this university are SLs. Selection of school leaver (SL) candidates is based on an aggregate score calculated from marks obtained in certain academic subjects from the grade 12 examinations and total STAT-P scores. Total STAT-P scores are derived from the verbal and quantitative reasoning scores. However, academic subjects used to select applicants for different courses are not necessarily the same.

3.2. Research Design

A completely randomized design was used to select a single cohort of students who were admitted to PNGUoT between 2016 and 2022 for this study. All the students selected met the university's requirement to take STAT-P to qualify for admission to the university.

3.3. Research Instrument

In this study, the relationship between STAT-P and performance was estimated as the linear correlation between STAT-P and the final assessment marks obtained by first-year students in 2018 for a common subject (LA101) that is taken by all students admitted to courses at the university. Each student is required to obtain a pass mark in this subject (or its equivalent) before proceeding to the next level of the course. The final assessment mark for LA101 is a combination of continuous assessment and final examination marks obtained by a student. The correlation between STAT-P and LA101 marks was estimated separately for groups of courses that had similar (but not identical), subject-specific entry requirements at the university. These course groups were Science, Engineering, and Humanities.

3.4. Validity and Reliability

Validity of STAT-P was assessed using the coefficient of linear correlation between STAT-P and LA101. Both tests are conducted by reputable institutions and were therefore assumed to be valid and reliable measures of aptitude and performance respectively of the subjects. Linear correlation is a widely accepted statistical procedure for evaluating the relationships between two variables which, in this case were STAT-P and LA101. Both STAT-P and LA101 were assumed to have a bivariate normal distribution. Visual inspection of scatterplots done during data preparation indicated that a linear relationship existed between the two variables. The significance of each correlation coefficient was assessed using the associated p-values. The null hypothesis was as follows: the population correlation coefficient is not significantly different from zero, i.e., there is no significant linear relationship between LA101 and STAT-P in the population. The alternative hypothesis was as follows: the population correlation coefficient is significantly different from zero, i.e., there is a significant linear relationship

between LA101 and STAT-P in the population. The null hypothesis was rejected when the p-value was less than the significance level ($\alpha = 0.05$).

The simple linear correlations for the different groups of courses were calculated and compared using the Least Significant Difference (LSD) procedure of SPSS (2013) software. In this study, the values of the correlation coefficients were not corrected for range restriction and for the bias caused by the inclusion of different subjects in the aggregate score used to select students. Both of these factors are believed to cause an underestimation of the correlation coefficient (Wiberg & Sundström, 2009; Zimmermann et al., 2017).

4. RESULTS

Analysis of the data collected on the 2018 cohort for the different course groups generated a positive and significant correlation between STAT-P and LA101 for the combined data ($(r(475) = 0.363$ and $P = 0.00)$ (see Table 1)) as well as for each of the course groups. However, the magnitude of the correlation coefficient differed between the course groups.

Table 1. Pearson correlations between STAT-P² and first-year subject scores in different course groups

Course group	Number of observations (n)	Degrees of freedom	Pearson correlation coefficient (r)	Significance (p)
Science	108	105	0.486	0.000
Engineering	143	141	0.19	0.023
Humanities	226	224	0.274	0.000
All data	477	475	0.363	0.000

Note: STAT-P = Special tertiary admissions test-Papua New Guinea.

5. DISCUSSION

The positive and significant correlation coefficients between STAT-P and LA101 marks for the course groups and the whole data indicate that STAT-P can be considered as a valid indicator of performance at the university for those who have been admitted. Furthermore, the magnitude of the correlation coefficients falls within the range reported by some authors (Coates, 2007). The magnitude of these correlations could have been higher if they had been corrected for range restriction and bias caused by the inclusion of different sets of subjects in the criterion which was used to select and admit the applicants (Zimmermann et al., 2017). These factors may also be responsible for the differences in correlation coefficients observed between the course groups. Range restriction has to do with the fact that LA101 was not measured on rejected applicants. Thus, the range of the correlation coefficient is restricted only to those who were selected to pursue courses at the university rather than to the whole group of applicants including those who were not selected. This also means that the correlation coefficients apply to only the restricted group of those selected and may not be generalized to the whole group of applicants. Furthermore, combinations of different subjects in the selection criterion may generate negative correlations among the subjects in the selection criterion, including STAT-P. These negative correlations could be due to the possibility that poorer performance in one of the subjects may have been compensated for by better performance in another subject in the set. This phenomenon has been shown to underestimate the correlation between a test, such as STAT-P and the outcome test, such as LA101 (Givner & Hynes, 1979; Gulliksen, 1950; Zimmermann et al., 2017). The degree of such underestimation is likely to depend on the relationship between the subjects involved.

In many parts of the world, aptitude tests are used either wholly or as a supplement to high school outcomes to select and admit students to university courses (Coates et al., 2010; McManus et al., 2005; Nicholson, 2005; Stringer, 2008). This development improves the diversity of entry pathways, thereby making tertiary education more accessible to gifted students irrespective of educational background. The results of this study indicate a positive and significant relationship between STAT-P and performance at one of the participating universities in PNG. This outcome supports the continued use of STAT-P at the university as an admission tool. However, further

insight could be gained by studying the data gathered on other cohorts and other participating universities in PNG.

6. CONCLUSION

The increasing number of students enrolled in HE in PNG (see Table 1) over the years has the potential to positively impact economic development in the country. This trend indicates an increasing awareness in the population of the proven benefits of HE including job security and better salary and conditions of service in an increasingly competitive job market. On the other hand, the increasingly competitive nature of admission into PNG tertiary institutions places the responsibility on teachers to ensure that only the most suitable candidates are admitted while maintaining diversity of students irrespective of social and educational background. STAT-P was conceived as a tool for enhancing the effectiveness of the process used to admit students to the first year of courses in certain universities of PNG. The test gives candidates an opportunity to demonstrate their ability to cope with tertiary studies. Its purpose is to measure candidates' aptitude or ability (capacity to perform), rather than achievement (demonstrated performance), which takes place in educational institutions. This study found a positive and significant linear relationship between STAT-P and performance at one of the universities. The results of this study support the continued use of an aptitude test as part of the admission criteria to the university concerned. It may also seem to align with national aspirations for the development of HE in PNG as enshrined in several national development goals: PNG Vision 2050 (GoPNG, 2021a); PNG Strategic Development Plan (GoPNG, 2021c) 2030 and the PNG Medium Term Development Plan III (GoPNG, 2021b).

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Institutional Review Board Statement: The Ethical Committee of the Papua New Guinea University of Technology, Papua New Guinea has granted approval for this study on 3 June 2024 (Ref. No. AIEC 2024/GD).

Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Competing Interests: The authors declare that they have no competing interests.

Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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