



Medical Students and Residents Educational Needs in Diagnosing Eye Problems and Competence in Ophthalmic Skills: A Perception Survey Study

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Abstract: Background: Ophthalmology is underrepresented as examinable material among medical students, possibly unintentionally so. This study aims to assess medical students and residents perceived comfort, knowledge, and confidence in ophthalmology. **Method:** A cross-sectional survey among medical students at Umm Al-Qura University, located in Makkah, Saudi Arabia was distributed, and 39 students were included in the analysis. **Results:** Most students rated their knowledge as average or below average across the majority of areas. For ocular manifestations of systemic diseases, 18 (46.2%) rated their knowledge as average, while only 1 (2.6%) rated it as excellent. Among all the examined variables, only clinic-based learning was associated with knowledge in ophthalmology skills (OR = 15.24, 95% CI :1.31-177.56, $p = 0.03$). **Conclusion:** This study highlights significant deficiencies in ophthalmology knowledge and clinical confidences among medical students and junior residents. Although basic ophthalmic concepts and skills are moderately understood, there remains a considerable gap in the diagnosis and management of more complex or less frequently encountered eye conditions. Studies with larger sample size are recommended to validate these findings.

Key Words: Medical Students, Ophthalmology, Clinical Based Learning, Saudi Arabia

INTRODUCTION

The ophthalmology education in medical faculties curriculum decreased in last decades in several countries. The international Council of Ophthalmology doesn't require or recommend a standardized curriculum in medical schools in globally [1, 2]. Ophthalmology is underrepresented as examinable material among medical students, possibly unintentionally so. Medical education should attempt to reflect the changing requirements of the patients that physicians are supposed to serve. The reality is that 5.5 million Canadians are already living with a vision-threatening eye ailment. With Canada's aging population, this number is predicted to climb by 29% over the next decade [3].

Despite the importance of ophthalmology in medical practice, insufficient time is given to teaching ophthalmology in undergraduate medical education, and the majority of primary care physicians do not believe they have received adequate undergraduate ocular education [4]. Delays in providing care and inadequate management of

these ocular emergencies are significant causes of blindness or irreversible vision loss [5]. Ophthalmic emergencies account for approximately 1%-6% of complaints presented to emergency departments worldwide [6-10].

Several ocular diseases, including congenital retinoblastoma, congenital cataract, congenital glaucoma, and some other retinal abnormalities, can cause significant visual impairment in children, which is considered a significant public health concern because it negatively affects the children in question, their families, and society [11, 12]. Fortunately, these eye disorders could be diagnosed during a child's visit to a pediatrician or a family physician, or by early referral to a trained ophthalmologist [13]. As a result, early detection by eye examinations and complete visual assessment with urgent care are critical and may save children from lifelong visual impairments [11].

Managing ophthalmic emergencies need proper knowledge of general physicians. Insufficient medical training concerning ophthalmology for medical students will lead to improper diagnosis for ophthalmic conditions by

future doctors. Examining medical students’ ophthalmic educational need is important to identify any educational deficiencies. A previous study in Saudi Arabia examined ophthalmology teaching and revealed that medical students should have more hands-on clinical experience, early mentorship, across all academic years [14]. This study aims to assess medical students and residents perceived comfort, knowledge, and confidence in ophthalmology and explore how various teaching strategies, including clinic-based learning, influence these outcomes. This study hypothesized that teaching methods will affect students’ learning of ophthalmology skills.

Self-confidence does not necessarily reflect actual competences. This was demonstrated in previous systematic review which reported that physicians have a limited self-assessment ability [15]. Despite that using structured skills checklists and OSCEs provides objective measures for the actual performance, self-reported confidence remains valuable and offers comprehensive understanding.

METHOD

Study Design and Setting

This study was a cross-sectional survey among medical students at Umm Al-Qura University, located in Makkah, Saudi Arabia. This university was selected due to the accessibility to university students and curricula. Ophthalmology is taught in the 5th and 6th year of the MBBS program during medical students’ clinical phase. Medical students are supervised during their clinical training in the outpatient clinics, operating room, and wards.

Participants

A total of 39 medical students participated in the study. Participants were recruited from different academic levels, and their responses were collected voluntarily and anonymously. Data were collected after clinical rotation.

Data Collection Tool

A structured questionnaire was used to assess students’ self-reported:

- Comfort in diagnosing ophthalmologic condition, with 26 different conditions
- Knowledge related to ophthalmology
- Confidence in performing ophthalmologic skills

Each domain was measured using Likert-type items. Students rated their responses on a scale ranging from “Not at all comfort/confident” to “very comfortable/confident”.

Scoring and Categorization

For each domain (comfort, knowledge, and confidence), the responses were numerically scored and median scores were calculated. Based on the median, participants were categorized into two groups: low, and high.

Reliability Assessment and Piloting Phase

The questionnaire tool was assessed by expert academic who is specialized in ophthalmology, who confirmed the external validity of the questionnaire tool. This was followed by small pilot study on students who meet the inclusion criteria to assess the questionnaire tool. They confirmed that it is easy to understand and fill.

Data analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 29). Categorical variables were expressed as frequency and percentage, while continues data, such as scores, were reported as means and standard deviations (SD). The median total score for the three scores was used as the cutoff point for multiple logistic regression. Demographic characteristics were included as independent variables in the regression model. The findings of the regression analysis were presented as adjusted odds ratio (AOR) with its corresponding 95% confidence interval. The level of significance was defined as p-value less than 0.05. This study followed reporting guidelines (STROBE) for a cross-sectional survey.

RESULTS

A total of 39 medical students were included in the analysis. Out of 39 students, 21 (53.8%) were male and 18 (46.2%) were female. In term of education level, 36 students (92.3%) were in sixth year, while 3 (7.7%) were in first-year residents. Regarding sources of ophthalmology skills learning, 30 participants (83.3%) reported didactic lectures, 20 (55.5%) clinic-based learning, 10 (27.7%) tutorials, and 7 (19.4%) seminars (Table 1).

The Table 2 illustrates participants’ self-reported comfort levels in diagnosing various ophthalmic conditions. A considerable proportion felt not at all or only somewhat comfortable across most conditions. For instance, 22 students (56.4%) felt not at all comfortable diagnosing keratomalacia, and 17 (43.6%) reported the same for acute iridocyclitis. Furthermore, students reported being not at all comfortable diagnosing pterygium (35.9%) and corneal blindness (46.2%). In contrast, higher comfort levels were

Table 1: Demographic Characteristics of the Students

Demographic characteristics		N	Percentage
Gender	Male	21	53.8
	Female	18	46.2
Education level	First year resident	3	7.7
	Sixth year medical student	36	92.3
Which of the following teaching methods is a source for your learning of ophthalmology skills?	Didactic lectures	30	83.3
	Seminars	7	19.4
	Tutorials	10	27.7
	Clinic-based learning	20	55.5

Table 2: Students' Self-Reported Comfort in Diagnosing Ophthalmic Conditions

Please indicate how comfortable You feel diagnosing the following issues based on your present knowledge	Not at all comfortable	Somewhat comfortable	Moderately comfortable	Comfortable	Very comfortable
Conjunctiva/cornea	5 (12.8%)	12 (30.8%)	9 (0.0%)	9 (23.1%)	4 (10.3%)
Viral conjunctivitis	6 (15.4%)	10 (25.6%)	9 (0.0%)	11 (28.2%)	3 (7.7%)
Allergic conjunctivitis	5 (12.8%)	10 (25.6%)	8 (0.0%)	12 (30.8%)	4 (10.3%)
Subconjunctival hemorrhage	5 (12.8%)	8 (20.5%)	13 (0.0%)	5 (12.8%)	8 (20.5%)
Pterygium	14 (35.9%)	2 (5.1%)	10 (0.0%)	4 (10.3%)	9 (23.1%)
Corneal abrasion/ulcer	8 (20.5%)	6 (15.4%)	13 (0.0%)	7 (17.9%)	5 (12.8%)
Keratomalacia	22 (56.4%)	12 (30.8%)	3 (0.0%)	1 (2.6%)	1 (2.6%)
Corneal blindness	18 (46.2%)	8 (20.5%)	6 (0.0%)	5 (12.8%)	2 (5.1%)
Eyelid/lacrimal sac	4 (10.3%)	10 (25.6%)	13 (0.0%)	6 (15.4%)	6 (15.4%)
Blepharitis	10 (25.6%)	5 (12.8%)	13 (0.0%)	5 (12.8%)	6 (15.4%)
Chalazion	8 (20.5%)	1 (2.6%)	7 (0.0%)	8 (20.5%)	15 (38.5%)
Stye	14 (35.9%)	3 (7.7%)	14 (0.0%)	5 (12.8%)	3 (7.7%)
Dacryocystitis	8 (20.5%)	8 (20.5%)	8 (0.0%)	10 (25.6%)	5 (12.8%)
Lens/Uvea	13 (33.3%)	10 (25.6%)	7 (0.0%)	7 (17.9%)	2 (5.1%)
Cataract	4 (10.3%)	7 (17.9%)	10 (0.0%)	11 (28.2%)	7 (17.9%)
Acute iridocyclitis	17 (43.6%)	6 (15.4%)	10 (0.0%)	2 (5.1%)	4 (10.3%)
Glaucoma	6 (15.4%)	7 (17.9%)	8 (0.0%)	10 (25.6%)	8 (20.5%)
Primary open-angle glaucoma	7 (17.9%)	12 (30.8%)	12 (0.0%)	6 (15.4%)	2 (5.1%)
Acute angle-closure glaucoma	7 (17.9%)	9 (23.1%)	10 (0.0%)	7 (17.9%)	6 (15.4%)
Ophthalmic emergencies	5 (12.8%)	9 (23.1%)	14 (0.0%)	6 (15.4%)	5 (12.8%)
Globe rupture	12 (30.8%)	4 (10.3%)	6 (0.0%)	11 (28.2%)	6 (15.4%)
Chemical injuries	3 (7.7%)	11 (28.2%)	8 (0.0%)	11 (28.2%)	6 (15.4%)
Endophthalmitis	12 (30.8%)	8 (20.5%)	6 (0.0%)	8 (20.5%)	5 (12.8%)
Pediatric ophthalmology	12 (30.8%)	14 (35.9%)	7 (0.0%)	6 (15.4%)	0 (0.0%)
Strabismus	12 (30.8%)	7 (17.9%)	6 (0.0%)	8 (20.5%)	6 (15.4%)
Leukocoria	11 (28.2%)	6 (15.4%)	13 (0.0%)	4 (10.3%)	5 (12.8%)

Table 3: Students' Self-Assessed Knowledge on Ophthalmic and Systemic Eye Health Topics

Using the table below, please indicate your knowledge on the following issues	Very poor	Poor	Average	Good	Excellent
Ocular manifestations of systemic diseases	3 (7.7%)	9 (23.1%)	18 (46.2%)	8 (20.5%)	1 (2.6%)
Diabetic retinopathy	3 (7.7%)	4 (10.3%)	14 (35.9%)	16 (41.0%)	2 (5.1%)
Hypertensive retinopathy	4 (10.3%)	9 (23.1%)	16 (41.0%)	7 (17.9%)	3 (7.7%)
Tuberculosis	8 (20.5%)	16 (41.0%)	11 (28.2%)	0 (0.0%)	4 (10.3%)
Toxemia of pregnancy	15 (38.5%)	14 (35.9%)	8 (20.5%)	2 (5.1%)	0 (0.0%)
HIV	9 (23.1%)	12 (30.8%)	13 (33.3%)	5 (12.8%)	0 (0.0%)
Community ophthalmology	8 (20.5%)	12 (30.8%)	16 (41.0%)	3 (7.7%)	0 (0.0%)
Magnitude of blindness in India	24 (61.5%)	10 (25.6%)	5 (12.8%)	0 (0.0%)	0 (0.0%)
NPCB and implementation at various levels	22 (56.4%)	10 (25.6%)	5 (12.8%)	2 (5.1%)	0 (0.0%)
Functions of ophthalmic assistant	19 (48.7%)	9 (23.1%)	8 (20.5%)	3 (7.7%)	0 (0.0%)
Organization of eye camp	17 (43.6%)	10 (25.6%)	11 (28.2%)	1 (2.6%)	0 (0.0%)
Medical care/referral	5 (12.8%)	8 (20.5%)	18 (46.2%)	5 (12.8%)	3 (7.7%)
Indications of topical antibiotics	3 (7.7%)	10 (25.6%)	19 (48.7%)	6 (15.4%)	1 (2.6%)
Indications of topical steroids	2 (5.1%)	10 (25.6%)	20 (51.3%)	5 (12.8%)	2 (5.1%)
Indications of antiglaucoma drugs	6 (15.4%)	7 (17.9%)	15 (38.5%)	8 (20.5%)	3 (7.7%)
Indications of ophthalmology referral	3 (7.7%)	7 (17.9%)	17 (43.6%)	8 (20.5%)	4 (10.3%)

observed in more common conditions like chalazion, with 15 participants (38.5%) felt comfortable managing viral conjunctivitis and globe rupture. Overall, the data suggests limited confidence among learners, particularly in diagnosing complex or less commonly encountered conditions, Table 2.

Most students rated their knowledge as average or below average across the majority of areas. For ocular manifestations of systemic diseases, 18 (46.2%) rated their knowledge as average, while only 1 (2.6%) rated it as excellent. Regarding diabetic retinopathy, 16 (41.0%) rated their knowledge as good and 2 (5.1%) as excellent. In contrast, topics like the magnitude of blindness and NPCB implementation showed limited knowledge, with 24 (61.5%) and 22 (56.4%) participants respectively rating their knowledge as very poor, (Table 3).

Most participants felt moderately comfortable with skills like clinical assessment (16, 41.0%) and ophthalmic history taking (12, 30.8%), while 14 (35.9%) reported feeling comfortable with the latter. Visual acuity testing was among the most confidently performed skills, with 12 (30.8%) reporting comfort and 7 (17.9%) very comfortable. On the other hand, complex procedures like Schiotz tonometry and assessment of anterior chamber depth showed lower confidence – 27 (69.2%) and 20 (51.3%) participants, respectively, felt not at all comfortable performing these tasks, (Table 4).

Among all the examined variables, only clinic-based learning showed a statistically significant association with knowledge in ophthalmology skills (OR = 15.24, 95%

Table 4: Students' Confidence in Performing Ophthalmic Clinical Skills

Using the table below, please indicate how comfortable You feel performing the following phthalmology-related skills:	Not at all comfortable	Somewhat comfortable	Moderately comfortable	Comfortable	Very comfortable
Clinical assessment	3 (7.7%)	13 (33.3%)	16 (41.0%)	6 (15.4%)	1 (2.6%)
Ophthalmic history taking	3 (7.7%)	9 (23.1%)	12 (30.8%)	14 (35.9%)	1 (2.6%)
Visual acuity testing	1 (2.6%)	10 (25.6%)	9 (23.1%)	12 (30.8%)	7 (17.9%)
Test color vision	4 (10.3%)	6 (15.4%)	11 (28.2%)	11 (28.2%)	7 (17.9%)
Cover/uncover test	7 (17.9%)	9 (23.1%)	12 (30.8%)	7 (17.9%)	4 (10.3%)
Assessment of anterior chamber depth	20 (51.3%)	10 (25.6%)	7 (17.9%)	2 (5.1%)	0 (0.0%)
Pupil examination/swinging flashlight test	6 (15.4%)	9 (23.1%)	12 (30.8%)	9 (23.1%)	3 (7.7%)
Visual field testing by confrontation	8 (20.5%)	13 (33.3%)	6 (15.4%)	9 (23.1%)	3 (7.7%)
Extraocular movements	2 (5.1%)	9 (23.1%)	9 (23.1%)	9 (23.1%)	10 (25.6%)
Interpretation of fluorescein staining	17 (43.6%)	10 (25.6%)	8 (20.5%)	2 (5.1%)	2 (5.1%)
Schiotz tonometry	27 (69.2%)	5 (12.8%)	5 (12.8%)	2 (5.1%)	0 (0.0%)
Direct ophthalmoscopy	7 (17.9%)	13 (33.3%)	11 (28.2%)	5 (12.8%)	3 (7.7%)

Table 5: Factors Associated with Medical Students' Comfort, Knowledge and Confidence in Ophthalmology Skills Comment on Significance

Parameters		Comfort in diagnosing		Knowledge		confidence in skills	
		OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
Gender	Male	Reference					
	Female	1.73 (0.25-12.10)	0.581	5.84 (0.40-85.66)	0.198	1.46 (0.18-11.98)	0.722
Education level	4th year	Reference					
	6th year	0.46 (0.03-6.89)	0.577	27.25 (0.17-4309.42)	0.201	0.61 (0.04-9.29)	0.721
How many hours would you have spent in self-directed learning in ophthalmology?	0 to 2	Reference					
	2 to 5	0.32 (0.02-5.34)	0.430	9.74 (0.30-317.12)	0.200	1.04 (0.08-13.83)	0.977
Which of the following teaching methods is a source for your learning of ophthalmology skills? Didactic	lectures	1.25 (0.13-11.66)	0.846	2.03 (0.10-39.81)	0.642	0.30 (0.02-3.90)	0.359
	Seminars	1.67 (0.19-14.35)	0.641	0.56 (0.02-14.18)	0.724	0.93 (0.08-10.53)	0.954
	Tutorials	0.78 (0.09-7.15)	0.830	0.21 (0.01-6.07)	0.360	0.91 (0.08-11.13)	0.944
	Clinic-based learning	1.15 (0.22-6.10)	0.866	15.24 (1.31-177.56)	0.030	0.89 (0.15-5.16)	0.892
	Constant	1.71 (0.00-0.00)	0.778	0.00 (0.00-0.00)	0.083	5.40 (0.00-0.00)	0.397

CI:1.31-177.56, p = 0.03). This indicated that students who were exposed to clinic-based learning were significantly more likely to report higher knowledge in ophthalmology, (Table 5).

DISCUSSION

This study assessed the self-reported knowledge, confidence, and learning experiences of medical students and junior residents in ophthalmology.

The results showed that visual acuity testing was among the most confidently performed skills, with 12 (30.8%) reporting comfort and 7 (17.9%) very comfortable. In align with other study conducted in India, their results showed that approximately 93% of the sample had adequate confident level [4]. These agreement between the studies from different may due the importance of this skill which involved not only in ophthalmology but also general medicine, neurology, and trauma care. Understanding the applications of visual acuity testing and the various testing methods is critical. The simplest way to assess distant visual acuity is to use a Snellen chart. Care should be made to ensure that the patient stands at the appropriate distance from the chart and that both eyes are tested simultaneously as well as individually [16, 17].

For ocular manifestations of systemic diseases, 18 (46.2%) rated their knowledge as average, while only 1 (2.6%) rated it as excellent. Regarding diabetic retinopathy, 16 (41.0%) rated their knowledge as good and 2 (5.1%) as

excellent. These findings are consistent with previous studies that have identified deficiencies in medical students' knowledge of diabetic retinopathy and related ocular conditions. For instance, a study conducted among Pakistani medical students and reported a poor score in identifying correct values of HbA1C and diabetic retinopathy screening [18]. Previous study in Saudi Arabia reported that despite that over 50% of medical students demonstrated satisfactory knowledge of diabetic retinopathy, still, a significant proportion of them exhibited poor knowledge, attitudes, and practice [19].

In this study, 56.4% of the participating students reported felling not at all comfortable diagnosing keratomalacia, and 43.6% reported that for acute iridocyclitis. On the other hand, higher comfort levels were reported for chalazion, with 38.5% reported feeling comfortable managing viral conjunctivitis and globe rupture. This suggests limited reported confidence among students , particularly in diagnosing complex or less common conditions.

Previous studies showed similar trends in medical students' comfort and confidence levels while diagnosing ocular diseases and conditions. Esparaz *et al.* assessed the preparedness of medical students to diagnose and manage common ocular conditions and found that students performed better on diagnostic questions than on management items, indicating a gap in comfort and competence in managing ocular conditions [20]. Al-Omari

et al. highlighted that while students had a good degree of competence in identifying conditions like sty and dacryocystitis was insufficient [21].

This study showed students who used clinic-based learning had higher odds of better knowledge in ophthalmologic condition compared those who didn't use. These findings align with previous research indicating that clinic – based learning enhances medical students' ophthalmic knowledge and skills. For instance, a study showed UR well Eye care program reported that students involved in clinic received comprehensive ophthalmic education, resulting in improved clinical exposure and skills [22].

Teaching students in small groups collaboratively is known as clinical-Based Learning. In the context of medical education, medical scenarios and are built on contextualized cases. In clinical-based-learning students expand their knowledge and collaborate as a group in multiple sessions [23-25].

The findings from this study may help as a catalyst for curriculum reform, inspiring medical schools and training programs to restructure the depth and delivery of ophthalmology education in their curriculum. However, larger scale studies are needed to confirm the study findings. Integrating more practical clinical training sessions and simulation-based learning might improve students' competence and confidence while delivering ophthalmic care.

This study has several strengths. The questionnaire covers many conditions and skills, giving a broad picture of perceived gaps. It attempts to connect teaching methods (lectures/clinic exposure) with student confidence. It provides local data that can help the institution reflect on teaching priorities. The study has several limitations, First, the use of a self-administered questionnaire may introduce response bias, as participants may overestimate or underestimate their true knowledge and confidence. Second, the study was limited to a single institution, convenience sampling, and small sample size, which may affect the generalizability of the findings to other medical schools or training settings. Additionally, the cross-sectional design captures a snapshot in time and doesn't assess changes in knowledge or confidence over the course of medical training. Furthermore, the cross-sectional design cannot prove that teaching method caused better confidence. The objective focuses on "comfort/confidence," which is a low-level outcome; educational need is better measured with competence (tests/OSCE). Furthermore, mixing students and residents makes the sample uneven and hard to interpret, because their training levels are different. The response rate cannot be estimated as the number of invited participants was not estimated. Using Likert scales for "comfort" is subjective and does not measure real diagnostic ability or procedural performance and can be interpreted differently by different students, reducing consistency. Therefore, the study findings should be interpreted carefully.

CONCLUSIONS

This study highlights significant deficiencies in ophthalmology knowledge and clinical confidence among

medical students and junior residents as pilots. Although basic ophthalmic concepts and skills are moderately understood, there remains a considerable gap in the diagnosis and management of more complex or less frequently encountered eye conditions. The results emphasize the urgent need to strengthen ophthalmology education within undergraduate and early postgraduate medical curricula, particularly through increased hands-on clinical exposure and interactive learning methods. However, larger scale studies are needed to confirm the study findings.

Clinical exposure that focuses on ocular crises and complicated situations should be incorporated into medical curricula to improve ophthalmic training. Additionally, it is important to incorporate interactive teaching approaches to help students learn, since this will improve missed diagnoses, referral quality, and patient safety.

Recruitment techniques could be improved in future research. Keep residents and students apart, or hire enough residents to conduct a thorough analysis. Unless the sample size permits multivariable models, substitute suitable basic analysis for regression. To verify true competency, include objective skill measurement (A exam, OSCE, or observed checklist).

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