ORIGINAL ARTICLE

Evaluation of Competence of Medical Students in Performing Direct Ophthalmoscopy

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ABSTRACT

Aim: The aim was to determine the competence of medical students in performing direct ophthalmoscopy. **Materials and Methods:** It was a cross-sectional study whereby year 5 medical students were assessed during Objective Structure Clinical Examination (OSCE) at the end of 4 weeks clinical rotation in ophthalmology. Every student had 5 min in each OSCE station, including the station for direct ophthalmoscopy. The correctness or otherwise of students' quantitative assessment of cup-disc ratio (CDR) was analyzed using Statistical Package of Social Sciences (SPSS, USA) version 20.0. **Result:** A total of 96 students were assessed in 6 groups over a 6 months period; age range was 20–33 years and a mean age of 24.8 ± 3.2. There were 57 males and 39 females (M:F = 1:0.25). Seventy-eight (81.3%) were satisfied with teachings and tutorials on direct ophthalmoscopy. Eighty-nine (92.7%) admitted visualizing the disc in the course of tutelage while 7 (7.3%) had never seen the disc with the direct ophthalmoscope. The retinal vessels were seen with the ophthalmoscope by 93 (96.9%). Direct Ophthalmoscopy was not considered to be difficult by 87(90.6%). Forty-six (47.9%) got CDR correct on the right eyes while 50 (52.1%) got it correct on the left eyes. There was statistically significant relationship between the group students belonged and performance with χ^2 = <0.001. **Conclusion:** Based on the CDR benchmark, students' performance was not satisfactory.

Keywords: Direct ophthalmoscopy, medical curricula, medical students, ophthalmic education

INTRODUCTION

Ophthalmoscopy whether direct or indirect forms an important part of clinical examination armamentarium. Like any other skill, it requires specific formal tutelage and continuous practice to gain proficiency.[1-5] The bane of ophthalmic medical education is the limited time allotted to ophthalmology in medical curricula all over the world.[6-8] In Nigeria, depending on the medical school, medical students rotate through ophthalmology between 2 and 4 weeks. This is grossly inadequate given the volume of basic ophthalmic knowledge the students are expected to acquire.

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The skill of direct ophthalmoscopy continues to be important in general medical settings. This makes it crucial for proper acquisition of ophthalmoscopic skill for the medical students who may not have future training exposure. Diseases of the posterior segments requiring ophthalmoscopy are common in young and old populations. In particular, Juvenile glaucoma and Stargardt's disease have a significant impact on quality of life. With increasing life expectancy, age-related clinically significant ocular pathology needing prompt referral to the ophthalmologist is expected to be on the rise. Quillen *et al*.[9] reported that 50% of an ageing population attended to in a general medical practice had significant eye problems. This demands that general practitioners and internists acquire prerequisite skills in ocular screening with the direct ophthalmoscope.

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Currently, there is no defined proficiency assessment for direct ophthalmoscopy as there is no way to verify what the student visualizes.[10] This creates a special challenge in the evaluation of student in the course of learning the skill. Two options are possible; a qualitative description of what in the fundus has been visualized, for instance characteristics of retinal blood vessels, and a quantification of the morphology of the disc in form of cup-disc ratio (CDR). Neither of these is free from observer's bias. To reduce the impacts of observer's bias, we set a CDR range within which a reasonable assertion could be made.

To the best of our knowledge, no Nigerian study has provided the insight into how much of direct ophthalmoscopic skill medical students acquire at the end of clinical rotations in ophthalmology. This study sets out to explore the impact of a 4 weeks exposure in direct ophthalmoscopy on year 5 medical students. It is hoped this will form a template for feature longitudinal studies directed at how much of the acquired skills are retained till graduation when such skills are most ultimately needed.

MATERIALS AND METHODS

We conducted an extensive literature search with Medline and Cochrane data library on relevant subjects, including psychology of learning.

Design

Cross-sectional study.

Participants

Year 5 medical students who rotated in six groups through ophthalmology department of a public medical school in Calabar.

Methods

An average of 15 students in each group rotated through ophthalmology department for 4 weeks during which they underwent a didactic lecture on direct ophthalmoscopy and tutelage in ocular examination skills including direct ophthalmoscopy. As part of initial practical steps in direct ophthalmoscopy, each student dilated the least preferred eye with tropicamide 1% for the purpose of examination by other students. The undilated eye of a student was used to view the dilated eye of another student. Students were guided until they visualized the fundus. They were exposed to subsequent practice of fundoscopy during clinic sessions, which ran from Mondays to Fridays. Each student was to do dilated fundoscopy on assigned patients after a clerkship with supervision of a resident doctor or a consultant ophthalmologist. No fundoscopy was done whenever a student was assigned to the theatre, which was once a week for medical students.

The mandatory 75% attendance, regular clinic sessions and exposure to clerkship ensured that all students had the opportunity to acquire the skills needed to carry out direct ophthalmoscopy.

Students were assessed during a 10-station, 5 min Objective Structure Clinical Examination (OSCE) at the end of 4 weeks clinical rotation in ophthalmology. Every student had 5 min in each OSCE station, including the station for direct ophthalmoscopy.

Data collection

A structured self-administered question was filled by each student on the morning of the OSCE examination. The information contained in the questionnaire included demography and questions designed to meet study's objectives. Filled questionnaires were submitted before the examination.

Outcome measured

The CDR was the main outcome measured. CDR of patients for the study for the examination was determined by two ophthalmologists, and a consensus value was then reached. A cut-off was set two points above and below the consensus value (consensus CDR ± 2). Students with CDR within this range were scored right while those outside this range were marked wrong. For example, a consensus CDR of 0.7 has a range of 0.5–0.9; any value within this range was scored as correct, and value outside this range was scored as incorrect. Different patients were used by different batches of rotating students. However, the same patient was used by all the students in the same batch. Patients for fundoscopy were selected such that their discs morphology was not ambiguous, and ocular media was clear to the students.

Data analysis

Dependent and independent variables were coded and entered into Statistical Package for Social Sciences (IBM SPSS inc., USA) version 20.0. Univariate and bivariate analyses were done with same statistical software. Relevant findings were tabulated in the frequency table, bar chart and pie chart. $P \leq 0.05$ was considered significant.

Consent

Only students who consented and granted written and verbal permission were recruited. They were not coerced, and neither was performance in the examination linked with granting consent.

Inclusion criteria

Must be a year 5 medical students of the school who met 75% statutory attendance requirement for the exam

Exclusion criteria

Medical students who failed to meet 75% attendance as stipulated by the University authorities.

RESULT

A total of 96 students were assessed in 6 groups over a 6 months period; age range was 20–33 years [Table 1] and a mean age of 24.8 ± 3.2. There were 57 males and 39 females (M: F = 1:0.25). Seventy-eight (81.3%) were satisfied with teachings and tutorials on direct ophthalmoscopy while 18 (18.7%) were not satisfied. Eighty-nine (92.7%) admitted visualizing the disc in the course of tutelage while 7 (7.3%) had never seen the disc with the direct ophthalmoscope. The retinal vessels were seen ophthalmoscopically by 93 (96.9%). Direct ophthalmoscopy was not considered difficult by 87 (90.6%). Forty-six (47.9%) got CDR correct on the right eye while 50 (52.1%) got it correct on the left eye. There was inter-group variation with regards to whether students failed or passed the CDR benchmark with χ^2 = <0.001. The most common challenge by the students was inability to estimate the CDR [Figure 1], and they suggested that more ophthalmoscopes should be available [Figure 2].

DISCUSSION

Before comparing our results with closely related research, the limitations of this kind of study should be put in the right perspective for clarity. Nonstandardization of research protocols on direct ophthalmoscopy creates a barrier for point-to-point comparisons and generalizations to a different population.

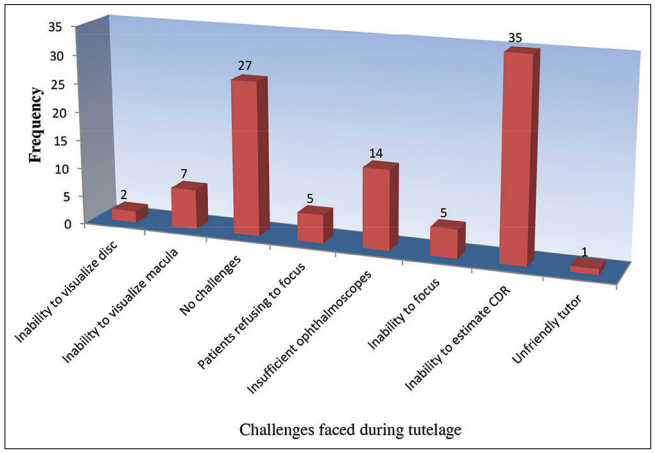

Figure 1: Challenges faced during tutelage

Secondly, skill acquisition can be difficult to determine as there are yet no parameters or gauge to do so. Over the years interpretation of learning has relied heavily on behaviorists' and cognitivists' approaches. The former, the associationists, typified by Russian psychologist, Ivan Petrovich Pavlov, believed that knowledge is said to be acquired if a change in behavior occurs.[11] The latter, the Gestalt school, represented by Jerome Seymour Bruner, would not agree with this line of physical or outward attitudinal change but say one has learnt when there is a change in cognitive structure, which is not visible to anyone.[12] Therefore, the school of thought would influence substantially how learning is appreciated and interpreted.

Thirdly, tutors/instructors can be broadly classified into X and Y based on Douglas McGregor's theory.[13] The X instructor is pessimistic that students are not ready to learn and must be threatened with punishment while the Y instructor believes students are motivated to learn willingly without close supervision. The orientation of the ophthalmologist/instructor, therefore, has a significant bearing on how skills are thoughts and knowledge acquired.

Lastly, in a bid to make the study objective, we set a CDR range, which may have increased false positive results. It is believed that this technique ensured those

Table 1: Age distribution

Age	Frequency (%)
20.00	5 (5.2)
21.00	7 (7.3)
22.00	18 (18.8)
23.00	14 (14.6)
24.00	9 (9.4)
25.00	5 (5.2)
26.00	5 (5.2)
27.00	11 (11.5)
28.00	7 (7.3)
29.00	7 (7.3)
30.00	3 (3.1)
31.00	3 (3.1)
32.00	1 (1.0)
33.00	1 (1.0)
Total	96 (100.0)

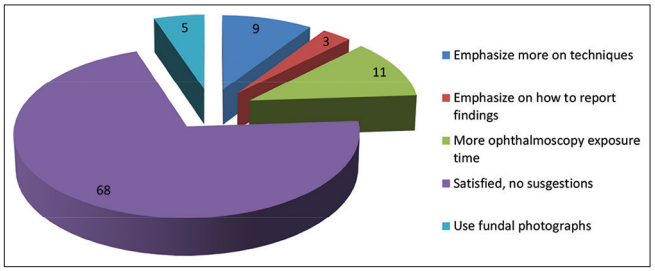

Figure 2: Suggestions by students for improvement

that were right were not scored wrong, although a little percentage who guessed may have been inadvertently scored right.

With these confounding drawbacks in sight, we now discuss our findings. Direct ophthalmoscopy skills cannot be acquired through didactic means alone but also requires "hands-on" direct experience. Once in practice, time constraints often reduce the incentive to do complete physical examination, and, as a result, ocular examination is frequently neglected.[2] This is particularly unfortunate with increasing prevalence of glaucoma, diabetic retinopathy and age-related maculopathy, which can be detected early with widely available affordable direct ophthalmoscopes. Ophthalmologists can enhance referral behavior by emphasizing to medical students that blindness prevention is co-operative endeavor in which all physicians can play a collaborative role.[14] One way of doing this is to ensure that direct ophthalmoscopy skills are taught in such a way that students become proficient and confident enough that they will incorporate these into their future practice.

The overall pass rate among our students, using the preset CDR range as benchmark was 47.9% (46 students) and 52.1% (50 students) on the right and left eyes, respectively. This was less than satisfactory and may have reflected self-reported challenges faced in CDR estimation by 36.5% (35 students) of the students. There was inter-group variation in the numbers that passed or failed the benchmark with χ^2 = <0.001. This may be linked with lack of specific protocols that ensure each group had the same training exposure.

In this study, 78 (81.3%) was satisfied with teachings and tutorials on direct ophthalmoscopy. Shuttleworth and Marsh[15] had reported 22% (29/130) satisfaction by respondents to undergraduate ophthalmic medical education.[15] Eighty-nine (92.7%) of our students admitted visualizing the disc in the course of tutelage while 7 (7.3%) had never seen the disc with the direct ophthalmoscope. The retinal vessels were seen ophthalmoscopically by 93 (96.9%) but not by remaining 3 (3.1%). Lippa *et al*.[7] in a longitudinal study among medical students on the same subject reported that 72% to 82% were able to visualize various parts of the fundus and 59% felt comfortable visualizing some aspect of the fundus, which increased to 76% after further fundoscopic training in year 4. The differences in these studies may have been occasioned by the study design, the primary outcome measured, different settings and reliance on unverifiable self-reported assessments. However, it brings to the fore that further training in senior classes may be necessary to enhance confidence and efficiency.

Some of our students 9 (9.4%) wanted the basic technique of ophthalmoscopy to be emphasized repeatedly. This has been established by Dornan *et al*.[16] that guidance and support was a better teaching option than self-direction. Direct ophthalmoscopy was not considered difficult by 87 (90.6%). The most common challenge by the students was inability to estimate the CDR with the suggestion that more ophthalmoscopes should be available for enough hands-on training. McNaught and Pearson[17] observed that owners of direct ophthalmoscopes performed ophthalmoscopy more frequently than non-owners, but the difference did not reach statistical significance. However, a study[15] noted that students felt confident using dilating drops ($P < 0.002$, χ^2 yates corrected).

CONCLUSION

The outcome of this study provided additional data to facilitate curriculum design in teaching ophthalmoscopy to undergraduate medical students in Nigeria. It is recommended that medical students should be given specific teaching protocol and those with difficulty should be identified for additional teaching sessions. Furthermore, students with difficulty visualizing the fundus can continue fundoscopy on dilated eyes until they become confident. Lastly, a few weeks posting in ophthalmology during internship are an avenue that can be explored to refresh undergraduate clinical skills.

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