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Original Article

Assessment of Clinical Skills and Knowledge in Ophthalmology in Undergraduate Medical Students

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Abstract

Objective: To evaluate the self-perceived competence and exposure of undergraduate medical students to clinical skills and theoretical knowledge in ophthalmology.

Methodology: A descriptive cross-sectional study was carried out at Fauji Foundation Hospital, Rawalpindi. A detailed online questionnaire was circulated amongst fourth-year medical students between October 2023 and February 2024 who had completed their end-of-year examination. We included in the analysis 189 out of 204 respondents who had fully completed the questionnaire. A validated, pilot-tested questionnaire with good internal consistency (Cronbach's alpha = 0.82) was used to collect data on demographics, ophthalmology training exposure, clinical skills competence, ability to recognize ocular emergencies, surgical observation, and research participation.

Results: A total of 189 students responded (mean age: 22.75 ± 0.84 years), two-thirds (66.7%) of which were female. Over 70% of students reported confidence in performing basic ophthalmic skills, including extraocular muscle function, visual acuity, pupillary examination, history taking, visual fields, and squint assessment. However, only 52.7% had hands-on exposure to direct ophthalmoscopy, and a mere 18% had participated in any ophthalmology-related research activities.

Conclusion: The findings highlight a limited and uneven exposure to essential ophthalmic skills among undergraduate students. Key deficiencies, particularly in direct ophthalmoscopy and research participation, highlight the need for structured curriculum enhancements to improve clinical preparedness in ophthalmology.

Keywords: Medical Profession, Ophthalmoscopy, Slit Lamp Examination.

Introduction

Ophthalmology is an important field of study for medical students, even if they do not plan to become practicing ophthalmologists. Understanding ophthalmology is necessary for providing comprehensive patient care, as eye health can impact overall well-being and determine quality of life.[1] Eyes are delicate organs, and many systemic diseases can manifest ocular symptoms which makes it all the more important for primary healthcare physicians. Whether it's diagnosing common conditions like refractive errors or more complex issues like glaucoma and diabetic retinopathy, a solid foundation in ophthalmology enhances a medical student's ability to and manage various health conditions.[2]

Despite the importance of ophthalmology, studies across the globe are reporting a decreasing trend vis a vis the teaching and learning of ophthalmological skills, decreasing length of clinical rotations in eye, and lack of undergraduate students' satisfaction, knowledge and confidence in handling eye diseases.[3] Ophthalmology is taught in most medical institutes in Pakistan in the 4th year of medical college, as per the guidelines of Pakistan Medical and Dental Council, through interactive lectures, teaching sessions in the eye ward and through observation in the operation theatre. At the start of the course, lectures on the anatomy and physiology of the eye are given, followed by lectures on different ocular diseases and their treatment. After that, the students are taught history taking for ocular conditions, vision testing (distant vision, near vision, and color vision), examining anterior segment using a torch, testing ocular movements, assessing intraocular pressure and fundus examination using a direct ophthalmoscope.[4] This teaching is followed by an end-of-rotation exam.

Assessment techniques employed by educators play an important role in the overall learning experience of students.[5] By using a variety of assessment methods, educators can comprehensively evaluate undergraduate students' skills and knowledge in clinical ophthalmology, ensuring they are well-prepared for further post-graduate training or professional practice in the field.[6,7] The assessment methods used at our medical college and indeed in most medical institutions in Pakistan include written examinations, assessment of clinical skills, and objective structured practical examinations (OSPE).[8] To address these issues, we conducted this study

to explore the current state of ophthalmology education within our local context, with the goal of identifying existing knowledge gaps and areas for improvement. As ophthalmology is both taught and assessed during the fourth year of medical school, fourth-year students were selected as the study population to ensure that findings would accurately reflect the outcomes of current teaching practices and assessment methods.

Methodology

Following institutional ethical review board permission (Ref No.893/RC/FFH/RWP), this cross-sectional investigation was carried out at the Fauji Foundation Hospital, Rawalpindi. Between October 2023 and February 2024, fourth-year medical students that had completed their end-of-year examination were administered a structured online questionnaire through convenience sampling.

The questionnaire was developed after a thorough review of existing literature on undergraduate ophthalmology education and was reviewed by three subject experts in ophthalmology and medical education to ensure content validity. A pilot test was conducted with a group of 20 fourth-year students (not included in the final sample) to assess clarity, relevance, and internal consistency of the questions. Based on their feedback, minor modifications were made to improve comprehension. The questionnaire was filled anonymously. The questionnaire included sections on students' exposure to ophthalmic clinical skills, confidence in performing key ophthalmology examinations, ability to diagnose and manage common ophthalmic conditions, recognition of ocular emergencies, surgical observation during clinical rotation, factors influencing learning experiences, and access to research opportunities in ophthalmology.

The students were explained the rationale of the study and were asked to sign a consent form to participate voluntarily, excluding those who did not consent. A total of 189 respondents who had fully completed the questionnaire were included in the final analysis, out of 204 total participants. This exceeded the recommended sample size of 165, which had been calculated based on a 95% confidence level, 7% absolute precision, and an expected response proportion of 70%.9 Statistical analysis was conducted using SPSS version 16, including calculations of means, standard deviations, and frequencies.

Results

Out of 189 responses, 126 (66.7%) were from female students and 63 (33.3%) from male students, with a mean age of 22.75 ± 0.84 years. Over 70% of students reported being taught extraocular muscle examination (160; 84.6%), visual acuity assessment (154; 81.4%), pupillary examination (146; 77.1%), history taking (140; 73.9%), visual field assessment (140; 73.9%), and squint assessment (134; 70.7%). In contrast, fewer students reported exposure to direct ophthalmoscopy (99; 52.7%) and slit-lamp examination (86; 45.5%). Figure. 1 summarizes these findings.

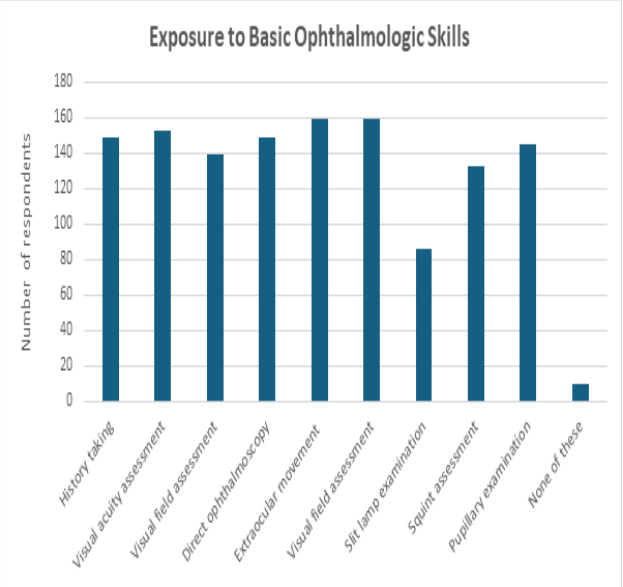

Figure 1: Self-reported exposure to clinical skills in ophthalmology. The x-axis shows different clinical skills; the y-axis shows the number of students and corresponding percentages.

When asked what made their learning experience beneficial, the majority of students (151, 79.9%) said they would rather be taught by a senior physician. Additionally, almost half of the respondents said that having enough clinical exposure had a good effect (103, 54.5%), followed by having enough instructional hours (92, 48.7%). Just 63 respondents (33.3%) said that having access to sufficient resources improved their learning. Conversely, the major causes of a poor learning experience were reported to be lack of resources (52, 28.1%) and insufficient clinical exposure (78, 42.2%) as the main causes of a poor learning experience.

We also inquired about students' self-assessment of their clinical skills in ophthalmology. A significant majority of students (149, 78.8%) expressed confidence in taking history related to eye problems, while an even larger number (164, 86.8%) felt confident in assessing visual acuity. Similarly, a substantial portion of students (140, 74.5%) reported confidence in examining the anterior segment of the eye using a torchlight, and 166 (88.3%) were confident in performing the swinging flashlight test to detect relative afferent pupillary defects. Additionally, 177 (93.7%) students felt confident in assessing extraocular movements, and 157 (83.1%) were confident in evaluating the visual field using the confrontation method. However, fewer than half of the students reported confidence in performing a fundus examination with a direct ophthalmoscope (91, 48.1%), and fluorescein corneal staining (76, 41.1%) while only a little more than half reported confidence in using digital tonometry to assess intraocular pressure (114, 60.6%).

Figure 2 lists the surgeries that the students observed. As anticipated, the majority of students (154; 81.5%) observed cataract surgery. In contrast, 30 students (15.9%) reported that they did not witness any surgeries during their clinical rotation.

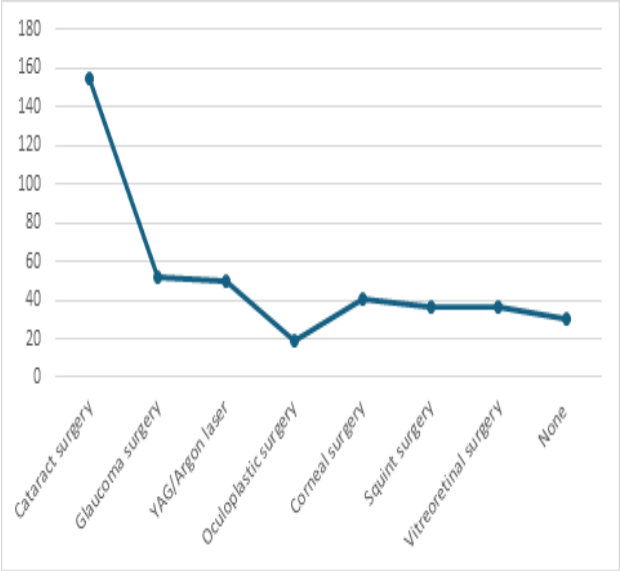

Figure 2: List of surgeries observed by students. The x-axis shows types of surgeries observed; the y-axis shows the percentage of students.

As shown in Figure. 3 below, students' self-reported ability to manage ocular conditions follows a similar trend to diagnosing them. We can see that the four conditions where there is a large gap between ability to diagnose and manage are cataract, glaucoma, pterygium and squint. Such a response is expected as these conditions require expert surgical intervention.

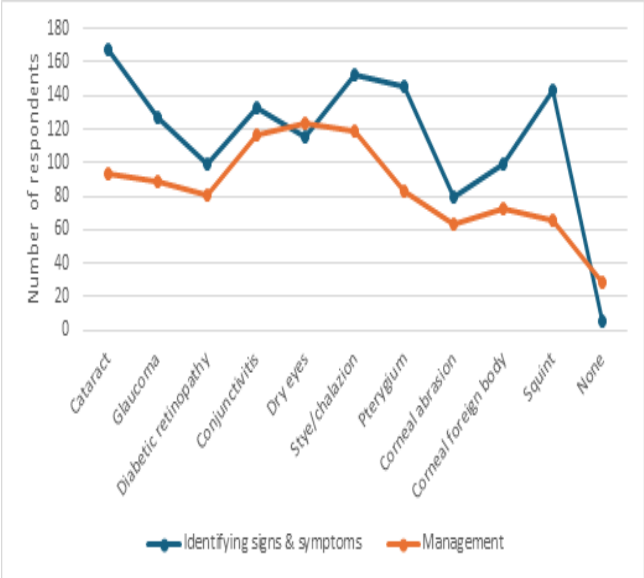

Figure 3: The x-axis shows common ophthalmic conditions; the y-axis shows the number of students and corresponding percentages reporting ability to diagnose or manage each condition.

As shown in Table 1, the respondents' self-reported ability to recognize the signs and symptoms various ocular emergencies. We can see from this table that between 40.7% (retinal detachment) and 63.5% (orbital cellulitis) of the respondents report confidence in being able to identify emergencies.

Table 1: Competency in recognizing ocular emergencies via signs and symptoms:

Ocular emergencies	Frequency (%)
Chemical injuries	99 (52.4)
Acute congestive glaucoma	105 (55.6)
Orbital cellulitis	120 (63.5)
Central retinal artey occlusion	88 (46.6)
Retinal detachment	77 (40.7)
Corneal ulcer	107 (56.6)
Hyphema	108 (57.1)
None	14 (7.4)

The pie-chart in Fig. 4 reveals that only 18% of the students surveyed reported access to research opportunities, indicating that perhaps this aspect of medical education needs to be addressed urgently.

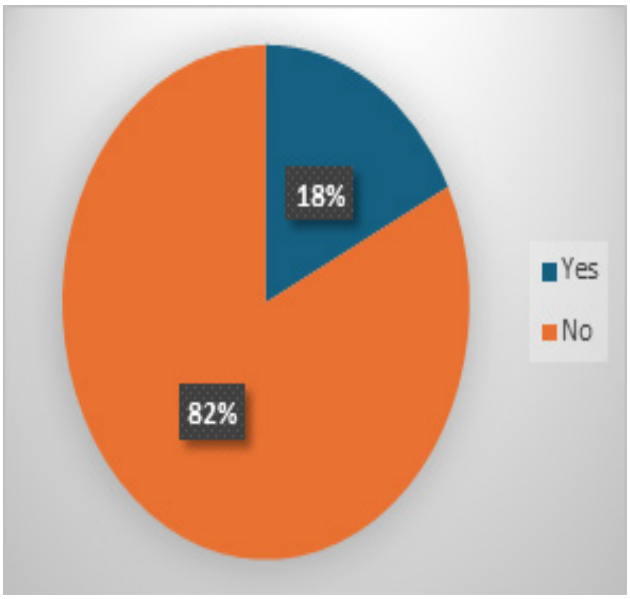

Figure 4: Student responses regarding access to research opportunities in ophthalmology.

Discussion

This study was conducted to evaluate the self-perceived competence and exposure of undergraduate fourth year medical students to clinical skills and theoretical knowledge in ophthalmology. We have been able to identify inadequate exposure to direct ophthalmoscopy which we think has tremendous diagnostic potential in the hands of a general medical practitioner. In addition, we have pieced together a picture of students' understanding (albeit self-reported) of clinical and surgical ophthalmological skills. Further, our data shows the potential for improvement in providing access to undergraduate research opportunities.

All medical professionals need a strong foundation in eye anatomy, physiology, common eye illnesses, and how to treat them, which is provided by undergraduate ophthalmology education. Knowing these fundamentals aids in the diagnosis and treatment of a variety of illnesses that may impact a patient's general health. Future family doctors and general practitioners are prepared to offer primary eye care through basic ophthalmology training.[9,10] In situations where access to specialized care is limited, this involves conducting eye exams, identifying prevalent eye issues, and administering preliminary or primary therapy. According to our research (Figure 1), students report a reasonable level of exposure to clinical skills in the areas of pupil examination (77.1%), visual acuity assessment (81.4%), and extraocular movement (84.6%).

On the other hand, exposure to direct ophthalmoscopy (52.7%) and slit lamp examination (45.5%) remains insufficient (Figure 1). This is concerning, given that direct ophthalmoscopy is a critical skill at the undergraduate level, as it enables medical practitioners to promptly identify and triage serious or life-threatening conditions. It is not uncommon for accident victims to arrive at primary healthcare units or emergency departments with limited or no access to a trained ophthalmologist. In such scenarios, it is essential that the attending physician is adequately trained in direct ophthalmoscopy. Unfortunately, many doctors are often unable to perform this medically vital procedure. Several studies have highlighted the declining proficiency of medical students in direct ophthalmoscopy, resulting in a lack of confidence and a demand for additional training in this area.[11-13] Some studies even suggest a growing tendency among medical educators to consider the teaching of direct ophthalmoscopy less feasible at the undergraduate level.[14] The primary reason cited is that such a delicate and complex skill cannot be fully mastered within the short clinical rotation period of 4-6 weeks.

Nevertheless, we feel that ophthalmologists must emphasize the importance of direct ophthalmoscopy more actively in medical education councils and work diligently to make it an essential component of undergraduate training.[15,16] As future medical practitioners, students will find this skill invaluable not only for managing their patients' eye health but also for accurately triaging many systemic diseases. To address this challenge, Bruner's theory of the spiral curriculum can be applied.[17] This approach suggests that a particularly challenging concept or skill should be introduced early in medical education with a simplified explanation for beginners. The same concept or skill should then be revisited and expanded upon in later years, allowing learners to gradually unravel and consolidate their understanding.

In our study, as many as 80% of students reported that they learned more effectively when taught by a senior ophthalmologist compared to a junior one. However, other studies suggest that while students perceive senior ophthalmologists as more knowledgeable, they also value the unique perspective offered by junior doctors. Junior doctors are often better at providing simplified, step-by-step guidance for practical skills, patient interaction, and offering more realistic advice regarding career choices and opportunities.[18]

Additionally, 42.2% of students felt that a lack of direct patient interaction and practical examination hindered their learning process. They believed that increased opportunities for student-patient interaction could enhance their learning experience. Whereas a majority of the students (81.5%) we surveyed did observe cataract surgery, 15.9% of them did not witness any surgeries while on clinical rotation (Figure 2). These findings are supported by a study by Yu et al, which highlighted that students desired more chances to directly examine patients, observe surgeries in operation theaters, and perform simple independent procedures to improve their skills.[19] Several studies suggest that a more skills-based teaching approach could address these concerns. For instance, Nema et al advocated for a Competency-Based Curriculum, which shifts the focus from theoretical knowledge acquisition to the practical application of skills.[20] It is expected that such changes will improve student learning outcomes as shown in Figure 3. Similarly, Liao et al supported the Cognitive Load Theory, emphasizing that teaching ophthalmic skills in conjunction with diseases from other medical disciplines can help solidify students' understanding of ophthalmology.[12] Some studies also recommend incorporating ophthalmology-related questions into Objective Structured Practical Examinations (OSPEs) at various difficulty levels and across different subjects.[12,21]

Students in our study identified several other factors that hindered their skill development. These included limited time for senior doctors to supervise their patient examination skills and insufficient feedback. They also noted that in large batches, it was challenging for a single trainer to monitor each student effectively. Additionally, students found it demoralizing when junior clinic staff displayed an unwelcoming attitude toward them. Furthermore, 28.1% of students cited a lack of resources for practicing clinical skills as another significant obstacle.

Addressing the challenges faced by undergraduate students in learning ophthalmology is crucial. Ophthalmologists in teaching institutions must make significant efforts to create a supportive and well-organized hospital environment for students. This includes developing feasible schedules for consultants to directly supervise students' ophthalmological skills, forming smaller student groups for more effective skills-based teaching, and advocating for the importance of basic ophthalmic skills in educational committees to maximize students' time in wards and operating theaters.[22] Also, providing realistic career counseling for students interested in pursuing ophthalmology at the postgraduate level is essential.[13]

What is also crucial is for medical professionals to encourage students to engage in research opportunities, a feature currently lacking as pointed out in our study (Figure 4).

In particular, we feel strongly that the survey indicates the medical curriculum in vogue does not adequately prepare students with the knowledge and skills to deal with ocular emergencies (Table 1). This is certainly suggested by the majority of our respondents who feel inadequately prepared to handle such situations. This is an area of improvement which should be focused on by medical practitioners and educators alike and deserves a specialized study to investigate the corrective measures needed.

With the growing advancements in artificial intelligence within the medical field, tools such as virtual electives, online dry labs, and virtual group discussions can serve as effective methods to bridge gaps in ophthalmology education and ensure equal attention for all students.[23,24] Equipping future generations of doctors with knowledge in ophthalmology will enable them to address eye-related public health issues more comprehensively, deliver basic care for common eye conditions, reduce the burden of preventable and irreversible blindness, and screen patients with systemic diseases that have ophthalmic manifestations.

Limitations

This study works with a small sample size and relies on self-reporting by the students which obviously introduces bias due to factors such as overconfidence, and perhaps not wanting to disappoint the teaching staff. Further, a larger multi-center study would be needed to see if the current findings scale to the national level.

Conclusion

This study highlights the declining emphasis on teaching basic ophthalmology to medical students. There is a clear need to strengthen ophthalmology education to ensure that future general practitioners are competent in providing primary eye care. The findings underscore significant gaps in exposure to key clinical skills, such as direct ophthalmoscopy, which only 52.7% of respondents reported having practiced. Strengthening core ophthalmic training during undergraduate education is essential for improving primary eye care delivery.

Recommendations

We recommend that medical curricula be revised to better integrate essential ophthalmic skills, particularly direct ophthalmoscopy, into mandatory clinical rotations. Additionally, greater emphasis should be placed on preparing students to recognize and manage ocular emergencies, an area that remains underexplored in current teaching frameworks. Future studies should specifically examine how the curriculum addresses the management of ocular emergencies to further guide targeted educational reforms.

Authors' Contributions: AR conceptualized the study, contributed to data collection, and was responsible for the write-up of the manuscript; MAH was responsible for data analysis and proofreading; NK contributed to data analysis; AA contributed to data collection, and approval of the final manuscript.

Conflict of Interest: None to declare

Funding disclosure: None to declare

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