

Gender Differences in Academic Performance of Medical Students

Alsawi Y. A. Yusuf

Assistant professor of Radiology, University of Kordofan, Sudan

Abdelsalam M. H. Elfaki

Professor of Medicine, University of Kordofan, Sudan

ABSTRACT

Background: The number of female medical students increased steadily over the last decades, outnumbering the male students in some medical schools including ours. Gender differences in academic performance among male and female medical students were addressed in many studies with variable results. The aim of this study is to investigate the difference in grades scored in different medical school subjects in a 6-year curriculum by female students, compared with the scores of fellow male students. **Methods:** Three cohorts of students, graduated in the years 2011, 2012 and 2013 were selected. The total number of students was 1254, 876 females (69.9%) and 378 males (30.1%). The achieved scores (grade-point average or GPA) were recorded for each subject's final examination. Data was analyzed using PSPP statistical software. **Results:** T-test for the first examination (anatomy, physiology and biochemistry) showed a slightly higher male mean total score (6.38) versus 5.76 for female, but the difference was not significant ($P=0.12$). For the second exam (pathology, pharmacology and microbiology), the mean score of male students was also higher than female students' mean score (5.19 versus 4.65) but the T-test was not significant ($p=0.14$). For the third exam (medicine, surgery, pediatrics, obstetrics and gynecology) the mean scores were almost equal (8.31 for females, 8.3 for males) and the T-test was not significant ($P=0.98$). Female students performed slightly better than males in obstetrics and gynecology and surgery, while male students scored better in medicine and pediatrics. However, these differences were not significant ($p=0.6$). **Conclusion:** The academic performance of medical students shows no significant differences among male and female students. The small differences noted could be explained by many factors influencing the performance of both sexes rather than attributed to gender only.

Keywords: medical school, medical students, gender differences.

INTRODUCTION

The number of female medical students increased steadily over the past decades in many countries, outnumbering male students [1,2], including our local medical school. Investigators and educators are interested in studying the effect of gender on academic performance of medical students. Some authors reported that female students significantly outperformed their male counterparts in each measured academic assessment criteria [3,4], particularly older women in clinical based performance examinations [5]. Differences in performance were most marked in pediatrics, psychiatry and obstetrics and gynecology, females being more successful in each case [6]. Other investigators found no significant differences in final course grades

between the two sexes and that gender would appear to have no relationship to medical students' performance [7], and that the differences in the medical school performances were much smaller than the dramatic age and gender differences evident in the preadmission performances [8]. The aim of this paper is to investigate gender differences in the academic performance of female and male students in three cohorts of students in the Faculty of Medicine, University of Kordofan, Sudan. This medical school follows a 6-year curriculum with basic sciences in the first two years, pre-clinical subjects in the third year, and clinical clerkships in the last 3 years.

METHODS

Three cohorts of students; batches that graduated in the years 2011, 2012 and 2013 were selected, as complete records of their medical school performance were available. The first cohort was 360 students, females were 259 (71.9%). The second cohort was 389 students, females were 276 (71%) and the third cohort was 505 students, females were 341 (67.5%). The total number of students was 1254, 876 females (69.9%) and 378 males (30.1%). The achieved scores (grade-point average or GPA) were recorded for each subject's final examination. Those who were absent from one or more examination were excluded from the study. Statistical analysis was done on PSPP, an open-source statistical package (GNU.org) to compute the T-test for equality of means (Levene's T-test) for each subject.

RESULTS

T-test for equality of means (Levene's T-test) for the first examination (anatomy, physiology and biochemistry) showed a slightly higher male mean total score (6.38) versus 5.76 for female, but the difference was not significant ($P = 0.12$).

For the second exam (pathology, pharmacology and microbiology), the mean score of male students was also higher than female students' mean score (5.19 versus 4.65) but the Levene's T-test was not significant ($p = 0.14$)

For the third exam (medicine, surgery, pediatrics, obstetrics and gynecology) the mean scores were almost equal (8.31 for females, 8.3 for males) and the T-test was not significant ($P = 0.98$). Female students performed slightly better than males in obstetrics and gynecology and surgery, while male students scored better in medicine and pediatrics. However, these differences were not significant ($p = 0.6$). Table 1.

Table 1: Male and female mean GPA scores in different subjects

Subject	Mean Female GPA	Mean Male GPA	t-test	P
Physiology	2.11	2.28	1.13	0.261
Biochemistry	1.96	2.2	1.63	0.104
Anatomy	1.67	1.90	1.59	0.114
Pharmacology	1.20	1.35	1.27	0.207
Microbiology	1.77	1.89	0.93	0.365
Pathology	1.68	1.95	1.92	0.056
Pediatrics	2.23	2.34	1.11	0.27
Obs. & Gyn.	2.22	2.18	0.42	0.67
Surgery	1.76	1.63	1.37	0.17
Medicine	2.10	2.16	0.6	0.5

DISCUSSION

To our knowledge, this is the first study addressing the issue of gender differences in academic performance of medical students in Sudan. This study showed that there are no significant differences in the academic performance of male and female medical students. The noted differences, however, are small and could be attributed to various factors. In one study, non-cognitive factors were found to have particular relevance for the performance of female medical students, morale and interpersonal stress variables strongly predicted the academic performance of female students [9]. Better performance of female students in clinical competence scores was found to be associated with empathy scores, which were higher in females [10]. The increased female interest in humanistic, psychosocial, and multidisciplinary components of the physician's role in the preclinical stages of medical school, was found to be no longer present in the graduate level [11]. Gender may influence the learning style preferences, and although the majority of students preferred multiple modes of information presentation, female student population tended to be more diverse than the male population [12,13]. In other studies, better female performance was attributed to other factors, including ethnicity [14], while better male performance could be due to differences in anxiety levels, as female medical students reported significantly higher test anxiety level as compared to the male medical students [15], particularly those who experienced stressful life events, such as death in the family or personal illness [16]. Past research showed that, despite performing equally to their male peers, female medical students consistently report decreased self-confidence and increased anxiety [17]. Academic performance is significantly affected by age and commitment level, as reported in one study, where mature-age students achieved higher final degree GPA compared to young undergraduates, and female students significantly outperformed their male counterparts in academic performance and obtained a significantly higher mean score on hardiness commitment compared to male students [3]. In another study, female students showed better academic performance to male students in pre-clinical courses at medical school, however, English language proficiency was the significant predictor of academic performance rather than gender [18]. Academic performance is also affected differently by the learning environment in males and females. Better performance in men demands arousal, this is best in environments that provide frequent opportunities for comparison of their performance with their internal standards. While achievement in women seemed dependent on evaluation of their sense of efficacy in adverse environments [19]. Differences in gender performance may

differ by subject, as reported in one study that compared academic scores in obstetrics and gynecology examinations, where female students performed better than their male colleagues on the written examination, Objective Standardized Clinical Examination and the final clerkship score [4,6]. In problem based learning (PBL), there was significantly higher group performance in female compared with male student-led tutorials [20]. Male and female students may differ also in basic intelligence tests, eventually affecting medical school performance, as reported in a study where male students as a group scored higher than the female students, the difference was small but statistically significant [21]. However, emotional intelligence (EI) was reported to be significantly higher in females compared to males and there was a positive correlation between EI and academic performance [22]. Curriculum and course design could also affect the performance of both sexes in medical school. In one study, females outperformed males in 79 % of subjects in the subject-based curriculum, but in only 24 % in the system-based course [23]. Students may also differ in psychomotor skills, as shown by a study comparing performance of male and female trainees in minimally-invasive surgery simulator. Female sex was an independent factor for worse performance, women took more time than men and made more errors [24]. Gender differences in cognitive abilities were also reported. In a study involving 187,110 medical school applicants, males scored higher on the reasoning factor than did females, and females scored higher than males on the memory factor [25]. Student motivation was found to differ also among male and female students. Although females had higher motivation compared to male students, strength of motivation appears to be a dynamic entity, changing primarily with age and maturity and to a small extent with gender and experience [26]. This study is limited by the number of students involved and the limited scope of student batches. Further studies are needed with larger number of subjects, to investigate the effect of socio-economic status, the school background as this affects the English language mastery level and to compare the gender performance levels in different curriculum types and various assessment methods.

CONCLUSION

This study concluded that the academic performance of medical students shows no significant differences among male and female students. The small differences noted could be explained by many factors influencing the performance of both sexes rather than attributed to gender only.

References

- [1] Burton KR, Wong IK. A force to contend with: The gender gap closes in Canadian medical schools. *CMAJ*. 2004 Apr 27;170(9):1385-6.
- [2] Bickel J. Gender equity in undergraduate medical education: a status report. *J Womens Health Gen Based Med*. 2001 Apr;10(3):261-70.
- [3] Sheard M. Hardiness commitment, gender, and age differentiate university academic performance. *British Journal of Educational Psychology*. March 2009;79(1):189-204.
- [4] Bienstock JL, Martin S, Tzou W, Fox HE. Medical Students' Gender is a Predictor of Success in the Obstetrics and Gynecology Basic Clerkship. *Teaching and Learning in Medicine*. 2002; 14(4):240-243.
- [5] Haist SA, Wilson JF, Elam CL, et al. The Effect of Gender and Age on Medical School Performance: An Important Interaction. *Advances in Health Sciences Education*. November 2000;5(3):197-205.
- [6] McDonough CM, Horgan A, Codd MB, Casey PR. Gender differences in the results of the final medical examination at University College Dublin. *Medical Education*. January 2000; 34(1):30-34.

- [7] Holmes FF, Holmes GE, Hassanein R. Performance of Male and Female Medical Students in a Medicine Clerkship. *JAMA*. 1978;239(21):2259-2262.
- [8] Ramsbottom-Lucier M, Johnson MM, Elam CL. Age and gender differences in students' preadmission qualifications and medical school performances. *Academic Medicine*. March 1995; 70(3):236-239.
- [9] Spiegel DA, Smolen RC, Jonas CK. An examination of the relationships among interpersonal stress, morale and academic performance in male and female medical students. *Social Science & Medicine*. 1986;23(11):1157-1161.
- [10] Hojat M, Gonnella JS, Mangione S, et al. Empathy in medical students as related to academic performance, clinical competence and gender. *Medical Education*. June 2002; 36(6):522-527
- [11] Dufort F, Maheux B. When female medical students are the majority: do numbers really make a difference? *Journal of the American Medical Women's Association*. Jan 1995;50(1):4-6.
- [12] Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? *Advances in Physiology Education*. December 2007; 31(4):336-342.
- [13] Nuzhat A, Salem RO, Al Hamdan N, Nada Ashour N. Gender differences in learning styles and academic performance of medical students in Saudi Arabia. *Medical Teacher*. 2013;35(1):S78-S82
- [14] Haq I, Higham J, Morris R, Dacre J. Effect of ethnicity and gender on performance in undergraduate medical examinations. *Medical Education*. November 2005;39(11):1126-1128.
- [15] Farooqi YN, Rabia Ghani, Charles D. Spielberger. Gender Differences in Test Anxiety and Academic Performance of Medical Students. *International Journal of Psychology and Behavioral Sciences*. 2012;2(2):38-43.
- [16] Hojat M, Glaser K, Xu G, et al. Gender comparisons of medical students' psychosocial profiles. *Medical Education*. May 1999;33(5):342-349
- [17] Blanch DC, Hall JA, Roter DL, Frankel RM. Medical student gender and issues of confidence. *Patient Education and Counseling*. September 2008;72(3):374-381
- [18] Al mously N, Salem R, Al-Hamdan N. The impact of gender and English language on the academic performance of students: An experience from new Saudi medical school. *J Contemp Med Edu*. 2013; 1(3): 170-176.
- [19] De Saintonge DMC, Dunn DM. Gender and achievement in clinical medical students: a path analysis. *Medical Education*. November 2001;35(11):1024-1033.
- [20] Kassab S, Abu-Hijleh M, Al-Shboul Q, Hamdy H. Gender-related differences in learning in student-led PBL tutorials. *Education for Health (Abingdon, England)* 01 Jul 2005, 18(2):272-282.
- [21] Ali MS, Suliman MI, Kareem A, Iqbal M. Comparison of gender performance on an intelligence test among medical students. *J Ayub Med Coll Abbottabad* 2009;21(3).
- [22] Aithal AP, Kumar N, Gunasegeran P, et al. A survey-based study of emotional intelligence as it relates to gender and academic performance of medical students. *Educ Health (Abingdon)*. 2016 Sep-Dec;29(3):255-258.
- [23] Mc Veigh TP, Dunne FP. Gender differences in undergraduate medicine in Galway: a tale of two curricula. *Ir J Med Sci*. 2014 Mar;183(1):103-10.
- [24] Thorson CM, Kelly JP, Forse RA, Turaga KK. Can we continue to ignore gender differences in performance on simulation trainers?. *J Laparoendosc Adv Surg Tech A*. 2011 May;21(4):329-33.
- [25] Stumpf H, Jackson DN. Gender-related differences in cognitive abilities: Evidence from a medical school admissions testing program. *Personality and Individual Differences*. September 1994, 17(3) 335-344.
- [26] Kusrkar R, Kruitwagen C, Ten Cate O, Croiset G. Effects of age, gender and educational background on strength of motivation for medical school. *Advances in Health Sciences Education*. August 2010, Volume 15, Issue 3, pp 303-313.