Academic performance of final year medical students at kerbala medical college

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Objective Assessment of final year students' examination results in Kerbala Medical College in the academic years 2014–2015 and 2015–2016.

Methods Students' achievements in different parts of the final year examination in Kerbala Medical College for the academic years 2014–2015 and 2015–2016. Students' scores in different parts of the theoretical and clinical examinations were analyzed to determine the effectiveness of the assessment process. In addition, students' cumulative scores for the preceding 5 years were explored to determine the association with final year scores. The data were analyzed using the (SPSS) version 20 through different descriptive and analytic statistical tools using: percentages, means, standard deviations, internal reliability, confidence intervals, factor analysis, t-test, ANOVA test and correlation.

Results The results of mean score (scored out of 10 for all scores) and standard deviation theoretical exam in medicine, surgery, gynecology and obstetrics and pediatrics were: 4.55 ± 1.14, 5.62 ± 1.12, 7.15 ± 0.78, 6.31 ± 1.14, respectively and no gender difference was observed. While the comparable results in 2016 were: 5.61 ± 0.92, 5.28 ± 1.08, 7.13 ± 0.92, 7.79 ± 1.22. Performance, objective structured clinical examination (OSCE) total score were (in the same order) for 2015: 6.30 ± 0.83, 6.66 ± 0.88, 7.02 ± 0.91, 7.81 ± 0.99. On comparison of 2015 and 2016 results, minor significant differences were found. A significant positive association was found between graduation score and previous year's scores. Minor significant gender differences were observed in only few assessed parameters.

Conclusion The present study aimed at a correct in depth analysis of the evaluation process and an examination of Kerbala Medical College graduates in two successive years. The results found were very helpful in pointing out the main shortcomings and strength in the examination stations.

Keywords evaluation, education, medical Students, clinical, examination

Introduction

When people hear the term "academic performance", they often think of a person's achievement in getting a bachelor degree. However, several factors indicate a student's academic success. While some may not graduate top of their class, they may hold leadership positions in several student groups or score high on standardized tests where people often consider grades first in evaluating academic achievement. This includes medical schools, which rank students by their scores, awarding special designations such as the joint educational premises for those who graduate first ten in their class.[1] Scholarship organizations and universities also start by looking at grades, as do some employers, especially when hiring recent graduates. Grades carry more weight in some industries, especially technical professions such as law, medicine and finance. Other industries place less importance on GPA, particularly creative professions such as writing or art and occupations such as sales where people skills are more crucial than technical knowledge.

The traditional approach in medical learning was based on the bucket theory: If medical students are filled with the required foundational knowledge, they are expected to be able to strategically retrieve and direct just the right subsets of that knowledge toward problems faced in clinical practice.[2] In addition, each student should develop basic clinical skills during undergraduate courses including: disciplines of medical core knowledge, medical ethics, and basic clinical skills of life saving procedures as well as other essential professions like communications, diagnostic and emergency

interventional experiences.[3] It is known that assessment in medical education is essential part and not a step for passing to a higher level. It serves many functions as it doesn't determine what students learn but it guides the process of learning, also it provides students' feedback on where they stand and motivates them to master the material and it show the society and related organizations that doctors are competent.[1,4,5]

Competence in medicine has been defined as "*the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served*".[1] Competence is not an achievement but rather a habit of lifelong learning.[6] On the other hand, competence is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served. Additionally, assessment plays an integral role in helping physicians identify and respond to their own learning needs. Ideally, the assessment of competence (what the student or physician is able to do) should provide insight into the actual performance (what he or she does habitually when not observed), as well as the capacity to adapt to change, find and generate new knowledge, and improve overall performance.[1,4] Some graduates unfortunately apparently fail acquiring some essential basic skills during undergraduate course. This problem of under competency is not limited to Iraqi medical graduates but also appears in some

graduates of credited universities and medical schools in developing and developed countries.[7,8]

In the United States, the assessment of medical residents, and increasingly of medical students, is largely based on a model developed by the Accreditation Council for Graduate Medical Education (ACGME). This model uses six interrelated domains of competence: medical knowledge, patient care, professionalism, communication and interpersonal skills, practice-based learning and improvement, and systems-based practice.[9]

Objective structured clinical examination (OSCE) was first described by Harden in 1975,[10] it has an established role in the assessment of the medical undergraduates. OSCE assess history taking, clinical examination, data interpretation procedure or practical skills and communication skills.[11–13] It represents a valid and reliable tool in medical education for evaluating clinical competence.[13] OSCE was introduced to test final year candidates in the Council of Arab Board students and later for undergraduate students in Iraq.[3,5,14] A study had reported overall good student's evaluation and preference of OSCE in Basra medical college.[14] In the last decade many articles tried to evaluate the level of assessment in medical colleges in Iraq and a national exit examination was suggested.[4,5,7,14–20]

There are 23 medical colleges in Iraq where medical teaching is based on the traditional British teaching system, grant Medicine and Surgery Bachelor certificate. The graduates after passing the final examination are recognized as members of the Iraqi Medical Association and officially assigned as house surgeons (intern resident doctors) serve 24 months rotational training courses in general hospitals.[3] Admission to medical schools is very competitive and is based on performance in the general national high school examination with nearly full mark scores in all branches. To ensure competence in these fields, and according to the instructions of the Ministry of Higher Education, all graduates need to pass a final examination after 6-year study. The examination tests theoretical and clinical aspects including: Long case, short case, Objective Structured Clinical Examination OSCE.[3]

Materials and Methods

The achievements of the students in the final year examination different sections in Kerbala Medical College for the academic years 2014–2015 and 2015–2016 in addition to cumulative sores for the preceding five years were assessed. The goal was to determine the effectiveness of different of examination methods and the level of performance of the students in each (and for different subgroups) according to examination scores in theoretical and clinical examinations. The clinical part of the examination included: direct observation clinical examination (DOCE), long case (LC), computerized images and video assessment (CIVA), oral examination (VIVA), objective structural clinical examinations stations (OSCE). The data were analyzed using the Statistical Package for Social Sciences version 20 (SPSS-20) at a significance level of .05 through different descriptive and analytic statistical tools using: percentages, means, standard deviations, internal reliability, confidence intervals, factor analysis, t-test, ANOVA test, correlation and structural Equation Modeling. Students' achievements in different parts of the final year tests and their cumulative sores for the preceding five years were compared among different gender and in the two studied years (2015 and 2016).

Results

The number of graduates in 2014/2015 (reported as 2015) was 51 graduates (15 males and 36 females) and in 2015/2016 (reported as 2016) were 71 graduates (27 males and 43 females).

The mean age of the graduate of the Kerbala Medical College was 24.63 ± 1.822 year in 2015, and 24.39 ± 1.011 year in 2016 with no significant gender difference.

The internal reliability (Cronbach's Alpha), when all examination scores were included was measured and the findings showed that it was 0.88 and 0.86 for 2015 and 2016, respectively. When Cronbach's Alpha was measured for these tests, it was 0.91 for both 2015 and 2016. When Cronbach's Alpha was measured for different branches OSCE examinations separately, the values were all almost acceptable (> 0.6).

The mean scores of theoretical examination, direct observation clinical examination (DOCE), or long case (LC), computerized images and video assessment (CIVA), oral examination (VIVA), objective structural clinical examinations stations (OSCE) total scores in 2015 and 2016 showed no significant gender difference (Table 1), while ANOVA test showed no significant difference between the means in the 2 years.

When gender difference was explored, no significant difference was discovered in any part of the assessment (Tables 2 and 3).

OSCE in Medicine

When the mean difference between OSCE in medicine in the two years was explored, significant differences were discovered in all parts of the assessment except for neurology (Table 4).

OSCE Surgery

When the mean difference between OSCE in medicine in the 2 years was explored, significant differences were discovered in all parts of the assessment except for a history of jaundice case and X-ray pediatric surgery (Table 5).

OSCE Gynecology and Obstetrics

When the mean difference between OSCE in the two years was explored, significant differences were discovered in all parts of the assessment except for obstetrics interpretation and two stations short case Examination -short case- (Table 6).

OSCE Pediatrics

When the mean difference between OSCE in the two years was explored, significant differences were discovered only in history, slides and clinical examination (Table 7).

Fig 1. **The gender distribution of the graduates from Kerbala Medical College in 2015 (n = 51) and 2016 (n = 71).**

Table 1. **The mean and standard deviation of the students' scores in the main final year examination parts in Kerbala Medical College in 2015 and 2016**

Assessment	2015							
	Medicine		Surgery		Gynecology and Obstetrics		Pediatrics	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Theoretical examination	4.55	1.14	5.62	1.12	7.15	0.78	6.31	1.14
CIVA	7.35	1.34	7.12	0.99	8.22	0.89	6.94	1.03
DOCE or Long case	6.08	2.09	6.77	0.95			6.98	1.81
OSCE total Score	6.30	0.83	6.66	0.88	7.02	0.91	7.81	0.99
Assessment	2016							
	Medicine		Surgery		Gynecology and Obstetrics		Pediatrics	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Theoretical examination	5.61	0.92	5.28	1.08	6.60	1.46	5.79	1.22
CIVA	6.06	1.20	6.77	0.96	7.13	0.92	6.94	2.20
DOCE or Long case	6.12	1.74	5.39	1.14			6.94	1.17
OSCE total Score	6.22	0.70	5.49	1.01	7.44	1.23	7.69	0.96

Table 2. **Gender difference in the mean and standard deviation of the students' scores in the main final year examination parts in Kerbala Medical College in 2015 (n = 51)**

Branch	Assessment	Males		Females		t-value	Significance
		Mean	Std. deviation	Mean	Std. deviation		
Medicine	Theoretical examination	5.11	1.01	4.32	1.12	2.35	0.847
	CIVA	7.17	1.39	7.42	1.33	−0.59	0.454
	DOCE1	5.93	2.06	6.14	2.12	−0.32	0.781
	OSCE total	6.24	0.83	6.24	0.83	0.89	0.811
Surgery	Theoretical E.	6.08	0.96	5.43	1.15	1.91	0.337
	CIVA	7.00	0.85	6.68	0.98	1.13	0.379
	Long Case	7.18	1.12	7.10	0.95	0.26	0.375
	OSCE total	6.62	0.94	6.67	0.87	−0.19	0.393
Gynecology and Obstetrics*	Theoretical E.	7.30	0.75	7.15	0.79	0.62	0.965
	CIVA	8.26	0.89	8.29	0.74	−0.10	0.669
	OSCE total	7.12	0.84	7.12	0.84	−1.03	0.055
Pediatrics	Theoretical examination	5.99	1.11	6.45	1.14	−1.33	0.542
	CIVA	7.14	2.11	8.33	1.39	−2.37	0.302
	Long Case	7.10	1.04	6.87	1.04	0.72	0.639
	OSCE total	7.63	1.36	7.89	0.79	−0.85	0.067

* There was no long case examination in gynecology and obstetrics.

Six years Summative Scores

For 2015, the mean for the first three study years were around 3.00 out of 5 and for the fourth year the mean was 12.75 ± 1.24 out of 20 and 16.65 ± 2.04 out of 25 for the fifth year and 26.36 ± 2.72 out of 40 for the sixth year, while the mean of the sum (total graduation score) was 65.72 ± 6.77 (Table 8).

For 2016 graduates, the means were slightly lower but no significant difference was found from 2015 mean score. The mean for the first three study years were similarly around 3.00 out of 5 and for the fourth year the mean was 12.38 ± 1.27 out of 20 and 16.98 ± 1.83 out of 25 for the fifth year and 25.91 ± 2.61 out of 40 for the sixth year, while the mean of the sum (total graduation score) was 64.88 ± 6.57 (Table 9).

Structural Equation Model (SEM)

Analysis of examination sections results using SEM showed the different regression weight subjected by each section of the examination on the total graduation score (Figure 4). A model for the cumulative results showed similarly the regression weight of each year score (Figure 5).

Discussion

Relatively few studies provide detailed comparative analysis of medical college graduates' performance.[21]

The results of the present study showed the importance of feedback resulting from the analysis of the detailed

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Table 3. **Gender difference in the mean and standard deviation of the students' scores in the main final year examination parts in Kerbala Medical College in 2016 (n = 71)**

Branch	Assessment	Males		Females		t-value	Significance
		Mean	Std. deviation	Mean	Std. deviation		
Medicine	Theoretical examination	5.74	0.84	5.53	0.97	2.35	0.850
	CIVA	6.39	1.17	5.85	1.18	−0.59	0.454
	DOCE	6.08	1.82	6.14	1.71	−0.32	0.781
	OSCE total	6.28	0.76	6.18	0.67	0.89	0.811
Surgery	Theoretical examination	5.58	1.06	5.08	1.07	1.91	0.337
	CIVA	6.80	0.81	6.76	1.05	1.13	0.381
	Long Case	5.68	1.24	5.21	1.06	0.26	0.375
	OSCE total	5.89	0.71	5.24	1.09	−0.19	0.397
Gynecology and Obstetrics*	Theoretical examination	7.00	0.90	7.21	0.93	0.79	0.959
	CIVA	7.48	1.34	7.42	1.17	0.22	0.926
	OSCE total	7.42	0.71	7.22	0.73	−0.94	0.058
Pediatrics	Theoretical examination	5.53	1.43	5.95	1.05	−1.33	0.540
	CIVA	6.77	1.34	6.97	2.50	−1.70	0.303
	Long Case	6.91	1.65	7.05	1.05	0.72	0.639
	OSCE total	7.83	0.87	7.61	1.01	−0.85	0.067

*There was no long case examination in gynecology and obstetrics.

Table 4. **The mean and standard deviation of the students' scores of OSCE final year examination in Medicine in Kerbala Medical College in 2015 and 2016**

Station	2015		2016		Significance
	Mean	Std. deviation	Mean	Std. deviation	
Communication	4.3824	1.94830	6.2143	1.37016	< 0.001
History interpretation A	6.245	2.0109	7.016	1.7635	0.027
History interpretation B	6.4382	1.62944	7.5357	1.83430	0.001
History interpretation C	6.588	2.1742	5.764	2.1564	0.041
Breaking bad news	7.1225	1.84619	5.9607	2.38680	0.004
Neurology	7.1510	1.89157	7.7607	2.35770	0.130
Locomotors	6.8137	1.94284	4.6286	2.08155	< 0.001
Posterior thoracic	5.7647	1.99588	6.5750	2.11634	0.035
Pericardium	7.2647	1.69589	4.1336	3.04400	< 0.001
General medicine	7.2647	1.69589	6.6000	1.46109	0.023

examination results which affect the quality of assessment in the future. The overarching goal of educational reform should be to transform medical assessment from passive observation to active process contributing both in curriculum correction and improvement of assessment. Detailed analysis of the results and possible causes for differences were discussed with the responsible departments in the college to reach for planning of improved assessment in the next year.

An analysis of radiology course in the Tikrit Medical College, reported a mean of 82 and CI 66–97.8 and only 6.3% of the participants got the "honors" -two standard deviation above the mean-, while 6.7% of the participants were two standard deviations below the mean in the written test. For the written and practical test, the range of the scores was tighter, 65–96%, and the mean of 80.5% and a standard deviation of 5.3, the "honors" and failure rates were approximately 5%.[20]

OSCE value was estimated in two articles in Basra medical college. In the first, the students' perception was reported to be positive. The selection of suitable assessment or evaluation depends on its validity (a measure of the extent to which the test actually measure what is intended to measure), reliability (a measure of whether the assessment or test is consistent and accurate; examines the extent to which factors such as examiners, questions, occasions affect the marks or scores awarded) and practicability was proved.[5,14]

Academic performance of medical students in western Australia and in Indonesia was found to be significantly

Table 5. **The mean and standard deviation of the students' scores of OSCE final year examination in Surgery in Kerbala Medical College in 2015 and 2016**

OSCE examination	2015		2016		Significance
	Mean	Std. deviation	Mean	Std. deviation	
History of jaundice case	5.99	1.92	6.21	1.05	0.429
Surgical examination A	5.86	1.82	4.93	1.76	0.006
Hand work	8.11	1.74	7.20	1.06	0.001
Surgical examination B	5.22	2.94	3.54	1.83	< 0.001
Burns management	6.41	2.59	3.89	3.69	< 0.001
Pictures interpretation	5.12	3.23	3.86	2.98	0.028
Orthopedic X-ray	7.08	2.62	5.70	2.87	0.008
General surgery instruments	8.19	1.03	6.43	1.87	< 0.001
CT Urology	9.27	1.70	6.36	3.11	< 0.001
Hand suturing	8.04	1.48	6.57	2.09	< 0.001
X-ray pediatric surgery	5.61	3.16	6.24	3.52	0.309
X-ray Urology	5.15	1.91	7.74	3.13	< 0.001

Table 6. **The mean and standard deviation of the of the students' scores of OSCE final year examination in Gynecology and Obstetrics in Kerbala Medical College in 2015 and 2016**

OSCE examination	2015		2016		Significance
	Mean	Std. deviation	Mean	Std. deviation	
Gynecology history	7.03	1.90	7.33	1.25	<0.001
Gynecology interpretation	8.67	1.49	6.33	1.29	<0.001
Obstetrics history	6.38	1.54	8.02	1.86	<0.001
Obstetrics interpretation	7.54	1.59	8.19	1.38	0.697
Gynecological examination	7.02	1.35	6.52	1.71	0.120
Two stations short case examination	8.29	1.31	7.37	2.08	0.353

Table 7. **Mean and standard deviation of the students' scores of OSCE final year examination in Pediatrics in Kerbala Medical College in 2015 and 2016**

OSCE examination	2015		2016		Significance
	Mean	Std. deviation	Mean	Std. deviation	
Clinical examination A	8.15	1.44	8.14	1.19	0.963
Data interpretation A	6.48	2.23	7.36	3.38	0.110
Counseling	7.12	3.25	7.85	1.98	0.128
Data interpretation B	8.19	1.71	7.78	1.79	0.210
Community	7.76	1.27	8.38	2.23	0.076
Instruments and drugs	8.35	2.05	8.70	1.49	0.280
History	8.80	1.65	7.08	1.42	0.000
Clinical examination B	8.30	1.37	7.64	1.35	0.009
Slides	7.98	1.70	6.94	2.20	0.006
Development	6.98	1.81	6.94	1.51	0.898

correlated with their performance as a Junior Doctor ($r = 0.229$, $P = 0.002$), and with their mean scores on entering medical college.[22,23] Blackman,[23] evaluated the influence of students score in different study years on post graduate performance. The effects of GPA scores with reference to Fig. 3, it can be seen that the grade point average scores obtained by students in their undergraduate studies (LV6) has a direct influence on their subsequent achievement on the clinical assessment tasks. A positive path coefficient exists between these two variables (0.17) which indicates that students with higher grade point averages in their undergraduate studies overall achieve at a higher level on the clinical examination in their third year of medical studies. The loadings for the GPA scores obtained in the first (0.88) second (0.92) or third

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Table 8. **The mean and standard deviation of the students' scores for the six years summative scores by gender in Kerbala Medical College graduates in 2015**

Year	Males		Females		Total	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
First	3.36	0.45	3.36	0.36	3.36	0.39
Second	3.25	0.32	3.20	0.41	3.22	0.38
Third	3.49	0.42	3.34	0.49	3.38	0.47
Fourth	13.02	1.28	12.64	1.22	12.75	1.24
Fifth	16.77	1.77	16.60	2.17	16.65	2.04
Sixth	26.62	2.60	26.25	2.80	26.36	2.72
Final	66.51	6.32	65.39	7.01	65.72	6.77

Table 9. **Mean and standard deviation of the students' scores of the six years summative scores in Kerbala Medical College in 2016**

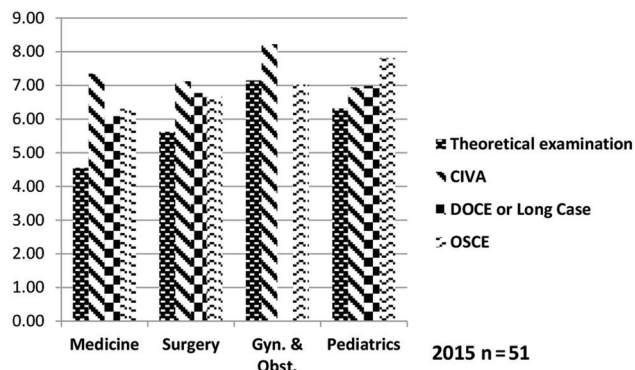| Year	Males		Females		Total	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
First	3.37	0.37	3.33	0.38	3.35	0.37
Second	3.12	0.39	3.02	0.39	3.06	0.39
Third	3.24	0.50	3.17	0.45	3.20	0.47
Fourth	12.49	1.36	12.32	1.23	12.38	1.27
Fifth	17.24	1.81	16.81	1.84	16.98	1.83
Sixth	26.50	2.78	25.53	2.46	25.91	2.61
Total	65.96	6.86	64.18	6.37	64.88	6.57

Fig 2. **The mean of the students' scores in the main final year examination parts in Kerbala Medical College in 2015.**
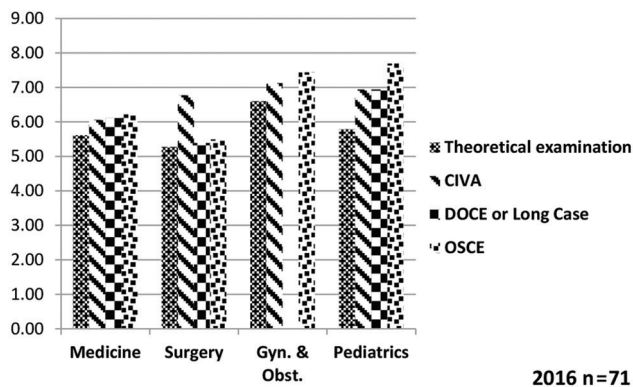

Fig 3. **The mean of the students' scores in the main final year examination parts in Kerbala Medical College in 2016.**

years (0.78) of study are an indication that there is little difference between the contributions to OSCE performance made by the different years of prior study. In the present study a direct association between the scores obtained in the previous study years and the final graduation score was clear (Figure 4). However, low to moderate correlation of undergraduate assessment with postgraduate training performance was reported by other studies.[24]

No gender difference was found in achievements in all parts of the final year examination in Kerbala Medical College and this was similar to the findings in many studies in other countries.[25–27] However, female students were consistently found in the literature to perform better than males in their medical training which might be related to higher motivation. A systematic review by Ferguson and his colleagues reported that a growing body of research explores whether different motivational, academic, and demographic factors influence the performance of male and female women where motivation seems to be important.[21] The reason behind failing to find any gender difference in the present study might be related to the higher proportion of females in the sample or some other reasons that need further investigation.

Environmental factors and personal characteristics might be responsible for the differences discovered between the two years. Differences in raters' grading could introduce variability into the measurement of a student's performance and thus make the measurement less reliable. Additionally, specific attributes of the student, evaluator, or environment in which the interaction took place might affect the student's scores by introducing systematic
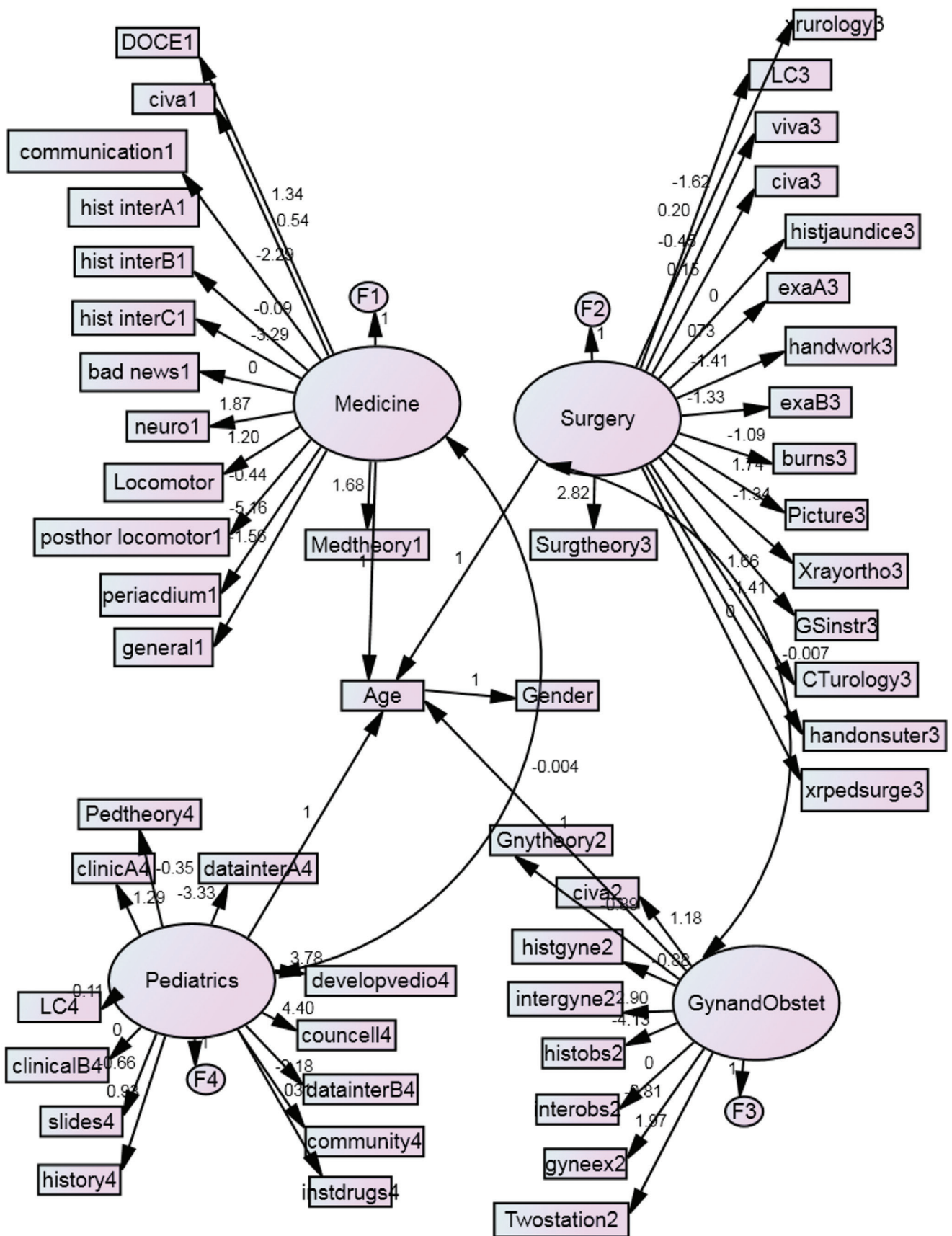
Fig 4. **Structural Equation Model of all input variables in different sections of final examination in Kerbala Medical College in 2016.**
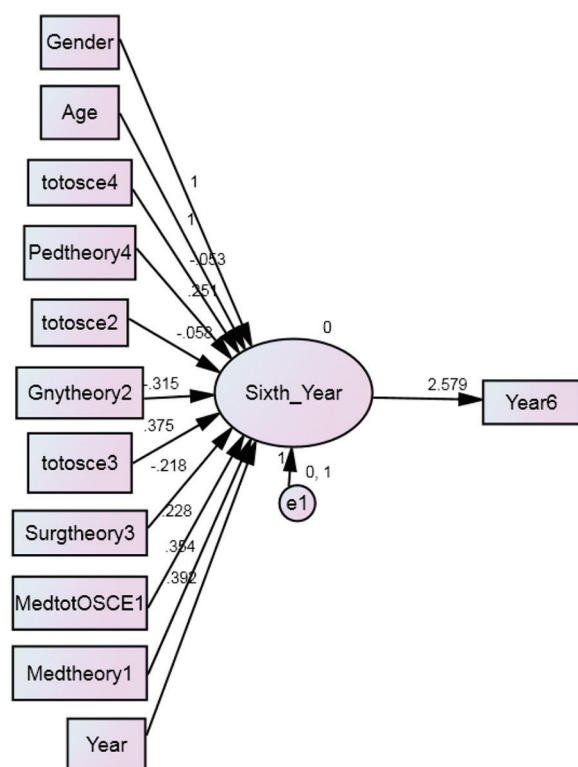
Fig 5. **Structural Equation Model of all input variables in different main branches of final examination in Kerbala Medical College in 2016.**

differences into the measurement, further decreasing the reliability of the system.[25]

Multivariate regression analysis approach to studying predictors of success in medical training was suggested in a systematic review of about twenty two thousands medical students [21]. Predictors are likely to be inter-correlated, as are outcome measures. Additionally, learning across the medical degree occurs over time, and time series analyses and models that allow for prediction of change over time would also be a useful approach in exploring trend effects. The use of SEM procedures, as well as hierarchical structural models using structural and time series components, was also beneficial to develop our understanding of the prediction of performance.[21,26]

Conclusions

The evaluation process and examination section yields correct in depth findings resulted from analysis of Kerbala Medical College graduates in two successive years (2015 and 2016). On practical base, the results found were very helpful in pointing out the main shortcomings and strength in the examination stations and to plan for more accurate assessment for the graduates.

Conflict of Interest

None. ■

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