A Comparison of the Arbitrary Set Fifty Percent Pass Mark Standard and Grade Point Average Attainment for Pharmacy Students at the University of Zambia: Implications for High-stakes decisions in Assessments

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Abstract

In many higher learning institutions and Health Professions Education (HPE) programmes in particular, there exists varying standard setting methods for assessment, certification and graduation of students' academic performance. In Zambia, the historic arbitrary set 50% pass-fail standard is predominant in most health professions' training programmes. Scientific validation of this practice, however, remains scarce. The aim of this study was to compare the academic performance on the historic arbitrary set 50% pass-fail standard to the Grade Point Average (GPA) score attainment for pharmacy students examined between 2013 and 2017 at the University of Zambia. A cross-sectional study was conducted with a total of 445 randomly selected final examination results for undergraduate pharmacy students examined between 2013 and 2017 at the University of Zambia. The data was analysed using Stata 13 and GraphPad Prism 5. For all the statistical tests conducted, normality of the data was checked using the Shapiro-Wilk test. There was statistically significant difference between the historic arbitrary set 50% pass-fail standard and the course-specific examination composite score attainment in all the courses (P<0.0001).

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Additionally, there was a statistically significant difference between the examinees' GPA score attained and the acceptable GPA score of 3.0 (Median GPA 1.75; IQR: 0.75-2.25 and 1.67; IQR: 1.0-2.0) for the fourth and fifth-year examinees respectively). The comparison of the academic performance on the arbitrary 50% pass-fail standard and GPA score attainment for pharmacy students revealed that despite students demonstrating ability to attain high course-specific composite scores using the arbitrary set 50% pass-fail standard, the attained median GPA score was statistically significantly less than the minimum acceptable GPA score of 3.0. While the 50% pass-fail standards' precision to detect academic performance maybe questioned, the findings suggests that the incorporation of a credit point and GPA system for making assessment decisions to rate students, certification and graduation requirements in Health Professions Education may offer better precision and prediction to detect academic performance and competency attainment.

Key Terms: Grade Point Average; Graduation Requirements; Pharmacy; Standard Setting.

1. Introduction

Assessment is a process of determining whether predetermined educational objectives have been achieved and is therefore a measure of student learning [1]. Assessment is considered a primary quality assurance mechanism by which Health Training Institutions (HTIs) and professional regulatory authorities can assure the public of acceptable levels of competence among their trainees and practitioners [1-3]. Whereas formative and summative types are generally two assessment categories; Summative Assessment (SA) is normally envisaged as a formal assessment with shared criteria, outcomes, standards and is a summation of a unit, course or programme of learning which is seen to take place towards the end and which is usually graded and part of an accredited unit[4]. SA gives an overall level of student performance and is a formal process that often leads to certification or pass/fail judgment or grading (for example: A+, B, C or D) [5]. The most important outcome of SA is to categorise examinees into ordered performance level groups with respect to stated objectives of a curriculum, that is, to classify them into those that demonstrate proficiency in having achieved the set standard to pass and those who fail to meet the set standard [4-6]. At University of Zambia Schools of Medicine and Health Sciences (UNZASOM/HS), respectively, this categorisation is from a summation of marks obtained from various assessment procedures, for example, essays, multiple choice items, and clinical or practical examinations [7]. The total score represents an examinee's attainment on the performance continuum implied by the proficiency levels and superimposed on a percentage scale ranging from 0 to 100% which is further comprised of a Continuous Assessment (CA) score (40%) and Final Examination (FE) score (60%) [7]. Since inception in 1966, the medical and health science programmes at UNZA have used the arbitrary 50% of composite scores of a candidate in an examined subject as the cut-off for pass or fail decisions. While this is important in SA, other institutions use the Grade Point Average (GPA) as a measure of academic performance and grading for certification. GPA is a numerical figure representing the average level of academic achievement based on numerical grade scores attributed to letter grades representing a level of academic achievement. The GPA is a number that indicates how well or how high an examinee scored in his/her courses on average and indicates to some extent, how consistent one has been performing in their studies [8]. It's meant to be scored, usually on a

GPA scale of between 1.0 and 4.0 during studies and shows whether the grades have been high or low overall in classes. Due to variations in the [9] grading system, the GPA scoring scale is however slightly different across training institutions, for instance at UNZA, Distinction = A = 4; Merit = B+ = 3; Clear Pass = C+= 1; Fail = D = 0 etc. Notwithstanding, faculty and examination boards have expressed deep concern about innumerable instances where students attained high scores in written examinations yet demonstrate glaring lack of factual, conceptual, and procedural knowledge in face-to-face oral (viva voce) and clinical examinations [8, 10]. This raises questions about the precision of the historical 50% criterion-referenced pass-fail standard setting to correctly identify those who have or have not attained stated educational objectives. This is against a background that other methods of standard setting, certification as well as graduation requirements may offer varying degrees of precision and prediction to detect academic performance. Recent evidence by Kalungia and colleagues *(2019)* showed that the majority of undergraduate pharmacy students at UNZA adopted predominantly strategic approach to learning with primary focus on passing specific courses during assessments [10]. Whether the prevailing assessment policy and pass-fail criteria used at the university contributes to influencing how students learn and take assessments is subject to further interrogation through research. The concerns raised about the validity and reliability of the historical 50% pass-fail standard have implications for so many students in high stakes proceedings and therefore cannot be ignored. This study compared the academic performance on the 50% pass-fail standard and GPA score attainment for pharmacy students examined between 2013 and 2017 at UNZA.

2. Methods

2.1 Study Design and Setting

The study was an analytical cross-sectional study conducted at UNZA, Department of Medical Education Development as well as at the Department of Pharmacy in Lusaka, Zambia.

2.2 Population, Sample Size and Sampling Technique

The study population comprised the Year 4 and 5 undergraduate pharmacy student's examination results. The sample size was calculated using the Centre for Disease Control and Prevention EPI info Statistical calculator (CDC, 2012) with 95 confidence interval and 5 % margin of error considered in the calculation. A total of 445 examination results (228 for the Year 4 and 217 for the Year 5, respectively) were randomly selected from the databases for the academic years 2013 through to 2017.

2.3 Data Analysis

Senate approved examination results for the following common core full-courses taught on the Bachelor of Pharmacy (BPharm) programme were considered: Pharmacology, Clinical Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal Chemistry and Clinical Pharmacy. Statistical analyses were done using Stata version 13 (STATA Corp., College Station, TX, USA) and Graph Pad Prism 5 (Graph Pad Software Inc., La Jolla, California, USA). For all the statistical tests conducted, normality of the data was checked using the Shapiro-Wilk test. To compare the demographic characteristics and the GPA score, the Mann-Whitney U test

was used while the One-sample t-test and Wilcoxon signed rank test was used to compare the attained examination composite score and GPA score with the standards.

2.4 Ethical Considerations

Ethical approved for this study was granted by the University of Zambia Biomedical Research Ethics Committee (Ref. No. 011-06-17).

3. Results

3.1 Demographic Characteristics of the Examinees

A total of 445 examination results were retrieved for the common core pharmacy courses. Table 1 below, summarises the demographic characteristics of the examinees by sex, marital status, type of sponsorship, level of entry into university, and age.
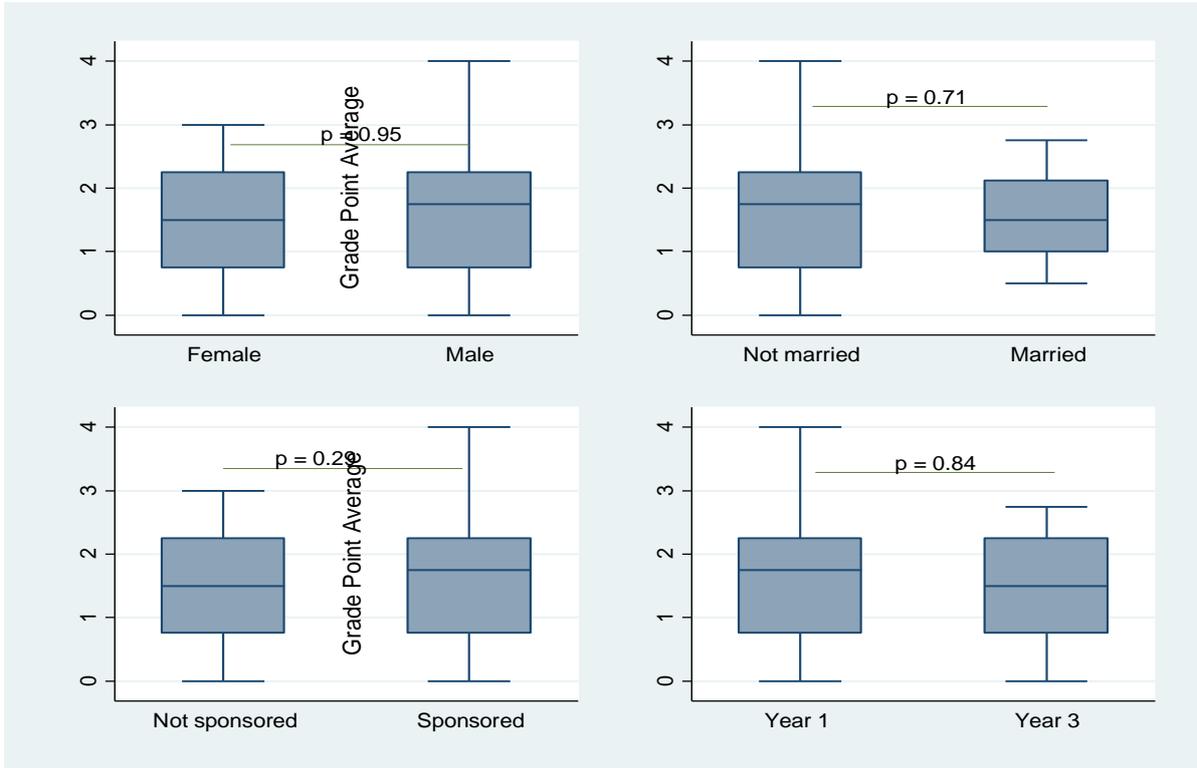
Table 1: Demographic Characteristics of the Examinees

| Variable		Fourth Year		Fifth Year	
		Proportions	p-value	Proportions	p-value
Sex	Male	148 (65%)		133 (61%)	
	Female	80 (35%)	<0.0001	84 (39%)	0.0016
Marital Status	Married	28 (12%)		25 (12%)	
	Unmarried	200 (88%)	<0.0001	192 (88%)	<0.0001
Sponsorship	Self-sponsored	65 (28%)		66 (30%)	
	Sponsored	163 (72%)	<0.0001	151 (70%)	<0.0001
Level of Entry into University	Year One	183 (81%)		170 (78%)	
	Year Three	45 (19%)	<0.0001	47 (22%)	<0.0001
Age (Median, IQR)		24 (23 – 25)		25 (24 – 27)	

3.2 Analysis of Demographic Characteristics against GPA score

An analysis of the demographic characteristics against the GPA was done in order to establish if there would be any relationship between the outcome and independent variables. Since the data was not normally distributed, the Mann-Whitney test was used. As shown in Figure 1 and 2 below for the fourth and fifth-year examinees respectively, there was no statistically significant difference between the demographic characteristics of examinees and their GPA score attained (Fourth Year: sex, $p=0.95$; Marital status, $p=0.71$; sponsorship, $p=0.29$; year of entry into university, $p=0.84$ and Fifth year: sex, $p=0.56$; marital status, $p=0.84$; sponsorship, $p=0.60$;

year of entry into university, p=0.11)

Figure 1: Median GPA scores for the Fourth year examinees by demographic characteristics
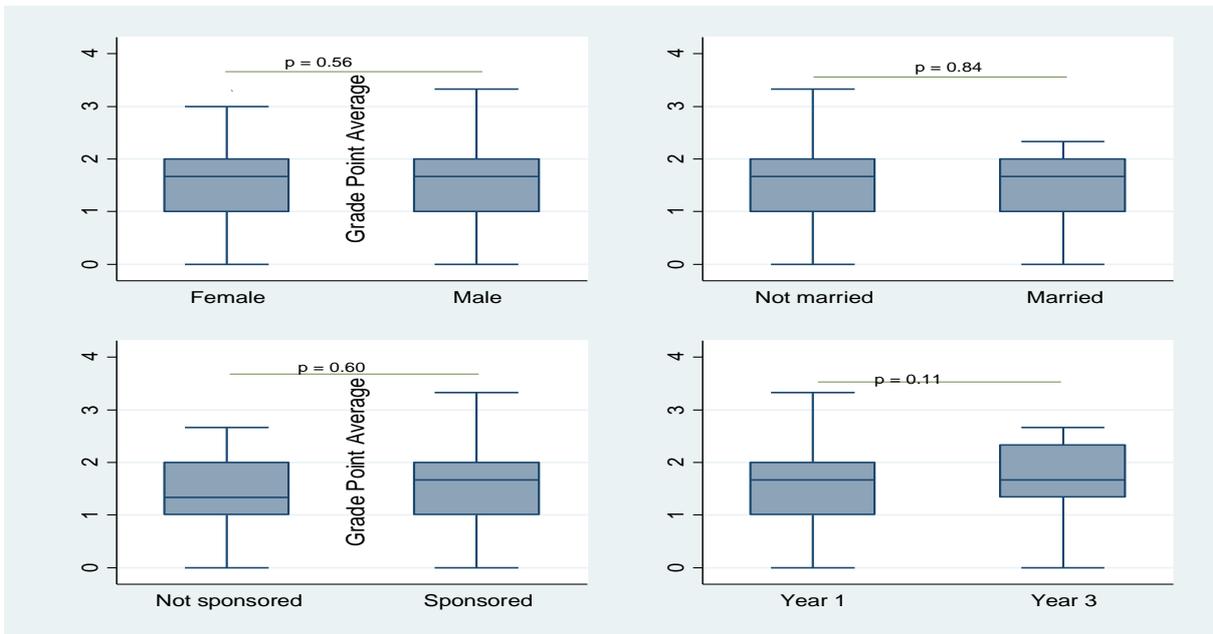
Figure 2: Median GPA scores for the Fifth-year examinees by demographic characteristics

3.3 Comparison of the 50% pass-fail standard and the composite course-specific examination score

To compare whether there is a difference between the 50% pass-fail standard and the course- specific examination composite score, a one sample t-test revealed a statistically significant difference between the two variables. This implied that on average, many examinees were able to attain an examination composite score above the 50% pass-fail standard in the respective courses examined. Table 2 below summarizes these findings.

Table 2: Comparison of the examinees course specific mean composite scores with the 50% pass-fail Standard

Level of Training	Pass-Fail Standard (Cut-off score, %)	Course Title	Mean Score (SD)	P value
Fourth (4) Year	**50**	Pharmaceutics	61 (7)	<0.0001
		Pharmacology	61 (8)	<0.0001
		Biopharmacy	62 (11)	<0.0001
		Medicinal Chemistry	60 (10)	<0.0001
Fifth (5) Year	**50**	Pharmacy Practice	63 (9)	<0.0001
		Clinical Pharmacy	59 (6)	<0.0001
		Clinical Pharmacology	60 (7)	<0.0001

In order to determine the overall examinee's performance based on their GPA score, a comparison of the participant's mean GPA score with the minimum acceptable GPA according to the revised UNZA academic regulations was done and the GPA scores attained were computed for each examinee based on the grading point allocation [7]. The Wilcoxon signed rank test was used for the comparison since the data was not normally distributed. In the fourth-year, the median GPA score was found to be 1.75 (IQR = 0.75 to 2.25; p<0.0001) while for the fifth-year students, the median GPA score was 1.67 (IQR, 1.00 to 2.00; p<0.0001).

Table 3: Comparison of the Examinees GPA Score with the minimum acceptable GPA standard.

Level of Study	Minimum GPA score	Median GPA score (IQR) in the core courses	P value
Fourth (4) Year	3	1.75 (0.75 – 2.25)	<0.0001
Fifth (5) Year	3	1.67 (1.0 – 2.0)	<0.0001

4. Discussion

This study compared the academic performance of undergraduate pharmacy students using the current 50% pass-fail standard criteria versus the GPA score attainment method. Summative assessment outcomes of the fourth- and fifth-year pharmacy students examined between 2013 and 2017 at UNZA were considered. To the authors' knowledge, this was the first such study to interrogate and compare the academic performance on the 50% pass-fail arbitrary set standard and the GPA score attainment system in Zambia. The findings revealed that while examinees demonstrated ability to attain high course-specific composite scores against the arbitrary set

historic 50% pass-fail standard, their median GPA score attained was less than the minimum acceptable GPA score of 3.0. Additionally, there was no statistically significant relationship between the various demographic characteristics included in this study with the GPA score attainment. The low GPA scores observed may be suggestive of poor mastery of expected competencies and cannot be ignored since the GPA score is a measure of student's progress toward mastery of the expected competency [11, 12]. Authors argue that instead of health training intitutions highly emphasing on the attainment of 50% pass-fail standard by the learners, as the assessment policy at UNZA suggests, a paradigm shift towards mainstreaming GPA attainment in curricula, supported by utilisation of credit hours and credit unit points for each course in the curriculum would be a more appropriate measure of student learning attainment and academic performance unlike the current practice. The GPA system offers several merits to this. The method further implies that a student will be expected to attain a specificied GPA score in order to be either certified or meet the graduation requirements for a specific programme or profession. Arguably, the findings are consistent with assessment practices elsewere were the GPA is used as a measure of students academic achievement as is demonstrated in a study conducted by [13]. Their study which evaluated, using a cross-sectional survey approach (questionnaire-based), the internal factors that affected pharmacy students' academic performance at five Malaysian public institutions of higher learning, found that internal factors had significant effect on student's Cumulative Grade Point Average (cGPA) and year of study. Their findings further showed that students' academic performance as measured by cGPA was associated with academic competency, test competency, time management skills, and test anxiety. These findings are very applicable to HPE and HTIs in Zambia. Based on the strength of the evidence, we therefore advocate that there be a paradigm shift in the assessment policies and practices from emphasizing on decisions using the arbitrary set historic 50% pass-fail standard, to mastery of expected course competencies by way of attainment of a good or acceptable GPA. Our findings agree with a study by [14] that assessed the extent to which 7 traditional and novel predictors contributed to overall pharmacy GPA using a convenience sample and a blinded retrospective record review of the first 3 class years of Doctor of Pharmacy (PharmD) students at Shenandoah University's, School of Pharmacy (Classes of 2000, 2001, and 2002). They found that Pharmacy College Admissions Test (PCAT) score, essay score, California Critical Thinking Dispositions Inventory (CCTDI) and Skills Test (CCTST) were all significant predictors of pharmacy academic success and GPA. The study concluded that the study of predictors of pharmacy students' performance by examining the role of critical thinking in students' performance is crucial and is thus cannot be ignored. Norcini and colleagues (2011) also argued that due to the increasing demands for accountability, HTIs are required to define standards of quality assurance in the assessment of their trainees through defensible, valid, reliable, and robust assessment policies and practices such that society can have confidence in the professional competence of the graduates once they are registered to practice [3]. It is with an evidence-based, defensible, and accountable system of standard setting in HPE that assessments will be highly valued vanguards of quality assurance for training competent health professionals for the 21st century.

4.1 Limitations of the study

Based on the monocentric nature of the study setting, the interpretation of the results should be limited to pedagogical settings that use a similar examination policy and practices such as UNZASOM and thus, the results could be generalized only to such settings. Notwithstanding, authors remain confident that ecological

validity was still demonstrated since the majority of health training institutions in Zambia employ the 50% pass-fail standard in summative assessments.

4.2 Recommendations

Given the limitation of the study above, the current study recommends the following: We are recommending that HTIs and HPE using the historic arbitrary set 50% pass-fail standard alone, for making assessment decisions may consider the incorporation and inclusion of a credit point and GPA system.

5. Conclusion

The comparison of the academic performance on the arbitrary set 50% pass-fail standard and the GPA score attainment for pharmacy students has revealed that while students had abilities to attain higher course-specific composite scores against the arbitrary set historic 50% pass-fail standard, their attained GPA score was statistically significantly less than the minimum acceptable GPA score of 3.0. The numerous deep concerns expressed about innumerable instances where students attained high scores in written examinations yet demonstrate glaring lack of factual, conceptual, and procedural knowledge in face-to-face oral (viva voce) and clinical examinations could be attributed to the arbitrary set historic 50% pass-fail standard. Its precision alone to correctly identify those who have or have not attained stated educational objectives could be questioned. Incorporation and inclusion of a credit point and GPA system for making assessment decisions for rating students, certification and graduation requirements in HPE may offer better precision and prediction in detecting academic performance and competency attainment.

Acknowledgement

6. Conflict of Interest

All authors declare no conflict of interest associated with this work.

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