

Critical analysis of relationship of medical students' Admission Criteria and their Academic performance: A Systematic review

Obwoye Ronald Omenge¹, Mosol J. Priscah²

1. Department of Community Health, Faculty of Health Sciences, Egerton University, Nakuru, Kenya

2. Department of Midwifery and Gender/Moi University, Kenya

Abstract; In Kenya, admission into universities' medical schools is either by Kenya Universities and Colleges Central Placement Service (KUCCPS) or on self-sponsorship programmes (SSP) basis. The KUCCPS selected students have strong O-level grades in all subjects, with specific cluster science subjects and cumulative points. The SSP students need to have minimum university entry requirements and cluster subjects for admission unto the medicine and surgery (MBCCHB) programme. The study aimed at analysing the relationship between Medical Students Admission Characteristics (sponsorship, sex, high school grade) and their performance in preclinical and clinical levels relationship between Medical Student Admission Characteristics (sponsorship, gender, High school grade) and their performance at preclinical and clinical levels as per various authors. The Study sought to; i) determine the relationship between medical students' high school grades and their performance. ii) Analyze sponsorship based the performance of medical students. iii) Analyze the performance by gender in preclinical and clinical courses.

The study utilized desktop research review on secondary data based on several articles on relationship between Medical Student Admission Criteria (sponsorship, gender, High school grade) and their performance as per various authors. The desk top reviewed over 54 articles. Review reveals that globally various medical schools have cognitive and non-cognitive factors as guided by universities and professional bodies. All these are done to ensure the selected applicants upon graduation are more likely to be good doctors, fulfil community expectations and protects of public health.

Various medical schools have their unique admission requirements ranging from cognitive factors (core subjects) to non-cognitive in line with their professional bodies. These cognitive factors range from high school scores, a first degree in either sciences or specific fields or entry examinations. Non-cognitive factors also ran are such as personality, interviews, references, personal statements, sex and ethnicity of prospective students.

Key Words: Admission criteria, Selection, academic performance, Cognitive, non-cognitive

Date of Submission: 25-06-2019

Date of acceptance: 10-07-2019

I. Literature Review

1.1 Background Information

Kenyan Universities' medical schools are among the schools that produce the medical doctors for the Eastern Africa region and beyond. There are public universities and private medical schools in Kenya. The selection of candidates to the medical schools is regulated by a national admission policy that spells out the criteria for admission.

The Medical Schools Council (2006) on Guiding Principles for the Admission of Medical Students in the United Kingdom indicated that selecting candidates for training as tomorrow's doctors is a huge and challenging task for medical schools. The unique nature of the medical profession requires certain capabilities to produce future doctors who are competent in cognitive, psychomotor and affective skills. The desired characteristics/criteria have to be addressed in the admission process. Leon & Kolstad (2010) who investigated on Wrong schools or wrong students found that the differences in admission policies among universities and financing possibilities available to individual students could influence the characteristics of students ultimately joining medical schools.

Globally, different Medical schools have drafted their criteria for admission guided by their governing and professional bodies. These are such as: college admission tests (entry examinations), high school specific subjects' grades, high school aggregate grade, first science degree or general degree. Purposely to select those upon graduation will be likely become good doctors, fulfilling community expectations and protectors of public health. Ferguson & Madeley, (2002) in their study on Factors associated with success in medical school indicated that previous academic performance was a good, but not perfect predictor of achievement in medical training, while among others gender was associated with success in medical training. Carpio & Hezekiah (1996), Foti & DeYoung (1991), McClelland et al., (1992), Roth et al., (1996) and Alexander and Brophy (1997) in their

studies on performance indicators found that high school grades were predictive of performance at medical schools". Salvatori (2001) in the study on validity of admission tools used to select students to health professions education calls for more studies to provide more reliable and valid ways of assessing non-cognitive characteristics of applicants. Which is the rational, fair and humane admission characteristic to potential applicants, medical schools and the public?

Gender consideration or not, in several studies is not one directional. Aldous et al., (1997) Blackman & Darmawan (2004) and Geiser & Santelices (2007) indicated that gender had a direct influence on achievement in clinical courses. Overall female students performed better than male students in their clinical assessments. Against Haist et al., (2000) whose study found men performing better than women in preclinical years. While Dixon (2007) found that performance of women in clinical years was equal to that of men. However, Al-Mulhimet al., (2012) found no significant difference between male and female students in the written examination scores, in a study that analysed the situation in the two universities, in relation to gender based performance in both the preclinical and clinical courses.

Patrick (2002) on his book on Training Research and practice indicates that getting the right policy for admission into medical school is a balancing act. It has to be fair to society by selecting people with the potential of qualifying as competent doctors and fair to applicants- that diverse group of people who for many reasons want to set out on a long road to the medical career". The admission procedures do aim at identifying ability of applicants who can complete the program successfully, fit in the medical profession and perform effectively as expected.

1.2 Statement of the Problem

The academic performance takes a central role in defining whether or not learning has occurred. It is not clear how the current admission criteria relate to students' performance in preclinical and clinical courses. There is no evidence in the literature that indicates the suitability of the selection criteria in use for Kenya. The admission criteria based on cognitive ability (previous academic grades) is yet to prove its effectiveness in predicting future performance, as Ferguson et al., (2002) argues in their study on factors associated with success in medical school showing that previous academic performance was a good, but not perfect predictor of achievement in medical training. While at medical school sometimes students repeat a year, retake supplementary examinations, or are even discontinued on failing to meet the pass mark. Evidence is required to prove academic and non-academic factors that may lead to poor performance. Without shading light on the relationships, the poor performance among students may continue to be experienced.

In view of the foregoing, this study conducted a desktop review. This was to investigate the relationship that exists between Medical Students Admission criteria (sponsorship, gender, high school grade) and their performance in preclinical and clinical courses. The desktop review was done to over 54 articles written by various experts in the field.

The study was guided by the research themes on:

1. the relationship between medical students' high school grade(s) and their performance in preclinical and clinical courses
2. the performance in preclinical and clinical courses of medical students based on sponsorship.
3. And the performance by gender in preclinical and clinical courses of medical students as per various authors.

1.3: Theoretical Framework

The study adopted a philosophical framework of constructivism. Constructivism is a learning theory that tries to explain that learners learn by constructing knowledge by themselves. Merriam & Caffarella (2001) describe constructivist learning as a process of constructing meaning; it is how people make sense out of their experiences. Learners actively build new knowledge by assessing past experiences, which are then used in assimilating new information in situations. Learners' understanding is subjective in constructivism because it is created by the learner using new information and previous knowledge rather than the newly absorbed information. Knowles (2013) indicates that instruction should take into account the wide range of different backgrounds of learners; learning materials and activities should allow for different levels/types of previous experience. Constructivism taps into and triggers the student's innate curiosity about the world and how things work.

Knowles (2013) made five (5) assumptions about the characteristics of adult learners (andragogy) that are different from the assumptions about child learners (pedagogy).

1. **Self-concept:** As a person matures his self-concept moves from one of being a dependent personality toward one of being a self-directed human being
2. **Adult Learner Experience:** As a person matures he accumulates a growing reservoir of experience that becomes an increasing resource for learning.

3. **Readiness to Learn:** As a person matures his readiness to learn becomes increasingly oriented to the developmental tasks of his social roles.
 4. **Orientation to Learning:** As a person matures his time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly his orientation toward learning shifts from one of subject- centeredness to one of problem centeredness.
 5. **Motivation to Learn:** As a person matures the motivation to learn is internal
- Medical students' admission process should factor in the constructivist philosophical argument. It should be a process that recognizes that a learner is ultimately motivated to learn internally and more effective learning and meaningful occurs when personal goals, interests, attitudes and beliefs come from learners rather than the instructor.

1.4: Conceptual framework

This study was guided on the basis that in the past 20 years there has been a paradigm shift away from Behaviourism to Cognitivism Constructivism, a conception of a “learner as sponge/empty vessel, blank slates or passive observers to an image of “learner as an active constructor of meaning/ player””.

<https://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles> Feb 26th, 2016.

“If result is not measured, success cannot be identified from failure. And if success is not seen, we cannot learn from it, nor can we recognize failure to correct it”. (n)

Student gender, sponsorship and high school grades have an association with performance at preclinical and clinical levels. Also the preclinical performance has an association with clinical performance. This was illustrated in figure 1.

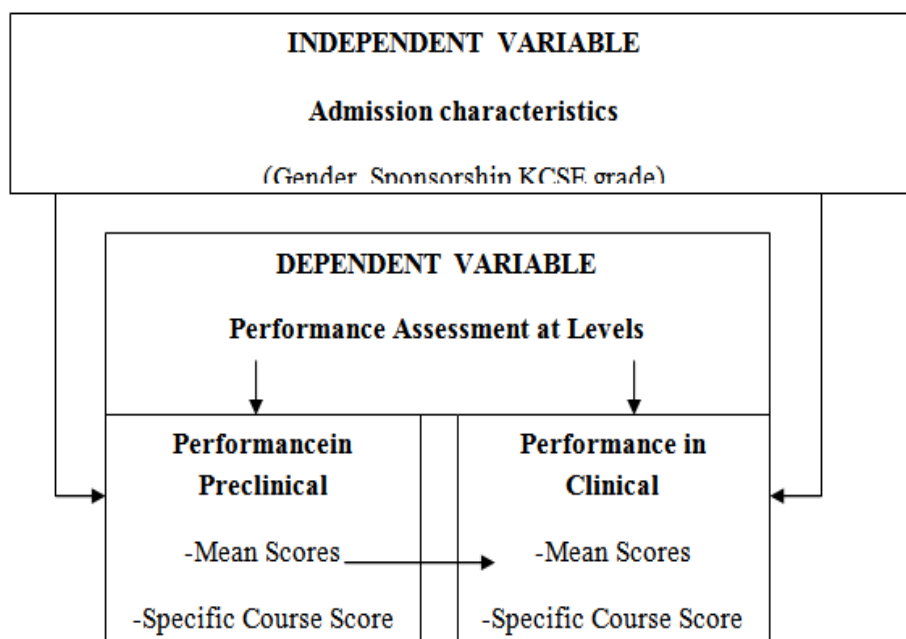


Figure 1: Conceptual Framework

II. Review Findings

2.1: Admission into medical schools

The admission process into medical school is a paramount roadmap in preparation of the future doctors that require intensive and careful consideration of required criteria for the selection of the right candidate. The nature of the medical profession as indicated by Salahdeen & Murtala (2004) in their study on relationship between Admission Grades and academic Performance that requires that doctors have certain basic skills and abilities. Salahdeen & Murtala (2004) who in their investigation on analysis of high school grades that showed SSCE was a better predictor of students' performance in pre-clinical sciences than any other criteria. Cleland et al., (2012) in their study on identifying best practice in the selection of medical students indicated that academic criteria are a major component of selection to medical school in several countries. It should be made clear which attributes are required when admitting students into medical school. A lot need to be done on the relationship of admission criteria and performance at preclinical and clinical levels.

Admission may consider various students' characteristics as cognitive and non-cognitive factors. These may have a direct and in some cases an indirect influence on academic performance. The cognitive factors

include O-level performance, college entry examination scores, earlier qualifications either a bachelor or diploma qualification and non-cognitive factors such as age and gender.

According to Alfayez et al., (1990) in their study on academic, social and cultural factors influencing medical school grade performance queries whether most studies conducted in countries with highly developed educational systems and similar cultural and social systems their findings can be applied to developing countries, where the educational and cultural experiences may be very different (admission is based on first degree, open entry examination systems). It is naive to assume that all learning environments such as resources availability and student support ratios support students positively.

The Queen's University Belfast, School of medicine, in its admission policy statement states a two stage criteria process. The selection process Stage 1: Cognitive Ability considering the previous academic performance, including school, college and university grades as appropriate and Aptitude test. Stage 2: Non-Cognitive Ability evaluation through multi-mini interviews.. <http://www.med.qub.ac.uk/docs/AdmissionPolicyMedicine.pdf> Retrieved Feb 26th, 2016.

The University of Florida, College of Medicine requires an applicant to have the minimum basic introductory subjects including:

- Biology – 2 semesters, with labs (8 credit hours)
- General Chemistry – 2 semesters, with labs (8 credit hours)
- Organic Chemistry – 1 semester, with lab (4 credit hours)
- Biochemistry – 1 semester (3 or 4 credit hours)*
- Physics – 2 semesters, with labs (8 credit hours)

<http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/> Retrieved May 13th, 2016.

University of Utah, School of Medicine, admits applicants with minimum and average standards in seven specific areas and a candidate should be average or above in 5 out of the 7 areas to be eligible for further consideration. The seven (7) areas are:

- Grade Point Average (GPA) - The minimum acceptable GPA is 3.2. Medical College Admission Test (MCAT), Community or Volunteer Service (involvement in a service activity without constraint or guarantee of reward or compensation).
- Leadership namely position of responsibility for others, with a purpose to guide or direct others in employment, church, community and school organizations including coaching, tutoring and mentoring will satisfy this requirement.
- Research involvement in a scholarly or scientific hypothesis investigation that is supervised by an individual with verifiable research credentials.
- Physician shadowing that is the observation of a physician as that individual cares for and treats patients and carries out the other responsibilities of a medical practice. <http://medicine.utah.edu/admissions/criteria/> Retrieved May 12th, 2016

Regular Admissions to enter the College of Medicine requires the applicant to apply initially through the American Medical College Application Service (AMCAS). A candidate is then invited to submit a secondary application. Applications are reviewed by selected committee members and competitive applicants are invited for an interview. Applicants are carefully appraised on the basis of personal attributes, academic record, evaluation of achievements, references, performance on the Medical College Admissions Test (MCAT) and personal interviews. The College of Medicine does not discriminate on the basis of race, sex, creed, age, nationality origin or disability. The College of Medicine welcomes applications from underrepresented minorities. Applicants must have a Bachelor's degree on-science or liberal art) conferred prior to matriculation from a regionally accredited American institution'. <http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/> Retrieved May 13th, 2016.

European universities vary from each other and from one country to another in their admission criteria into a medical school. High grades are required particularly in Chemistry, biology and Language subjects at Advance level (A-Levels), or its equivalent. European medical universities accept International Baccalaureate and European Baccalaureate (college bachelor's degree) qualifications. A few medical universities require additional tests such as the UK Clinical Aptitude Test (UKCAT), the Biomedical Admissions Test (BMAT) and the Graduate Medical School Admissions Test (GAMSAT). For other universities, the personal experience and achievements in the fields of medicine is an added advantage. <http://www.medicalstudyguide.com/medical-study-requirements.html>. Retrieved June 21st, 2016.

Traditionally in Kenya like the UK, selection for admission to a medical school was based on actual A-levels examination results. Currently in Kenya the admission is based on Ordinary level (O-level) aggregate grade and cluster subjects (Language: English or Kiswahili, Biology, Chemistry, Physics/ mathematics) examination results

In Bulgaria medical schools, the minimum requirement is two A-levels (biology, chemistry or physics). www.medicalstudyguide.com/medicine-in-bulgaria-now.html. Retrieved June 21st, 2016). Most Australian universities require a combination of Undergraduate Medical Admissions Test (UMAT) score, a medical interview and finally Australian Tertiary Admission Rank (ATAR) score to gain entry into medical school. Some universities also require specific pre-requisite subjects, such as high-school chemistry. Others require: Completed a basic degree in science. Appear for the Graduate Australian Medical School Admissions Test (GAMSAT) or MCAT. These test the extent of the applicant's knowledge of science subjects. ([http://www.medicalstudyguide.com/medicine in-australia-now.html](http://www.medicalstudyguide.com/medicine-in-australia-now.html). Retrieved June, 21st, 2016).

The various medical schools' admissions are governed by professional bodies. At the University of Central Lancashire (UCLan) applications require a significant amount of time and effort because recruitment into medical school is very rigorous and competitive. The University of California medical school screens applicants based on minimum GPA and MCAT scores before secondary applications are sent. For faculties of medicine in Canada number of available places is determined by provincial governments based on educational and financial resources as well as country's future physician workforce requirement.

The Kenyan universities consider the secondary school scores (O-level aggregate and Cluster grades) to select applicants to medical schools. Both Moi University and Egerton University admit Self-Sponsored Program (SSP) students in addition to KUCCPS students.

Moi University, admits SSP candidates based on the KUCCSP common requirements for entry into the University as stipulated. In addition, candidates must obtain at least the minimum cut off points for the year as determined from the following cluster drawn from the Kenya Certificate of Secondary Education structure. Mean grade of B+ (Plus) at KCSE: B+ in Cluster Subjects of:- English or Kiswahili, Mathematics or Physics, Biology and Chemistry. (<http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/>).

Candidates having qualifications equivalent to the above from institutions recognized or affiliated to Moi University Senate also be admitted. Candidates with suitable diplomas or University degrees in relevant fields who fulfil all other University entrance requirements may be considered for admission provided the School of Medicine Board recommends, and the Senate approves the admission. <http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/> Retrieved October 13th, 2017.

In Egerton University, SSP applicants must meet the minimum requirements as follows; Requirements: Mean grade of B+ (Plus) at KCSE: B+ in Cluster Subjects of: - English or Kiswahili Mathematics or Physics, Biology and Chemistry.

OR Holders of Diploma in Clinical Medicine, Bachelors and Master degree in related subjects of with a KCSE mean grade of B and B in Biology, Chemistry, mathematics or physics, and English or Kiswahili. (www.egerton.ac.ke/index.php/Faculty-of-Health-Sciences/faculty-of-health-sciences-programmes.html Retrieved October 13th, 2017.

The foregoing literature review indicates that admission criteria differs from university to university in different regions. The different universities have their guiding admission policies. Some have adopted cognitive that is based on high school grades in addition to cluster subjects while other universities require additional basic degree as admission requirements.

2.2: Entry grades and performance

The selection of new medical students is one of the most important activities of medical schools. They aim at selecting students who perform well not only in the pre-clinical years, but also in the clinical years of study and for future practice. Wilkinson et al., (2008) in their study on Medical school selection criteria and the prediction of academic performance found that the selection of students into medical programs must aim to serve two purposes. First to reduce the large number of otherwise qualified as per the available places at medical school. Second, to enrol students thought most likely to succeed in what is an arduous program of study. Also to select candidates who can serve country-specific educational goal, institutional and departmental objectives.

Arzuman et al., (2012a) in their study on the Influence of Pre-Admission Tracks on Students' Academic Performance indicates that High School Certificate (HSC) track and Biology background may be helpful for the medical school in selecting future students. Yoho et al., (2012) in their study on Undergraduate GPAs, MCAT scores and academic performance cautioned the usage of MCAT score to predict performance. The usage of the MCAT score is limited in predicting academic performance of medical students. Though the usage of MCAT is applicable in a set up where a quota system applies. It allows lower O-level grade achievers to have a chance for the test into admission. Usage of HSC aggregate scores as admission criteria may lock others out, who might have had low aggregate grade but met cluster courses scores.

Yoho et al., (2012b) investigated the relationship between student academic and clinical performance. Their findings indicated that there is a positive relationship between student academic and clinical

performance. Radhakrishnan et al., (2012) in their study on the influence of admission qualifications on the performance of first and second year medical students concluded that students with better grades in their pre-university examinations achieved better performance in their end of semester (EOS) examinations. This has led most medical schools to perceive that academic qualification provides the most objective and fair method for fair selection of the best applicants. Attaining the high academic qualification will not guarantee an applicant a place especially when there is a higher demand for available places in a medical school. Patrick (2002) in his book on Training Research and practice suggests that changes in selection criteria also may offer a solution to a performance problem. Selecting people either on the basis of higher aptitudes or abilities or with previous training in related skills may improve performance. He further indicated that selection of persons who have the appropriate abilities, attitudes or previous training scope would enable them to cope with the task(s).

Wilkinson et al., (2008) in their investigation on Medical school selection criteria and the prediction of academic performance concluded that most variation in academic performance is not explained by the selection criteria. It is presumably a consequence of both intrinsic personal factors and the effect of the teaching itself.

In practice, Universities tend to differ in basic admission requirements for medical students, either emphasizing on high school scores or the general degree as basis of admission. Arzuman et al., (2012) in their study on Influence of Pre-Admission Tracks on Students' Academic Performance suggest that understanding science was core to the understanding of medicine. However, it must be recognised that some students are not suitable for a career in medicine, even though they attained the necessary academic criteria. They should not be admitted in the interest of the students and public, rather than subsequently leave the profession'.

The literature reviewed indicates that entry grades can predict academic performance at early and later years. It serves as filter criteria to sort the many applicants who have the appropriate abilities, attitudes or previous training scope required and in relation to available chances.

2.3: Non cognitive abilities and performance of students

Selection based on academic performance, should also take into consideration socio-demographic characteristics of the applicants. Wilkinson et al., (2008) in their study on Medical school selection criteria and the prediction of academic performance caution that admission based on cognitive ability may lead to the admission of students with attractive non-cognitive attributes. Some personal factors like gender, age and region of origin are non-academic, non-cognitive and not directly related to performance but serve as admission conditions. The personal factor selection criteria may influence the learning behaviour of potential applicants which may influence future performance in medical school. Alfayez et al., (1990) in their study on Academic, social and cultural factors influencing medical school grade performance indicates that medical student performance can be influenced by non-academic factors such as; premedical academics, maturity, familial background and support, and personal experiences with illness. Yoho et al., (2012b) in their study on the investigation of the relationship between student academic and clinical performance identified that non-academic characteristics may play a pivotal role in clinical abilities. These characteristics need to be further identified and incorporated to the academic curriculum since they may also influence the admission criteria. Though the non-academic characteristics may not directly influence academic performance, they may impact on the learning behaviour and motivation of a student. On-academic factors are socio-economic in nature and should not be ignored. Hughes (2002) in a study on how to improve selection of medical students agreed that the non-academic factors also predict success or failure in student academic performance.

2.3.1: The Gender factor versus academic performance

Studies have indicated that a student's gender and age relate to academic performance. In their investigations Aldous et al., (1997), Blackman & Darmawan (2004), and Geiser & Santelices (2007) indicate that socio-demographic factors like student's gender and age all have a direct influence on their achievement in clinical courses. Blackman & Darmawan (2004) studied on variables that predict preclinical performance and found that overall, female students performed better than male students overall in their clinical assessments. The study lacked a strong explanation of the gender differences at clinical level with dismal performance over male students. Why these influences on the academic differences need to be studied further.

Haist et al., (2000) in their investigation on the Effect of Gender and Age on Medical School Performance found that males performed better than females in preclinical years that are knowledge-based and basic-science content oriented. Dixon (2007) examined Gender Differences in Academic Qualifications and Medical School Performance found that in later years the performance of females in clinical years was equal to that of males. Al-Mulhim et al (2012) in their study on the Influence of Gender on Saudi Students' Performance found that there was no significant difference between male and female students in the written examination. Haist et al., (2000) assumed that at the age of 24 years both gender have completed their maturation process. However at the age of 18 years, the maturation of the brain of males lagged behind the brains of female by 3 years and males can be considered to lag behind females by 2 years in physical maturation.

A Study by Salem et al., (2013) explored Academic and socio-demographic factors influencing students' performance and affirmed that socio-demographic characteristics do influence their performance. In particular gender significantly influence the male and female student's cumulative GPA.

KUCCPS (2014) placement processing Policy on section (4.6) indicate in the Gender Affirmative indicate: - i) Lowering by up to 2 points on the overall cut-off point for degree programs for female applicants. ii) Lowering the specific programme cut-off points by up to 2 points subject to attaining of a representation of a third for either gender and not exceeding the declared capacity of the programme by more than 10%. This shows that gender is a factor that is considered during admission process into the universities in Kenya.

The Literature review has revealed that the gender influence to academic performance is not towards one direction. The reason as to why differing influence lacks explanation, making it an area that requires further studies to determine its impact on academic achievement.

2.3.2: Sponsorship versus academic performance

Non-cognitive factors including sponsorship or financial support and their influence on performance in medical school attract attention and this deserves investigation. As emphasised in spoken words by President Johnson in his "Great Society" speech of 1964 (Johnson, 1963-64), "Poverty must not be a bar to learning, and learning must be an escape from poverty, further said that the Great Society is a place where every child can find knowledge to enrich his mind and to enlarge his talents." <http://www.presidency.ucsb.edu/ws/?pid=26262> Retrieved 21st June 2016.

Coonrod(2008), in the investigation on the Effects of Financial Aid amounts on Academic Performance found that financial aid either as grant, loan, and job, is what makes higher education affordable to the children of families who would otherwise be excluded by price. Further the study indicated that loan and job aid amounts had no significant connection with academic performance. Although not all loans are need based, and a student without financial need may still want to take a loan in order to ease the financial burden on the family. It is further indicated that additional money will encourage and motivate a student to put in more effort since the student realizes that it is essentially a gift rather than a natural right. Equal (2013) study on Effects of Financial Aid on College Student Success Education indicated why Scholarships would not be adequate to help college students succeed. Avery's (2014) investigation on the Relationship between Financial Aid Type and Academic Success in a Public Two-Year College in Georgia, Georgia Southern University shows no significant relationship in performance as the student financed and not financed groups performed equally.

Literature reviewed indicated that sponsorships do not amount to influence to academic achievement. But all this is done in resource sufficient societies. What about in developing societies where basic needs are limited. It is worth to study whether these factors influencing medical school performance in developed countries have similar impact on medical students in Kenyan context.

2.4 Predicting performance at medical schools.

It is important to select students capable of going through the programme successfully; becoming competent and safe practitioners. The dilemma is which selection criteria can best predict students' future performance. Gough & Hall (1975) in their study on prediction of academic and clinical performance in medical school concluded that prior studies suggested the importance of distinguishing between performance in the earlier and later years of medical education and recommended the need for factor analysis of grades by year. This study agreed with Sam & Michelle pp94.,(2011) in their study on Predicting performance and identifying at-risk students found that it may be possible to identify at-risk students early in their years of study.

The identification can be relatively early through continuous data archiving and regular analysis. Blackman & Darmawan (2004), in their investigation on variables predicting preclinical performance found that undergraduate GPA scores and the type of undergraduate studies undertaken were the significant predictors with direct influence. The entry interviews used in the selection process were not predictors to the assessed performance outcomes. Gough & Hall (1975) in their study on the prediction of academic and clinical performance that found MCAT criterion was more important than academic attainment, the study by Julian's (2005) on Validity of the MCAT for predicting medical school performance concluded that the MCAT was an indicator in learner's academic preparation. Basco et al., (2000) in their study on ability of a medical school admission process to predict clinical performance indicated that admission ranking and interview process at the medical school did not predict performance in clinical studies.

Peppleet al.,(2012) in their investigation on Prediction of Preclinical Students' Performance concluded that performance in one subject could relate to the performance in the other subjects, implying that performance in one subject can predict the performance in other subjects. The prediction can be used to identify at-risk students for early intervention and appropriate academic support. It is thought that several subject scores can reflect better and significantly generalise student performance than one subject.

Academic Performance of Medical students can be monitored at two major phases: - basic sciences and clinical sciences. The basic sciences can further be used to predict performance in clinical sciences. In their study on performance in basic science as predictors of performance in clinical sciences and licensure examination Lavine & Watkins (1999) indicated that preclinical performance was a strong predictor. Salahdeen & Murtala (2004) in their investigation on the Relationship between admission grades and Performances indicated that high school grade was a better predictor of student performance at pre-clinical sciences than entry examinations. Geiser & Santelices (2007) in their study on Validity of High-school grades in Predicting Student outcomes indicated that student background characteristics including applicants' age, gender, regionalism (quota) where applicable and should not be excluded in predicting their preparedness.

Salvatori (2001) in their studies on Reliability and Validity of Admissions Tools Used to Select Students and Sandow et al., (2002) on Correlation of admission criteria with performance indicated a less clear relationship between pre-admission GPA and clinical performance. Since Students with lower undergraduate science GPAs were more likely to remediate, to repeat an academic year, or to be dismissed. That is why Clinical performance is not only predicted by pre-entry academic scores, but can also be predicted by preclinical scores which is a foundation of clinical performance. It is necessary for the prediction to be done at an earlier level. James and Chilvers (2001) in their investigation on the Academic and non-academic predictors of success indicated that when using high school A-Level grades as predictors lower grades scores should also be factored. This is still vague; it needs further explanation and study.

In conclusion it is important for medical schools to be able to predict the future performance of their students. Once the right predictors are identified the unnecessary dropouts and low graduation rates will be avoided once the right intervention measures are put in place.

Alnasir & Abdel-Karim (2013), in their investigation on Prediction of Medical Students' Performance in the Medical School concluded that dropout was costly to the training schools. Dropout impacts negatively on the junior doctors' completion rate. This also affects the academic reputation of a medical school and staff morals, denying the training schools income.

It is clear from the foregoing literature reviewed that there are varied admission requirements for medical schools. The admission requirements have varied from country to country, university to university and one education system to another. Some base admission on; secondary or High school grades, Basic degree, Medical school entry tests or affirmative action. This study purposed to analyze the current three admission characteristics (KCSE grade, Sponsorship and gender) among others that are considered in Kenyan public university in the admission process in relation to their influence into academic performance while at medical school.

III. Conclusion

Globally various medical schools have developed their unique entry requirements stressing on cognitive factors (core subjects) that are guided by professional bodies. These cognitive factors arrange from high school scores, a first degree in either sciences or specific fields or entry examinations. Some medical schools in addition consider non-cognitive factors such as personality, learning styles, interviews, references, personal statements and demographic factors as sex, ethnicity before admitting prospective students.

All these are done to ensure the selected applicants upon graduation become befitting doctors, fulfilling community expectations and protectors of public health.

References

- [1]. Aldous, C.J., Leeder, S.R., Price, J., Sefton, A.E., & Teubner, J.K., (1997). A selection test for Australian graduate-entry medical schools. *The Medical Journal of Australia*. 166(5):247-50.
- [2]. Alexander, J.E., & Brophy, G.H., (1997). A five-year study of graduates' performance on NCLEX-RN™. *Journal of Nursing Education*. 36:443-445.
- [3]. Alfayez, S.F., Strand, D.A., & Carline, J.D., (1990). Academic, social and cultural factors influencing medical school grade performance. *Medical Education*. ; 24(3):230-8. <http://www.ncbi.nlm.nih.gov/pubmed/2355866>.
- [4]. Al-Mulhim, A., Elsharawy M., & Awad N., (2012). "The Influence of Gender on Saudi Students Performance in the Undergraduate Surgical Examination, *Surgical Science*, Vol. 3 No. 4, pp. 206-209. doi: 10.4236/ss.2012.34039.
- [5]. Alnasir, F.A., & Abdel-Karim, J.A., (2013). Prediction of Medical Students' Performance in the Medical School. *Family Med Medical Science*, Res 2: 113. doi: 10.4172/2327-4972.1000113
- [6]. Arzuman, H, Ja'afar, R., & Fakri, N. (2012). The Influence of Pre-Admission Tracks on Students' Academic Performance in a Medical Programme: *Universiti Sains Malaysia, Education for Health*, 25:124-7.
- [7]. Avery, D.D. (2014). The Relationship between Financial Aid Type and Academic Success in a Public Two-Year College in Georgia, Georgia Southern University, Electronic Theses & Dissertations. Paper 1064
- [8]. Basco, W.T. J, Gilbert, G.E, Chessman, A.W, & Blue, A.V., (2000). The ability of a medical school admission process to predict clinical performance and patients' satisfaction. *Academic Medicine: Journal of the Association of American Colleges*, 75(7):743-7.
- [9]. Blackman, I & Darmawan, I. G.N., (2004). Graduate-Entry Medical Student Variables that Predict Academic and Clinical Achievement. *International Education Journal* Vol 4, No 4 <http://iej.cjb.net>.
- [10]. Carpio, B., O'Mara, L. & Hezekiah, J., (1996). Predictors of success on the Canadian Nurses Association testing service (CNATS) examination. *Canadian Journal of Nursing Research*, 28(4): P115-123.

- [11]. Cleland, J., Dowell, J., McLachlan, J., Nicholson, S & Patterson, F., (2012) Identifying best practice in the selection of medical students (literature review and interview survey), London, Work Psychology Group Limited, Derby.
- [12]. Coonrod L (2008) The Effects of Financial Aid Amounts on Academic Performance, The Park Place Economist, Vol XVI pp 24-35 www.iwu.edu/economics/PPE16/PPE2008-3.pdf.
- [13]. Dixon D (2007) Gender Differences in Academic Qualifications and Medical School Performance of Osteopathic Medical Students, Medical Science Educator, Volume 17: No. 1.
- [14]. Dixon D (2015) Comparison of COMLEX-USA scores, medical school performance and preadmission variables between women and men. The journal of American Osteopathic Association, 115(4):222-5. doi: 10.7556/jaoa.2015.044.
- [15]. Egerton University. (2016) Retrieved from: Faculty of Health Sciences Programmes <http://www.egerton.ac.ke/index.php/Faculty-of-Health-Sciences/faculty-of-health-sciences-programmes.html>.
- [16]. Equal Justice Works (2013) Staff Writer Study Assesses Effects of Financial Aid on College Student Success <https://www.usnews.com/education/blogs/student-loan-ranger/2013/01/30/study-assesses-effects-of-financial-aid-on-college-student-success>. Retrieved October 13th, 2017.
- [17]. Ferguson, E, James, D, & Madeley, L., (2002). Factors associated with success in medical school: systematic review of the literature, British Medical Journal, vol. 324: 952-956.
- [18]. Foti, I. & DeYoung, S. (1991). Predicting success on the National Council Licensure Examination –Registered Nurse: Another piece of the puzzle. Journal of Professional Nursing, 7: 99–104.
- [19]. Fraenkel, J.R, Wallen, N.E & Hyun, H.H. (2012). How to design and Evaluate Research in Education, (8th ed.), San Francisco: The McGraw-Hill companies.
- [20]. Geiser, S., & Santelices, M. V. (2007). Validity of high school grades in predicting student success beyond the freshman year: High-school record vs. standardized tests as indicators of four-year college outcomes. The Center for Studies in Higher Education at the University of California, Berkeley, CSHE 2007 (CSHE.6.07).
- [21]. Gough, H.G. & Hall, W.B. (1975) The prediction of academic and clinical performance in medical school Res High Educ (1975) 3: 301. <https://doi.org/10.1007/BF00991247>.
- [22]. Haist, S. A., Wilson, J, F, Elam, C, L, Blue, A. V., & Fosson, S. E., (2000) The Effect of Gender and Age on Medical School Performance: An Important Interaction. Advances in Health Sciences Education, 5:197–205.
- [23]. Hughes, P. (2002). Can we improve on how we select medical students? Journal for the royal society of medicine Vol. 95: 19-22.
- [24]. James D and Chilvers C (2001). Academic and non-academic predictors of success on the Nottingham undergraduate medical course 1970-1995. Medical Education, 35(11):1056-64.
- [25]. Julian, E. R. (2005). Validity of the Medical College Admission Test for predicting medical school performance.
- [26]. Kenya Universities and Central Placement Services (2014) Placement Processing. http://www.kucpcps.net/sites/default/files/Placement_Processing_16042014_v1.pdf retrieved October 26th, 2017
- [27]. Knowles, M. (2013, Thursday, 9) The Adult Learning Theory - Andragogy - of Malcolm Knowles Retrieved June 2016, 20 from e-learning industry: <https://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles>
- [28]. Lavine R A, & Watkins D. (1999). Basic science performance as predictors of clinical science performance. Fourth Biennial Meeting of the Basic Science Education Forum and the International Association of Medical Science Educators. 17-20
- [29]. Leon, B.K., & Kolstad, R. (2010). Wrong schools or wrong students? The potential role of medical education in regional imbalances of the health workforce in the United Republic of Tanzania Human Resources for Health, 8:3
- [30]. McClelland, E., Yang, J.C. & Glick, O.J. (1992). A state-wide study of academic variables affecting performance of baccalaureate nursing graduates on licensure examination. Journal of Professional Nursing 8: 342–350.
- [31]. Medical Practitioners and Dentist Board (2013). Bachelors of Medicine And Bachelor of Surgery.
- [32]. Medical Practitioners and Dentists Board (2013). Bachelor of Medicine and bachelor of Surgery Core Curriculum.
- [33]. Medical Schools Council. (2006). Guiding Principles for the Admission of Medical Students. https://www.google.com/?gws_rd=ssl#q=Guiding+Principles+for+the+Admission+of+Medical+Students Retrieved on July 23rd, 2015.
- [34]. Medical study requirements abroad. (n.d) Retrieved May 12, 2015 <http://www.medicalstudyguide.com/medical-study-requirements.html>.
- [35]. Merriam, S.B & Caffarella, R.S (2001) Andragogy and Self-Directed Learning: Pillars of Adult learning jossey-Boss. A Publishing unit of John Wiley & Sons, Inc http://umsl.edu/~wilmarthp/modla-links-2011/Merriam_pillars%20of%20anrdagogy.pdf Retrieved on July 23rd, 2015.
- [36]. Patrick, J. (2002). Training Research and practice. London, Academic Press ISBN-13: 978-0125466608 ISBN-10: 0125466609.
- [37]. Pepple, D. L., Young, L. E., Gordon-Strachan, G. M., & Carrol, R. G. (2012). Comparison and Prediction of Preclinical Students' Performance in the MBBS Stage I Examination at the University of the West Indies, Mona Campus, Nigerian Journal of Physiological Sciences, Vol 27, No 2, 145–148.
- [38]. Queen's University Belfast, School Of Medicine, Dentistry and Biomedical Sciences Admission Policy Statement for Medicine for 2016 Entry, <http://www.med.qub.ac.uk/docs/AdmissionPolicyMedicine.pdf> Retrieved Feb 26th, 2016.
- [39]. Radhakrishnan, A. K., Lee, N., & Lee, N., Young, M. (2012). The influence of admission qualifications on the performance of first and second year medical students at the International Medical University, International e-Journal of Science, Medicine & Education, 6(2): 10-17.
- [40]. Roth, K.S., Riley, W.T., Brandt, R.B. & Seibel, H.R. (1996). Prediction of students' USMLE Step 2 performances based on premedical credentials related to verbal skills. Academic medicine: Journal of the association of American Medical Colleges, 71(2):176-80.
- [41]. Salahdeen, H. M., & Murtala, B. A. (2004) Relationship between Admission Grades and Performances of Students in the First Professional Examination in a New Medical School, African Journal of Biomedical Research, Vol.8:51-57.
- [42]. Salem, R.O, Al-Mously, N., Nabi, N. M, Al-Zalabani, A. H, Al-Dhawi, A. F & Al-Hamdan, N., (2013). Academic and socio-demographic factors influencing students' performance in a new Saudi medical school, Medical teacher, 35: S83–S89.
- [43]. Salvatori, P (2001) Reliability and Validity of Admissions Tools Used to Select Students for the Health Professions Education, Advance in Health Science Education: Theory Practice, 6: 159–175.
- [44]. Sandow, P. L., Jones, A. C., Peek, C. W., Courts, F. J., & Watson, N (2002) Correlation of admission criteria with dental school performance and attrition, Journal of dental education, 66(3):385-92.
- [45]. University Admission, Medical study requirements abroad, <http://www.medicalstudyguide.com/medical-study-requirements.html>. Retrieved June 21st, 2016.
- [46]. University Admission, Medical study requirements medicine in australia, <http://www.medicalstudyguide.com/medicine-in-australia-now.html>. Retrieved June, 21st, 2016.

- [47]. University Admission, Medical study requirements, Medicine in bulgaria, www.medicalstudyguide.com/medicine-in-bulgaria-now.html. Retrieved June 21st, 2016).
- [48]. University of Florida College of Medicine, Medical Admissions, Regular Admission Requirements Updated, 2017 <http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/> Retrieved 13th October, 2017.
- [49]. University of Florida College of Medicine, Regular Admission Requirements (n.d) Retrieved may 13th, 2016. <http://admissions.med.ufl.edu/admission-requirements/regular-admission-requirements/>.
- [50]. University of Utah School of Medicine. Admissions recommendations <http://medicine.utah.edu/admissions/criteria/> Retrieved May12th, 2016
- [51]. University of Utah, Office of Admissions, School of Medicine Admissions Criteria(n.d) Retrieved may 12, 2016 <http://medicine.utah.edu/admissions/criteria/>
- [52]. Wilkinson, D. Zhang., J. Byrne, G J. Luke.,H.,. Ozolins,I, Z, Parker, M. H. & Peterson, R, F. (2008). Medical school selection criteria and the prediction of academic performance. Evidence leading to change in policy and practice at the University of Queensland, *The Medical Journal of Australia*, 188: 349–354.
- [53]. Yoho, R. M., Antonopoulos, K. &Vardaxis, V., (2012a). Undergraduate GPAs, MCAT scores, and academic performance the first 2 years in podiatric medical school at Des Moines University. *Journal of American Podiatric Medical Association*,vol.102(6):446-50.
- [54]. Yoho, R.M., Tallerico, V., &Vardaxis, V., (2012b) Relationship between student academic and clinical performance in podiatric medical education at Des Moines University. *Journal of American Podiatric Medical Association*, 102(4):314-8.

Obwoge Ronald Omenge" Critical analysis of relationship of medical students' Admission Criteria and their Academic performance: A Systematic Review' *IOSR Journal of Research & Method in Education (IOSR-JRME)* , vol. 9, no. 3, 2019, pp. 27-36