

# Variability of ophthalmology residents' perception toward different major training programs in Saudi Arabia

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## Abstract

**PURPOSE:** The constant demand for ophthalmologists has nationally resulted in creating more programs in different regions of the kingdom. We have previously reported the overall residents' satisfaction with the current local ophthalmology curriculum and the competency of the ophthalmic training (clinical and surgical) in our local programs in Saudi Arabia compared to international standards. In this study, we aim at comparing the major local training programs and analyze the differences among them aiming at improving our training.

**METHODS:** This is a cross-sectional study using a questionnaire that was completed by residents and graduates of the local ophthalmology programs in Riyadh, Eastern and Western regions. A closed-ended questionnaire was validated and circulated online and a hard copy was distributed to residents and recently graduated ophthalmologists (2009-2015). Data were categorized by demographic variables, and basic statistics were done. The study has been approved by the Institutional Review Board (IRB) and Human Ethics Committee (HEC) of King Saud University.

**RESULTS:** Of the 200 individuals surveyed, 175 (87.5%) completed their responses. The average age was 29.6 years (range: 24-39) with 67.5% males and 32.5% females. The overall satisfaction among senior residents and graduates showed a statistically significant higher result among graduates in Riyadh area ( $P < 0.001$ ). Satisfaction of senior residents with the program director's support was higher in the Eastern region ( $P < 0.001$ ). Clinic-based training was generally satisfactory. Refractive surgery was reported to be significantly insufficient in 70.6% ( $P = 0.003$ ). Most of the graduates in Riyadh area achieved the surgical requirements for training compared to other regions.

**CONCLUSION:** Saudi postgraduate ophthalmology training programs show a variable level of satisfaction among senior residents and graduates. Better surgical exposure has been observed in Riyadh region, however reassessment of the current curriculum and the parameters for training are needed to fulfill the requirements with special attention to the surgical training in all programs.

### Keywords:

Curriculum, graduates, ophthalmology, postgraduate, program, residents, surgery, training

## INTRODUCTION

Ophthalmology Residency Program in Saudi Arabia (SA) is a well-recognized program that has been participating in the graduation of competent ophthalmologists. The residency programs started in Dammam (Eastern region) in 1983 and in Riyadh in 1984. Other programs were established in Jeddah, Makkah, and more recently in Almadinah (Western region) and Assir.

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The establishment of Saudi Ophthalmology Residency Program was based on a local survey that underscored two facts: first, the serious magnitude of ocular diseases and visual loss, and second, the paucity and lack of Saudi labor in ophthalmology. Consequently, new programs were initiated in Almadinah and Assir. Furthermore, the program in Riyadh was later divided into three individual programs with an increased capacity. Saudi Ophthalmology Residency Programs have been systematically evaluated according to international standards.<sup>[1]</sup>

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In the present study, we evaluate and compare the variability among Saudi ophthalmology residency major training programs in achieving the defined objectives and the proficiency of such programs in preparing residents for the actual clinical practice.

### METHODS

A cross-sectional study using a validated questionnaire completed by residents and graduates of all national ophthalmology programs was conducted. The study was approved by the Institutional Review Board and Human Ethics Committee at King Saud University prior to the distribution of the questionnaire. Data collection commenced from February till December 2016 using a closed-ended questionnaire which was divided into two main parts: demographics and review of residency programs satisfaction. The questionnaire was validated and distributed by E-mails as well as hard copies to current residents during the scientific committee visits. Participants were divided for easy comparison as follows: junior residents (postgraduates 1<sup>st</sup> and 2<sup>nd</sup> years: R1 and R2), senior residents (postgraduates 3<sup>rd</sup> and 4<sup>th</sup> years: R3 and R4), and recently graduated ophthalmologists (2009–2015). Data were collected and stored in a spreadsheet using Microsoft Excel 2010® software. Data management and coding were then done in Excel sheet. Data were analyzed using SPSS® version 20.0 (IBM Inc., Chicago, Illinois, USA).

Descriptive analysis was done where categorical variables were presented in the form of frequencies and percentages while continuous variables in the form of mean ( $\pm$  Standard Deviation). Chi-square test was used to test the differences between the residency group levels and regions with the study programs.  $P < 0.05$  was interpreted as an indicator of statistical significance.

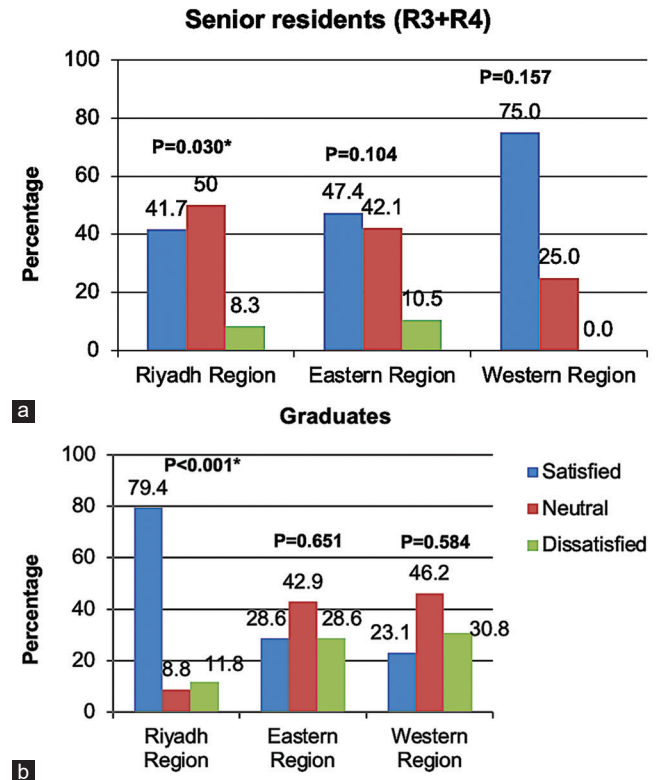
### RESULTS

We initially surveyed 200 individuals, including 121 (60.5%) current senior and junior residents and 79 (39.5%) graduates within the previous 6 years (2009–2015). The average age was 29.6 years (range: 24–39) with 135 (67.5%) males and 65 (32.5%) females [Table 1]. Only 175 (87.5%) completed their responses and were distributed according to the main four regions in SA (Riyadh = Central, Eastern, Western, and Southern = Assir). Respondents were grouped into three categories according to their level (junior, senior, and graduates), as demonstrated in Table 2.

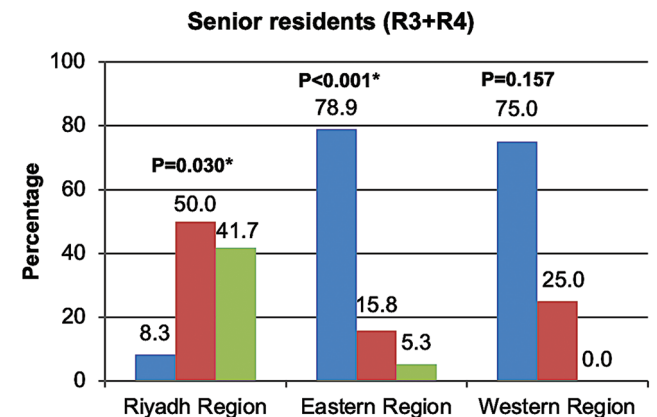
In the second part of our survey, we focused on three main regions to have better reflection of the actual assessment of programs based on the longer period of educational exposure and excluded the newly introduced Assir program from further analysis (because of its low numbers of residents) and focused on senior residents and/or graduates since residents in both groups have spent enough time in their respective programs for better judgment.

The overall level of satisfaction with the competency of the residency program and the program director's support was

best evaluated among senior residents and graduates and was graded as satisfied, neutral, or not satisfied, as in Figure 1. Majority of senior residents were satisfied or neutral in Riyadh, Eastern, and Western programs compared to the dissatisfied group in each region with a statistically significant result in Riyadh region ( $P = 0.030$ ). Again, among graduates, Riyadh region had a higher overall level of satisfaction (79.4%) than Eastern and Western regions (28.6% and 23.1%, respectively) with statistically significant  $P < 0.001$ . Questioning the level of satisfaction in each region separately has shown that in Riyadh region separately, graduates appeared more satisfied than senior



**Figure 1:** Overall level of satisfaction among senior residents (a) and among graduates (b) in each region



**Figure 2:** Level of satisfaction with program director support among different regions

residents with 27/36 (75%) and 10/25 (40%), respectively, which was statistically significant ( $P = 0.005$ ). Comparing the satisfaction rate between Riyadh, Eastern, and Western regions among senior residents only, the difference was not found to be statistically different. However, among the graduates, Riyadh region had the highest level of satisfaction (75% compared to 16.7% and 8.3%, respectively), which was statistically significant ( $P \leq 0.001$ ).

Regarding the satisfaction with the program director's support, we evaluated this only among senior residents due to the fact that these residents would have spent at least 3 years with their director and were still under his/her supervision at the time of the survey [Figure 2]. Most senior residents in Riyadh

**Table 1: Demographics of the total participants to whom the questionnaire was sent ( $n=200$ )**

Characteristic	<i>n</i> (%)
1. Age (years), mean±SD (range)	29.6±3.6 (24-39)
2. Gender	
Male	135 (67.5)
Female	65 (32.5)
3. Marital status	
Single	82 (41.0)
Married	114 (57.0)
Divorced	4 (2.0)

SD: Standard deviation

**Table 2: Distribution of respondents who completed the survey by region and current level categories ( $n=175$ )**

Region	Current level			Total
	Junior resident, <i>n</i> (%)	Senior resident, <i>n</i> (%)	Graduates, <i>n</i> (%)	
Riyadh region	29 (33.3)	24 (27.6)	34 (39.1)	87
Eastern region	13 (24.5)	19 (35.8)	21 (39.6)	53
Western region	9 (30.0)	8 (26.7)	13 (43.3)	30
Southern region	4 (80.0)	1 (20.0)	0 (0.0)	5
Total	55	52	68	175

**Table 3: Level of satisfaction with curriculum and rotation distribution**

Current level	Category	Region			<i>P</i>
		Riyadh region ( $n=58$ ), <i>n</i> (%)	Eastern region ( $n=40$ ), <i>n</i> (%)	Western region ( $n=21$ ), <i>n</i> (%)	
Curriculum					
Senior residents (R3 + R4) ( $n=51$ )	Satisfied	21 (87.5)	13 (68.4)	8 (100)	0.096
	Dissatisfied	3 (12.5)	6 (31.6)	0	
	<i>P</i>	<0.001*	0.025*	-	
Graduates (2009-2015) ( $n=68$ )	Satisfied	34 (100)	18 (85.7)	7 (53.8)	<0.001*
	Dissatisfied	0	3 (14.3)	6 (46.2)	
	<i>P</i>	-	<0.001*	0.704	
Rotation distribution					
Senior residents (R3 + R4) ( $n=51$ )	Satisfied	12 (50.0)	16 (84.2)	8 (100)	0.007*
	Dissatisfied	12 (50.0)	3 (15.8)	0 (0.0)	
	<i>P</i>	0.998	<0.001*	-	
Graduates (2009-2015) ( $n=68$ )	Satisfied	28 (82.4)	18 (85.7)	7 (53.8)	0.064
	Dissatisfied	6 (17.6)	3 (14.3)	6 (46.2)	
	<i>P</i>	<0.001*	<0.001*	0.704	

\*Statistically significant at 5% level of significance

area were either neutral (50%) or dissatisfied (41.7%) with statistically significant result ( $P = 0.030$ ), while most senior residents were satisfied with their program director's support in the Eastern region in about 79%. This was further shown when the level of satisfaction was compared between regions. The highest level of satisfaction in the Eastern region was shown to be statistically significant when compared to other regions ( $P \leq 0.001$ ).

We evaluated participants' level of satisfaction with the curriculum, the rotation distribution, clinic-based training, and research experience. Regarding the first two variables [Table 3], there was an overall good level of satisfaction with curriculum among senior residents across all regions, however, among graduates, the level of satisfaction in Riyadh and Eastern regions was better with a statistically significant *P* value ( $P < 0.001$ ). Regarding the rotation distribution, the level of satisfaction was consistently better among each of the two groups of senior residents and graduates in the Eastern region ( $P < 0.001$ ).

Clinic-based training was assessed (as being sufficient or not) for the following subspecialties: oculoplastic (OC), neuro-ophthalmology (NO), refractive surgery (RS), uveitis, and optics/refraction among respondents of senior residents in the three main regions [Table 4]. In Riyadh region, all except NO and RS training were found satisfactory in general (with significant *P* values for OC and uveitis:  $P = 0.014$  and  $P < 0.001$ , respectively). For NO, the satisfaction was 50%, and for RS, the majority felt that training was insufficient (71% with  $P = 0.041$ ). In the Eastern region, residents (79%) felt that they had had sufficient training in NO ( $P = 0.012$ ), while insufficient training was recorded in RS (similar to Riyadh region) and optics. The numbers for the Western region were relatively small and were not very conclusive. However, when all residents in the three regions were added together ( $n = 51$ ), sufficient training was apparent in OC and uveitis in 74.5% and 72.5% (with  $P < 0.001$  and  $P = 0.00$ ),

**Table 4: Deficiency in the clinic-based training among senior residents (R3 + R4) (n=51) in the 3 regions**

Subspecialty	Category	Region			Total (n=51), n (%)
		Riyadh region (n=24), n (%)	Eastern region (n=19), n (%)	Western region (n=8), n (%)	
OC	Sufficient	18 (75.0)	16 (84.2)	4 (50.0)	38 (74.5)
	Insufficient	6 (25.0)	3 (15.8)	4 (50.0)	13 (25.5)
	<i>P</i>	0.014*	0.003*	0.998	<0.001*
NO	Sufficient	12 (50.0)	15 (78.9)	2 (25.0)	29 (56.9)
	Insufficient	12 (50.0)	4 (21.1)	6 (75.0)	22 (43.1)
	<i>P</i>	0.998	0.012*	0.157	0.327
RS	Sufficient	7 (29.2)	8 (42.1)	0 (0.0)	15 (29.4)
	Insufficient	17 (70.8)	11 (57.9)	8 (100)	36 (70.6)
	<i>P</i>	0.041*	0.491	-	0.003*
Uveitis	Sufficient	21 (87.5)	12 (63.1)	4 (50.0)	37 (72.5)
	Insufficient	3 (12.5)	7 (36.8)	4 (50.0)	14 (27.5)
	<i>P</i>	<0.001*	0.251	0.998	0.001*
Optics/refraction	Sufficient	8 (33.4)	6 (31.6)	4 (50.0)	18 (35.3)
	Insufficient	16 (66.7)	13 (68.4)	4 (50.0)	33 (64.7)
	<i>P</i>	0.102	0.108	0.998	0.036*

\*Statistically significant at 5% level of significance. OC: Oculoplastic, NO: Neuro-ophthalmology, RS: Refractive surgery

**Table 5: Undertaking research during residency program in the three regions**

Current level	Category	Region			Total (n=119), n (%)	<i>P</i>
		Riyadh region (n=58), n (%)	Eastern region (n=40), n (%)	Western region (n=21), n (%)		
Senior residents (R3 + R4) (n=51)	Yes	24 (100)	19 (100)	5 (62.5)	48 (94.1)	<0.001*
	No	0	0	3 (37.5)	3 (5.9)	
	<i>P</i>	-	-	0.480	<0.001*	
Graduates (2009-2015) (n=68)	Yes	34 (100)	21 (100)	5 (38.5)	60 (88.2)	<0.001*
	No	0	0	8 (61.5)	8 (11.8)	
	<i>P</i>	-	-	0.405	<0.001*	

\*Statistically significant at 5% level of significance

**Table 6: Surgical experience upon the completion of residency program for cataract surgery (phacoemulsification and extracapsular cataract extraction) among graduates (2009-2015) (n=68)**

Procedure	Category	Region			Total (n=68), n (%)	<i>P</i>
		Riyadh region (n=34), n (%)	Eastern region (n=21), n (%)	Western region (n=13), n (%)		
Phacoemulsification	Meeting the requirement	17 (50.0)	8 (38.1)	3 (23.1)	40 (58.8)	0.231
	Below the requirement	17 (50.0)	13 (61.9)	10 (76.9)	28 (41.2)	
	<i>P</i>	0.998	0.275	0.052	0.146	
ECCE	Meeting the requirement	24 (70.6)	7 (33.3)	5 (38.5)	32 (47.1)	0.014*
	Below the requirement	10 (29.4)	14 (66.7)	8 (61.5)	36 (52.9)	
	<i>P</i>	0.016*	0.127	0.405	0.628	

\*Statistically significant at 5% level of significance, ECCE: Extracapsular cataract extraction

respectively, and to some extent in optics and refraction in 65% ( $P = 0.036$ ). The result was almost reversed for RS training, which was reported to be insufficient in 70.6% and was statistically significant ( $P = 0.003$ ).

Research during residency [Table 5] appeared to be well enforced among senior residents in all three regions: Riyadh, Eastern, and Western programs with (100%, 100%, and 62.5%, respectively) with statistically significant value  $P < 0.001$  for all senior residents combined. However, among graduates, even though the overall result among them combined was similarly satisfactory ( $P < 0.001$ ), the values were reversed in the Western region and majority of graduates did not conduct research (61.5%).

To evaluate the surgical exposure and training as a reflection of anterior segment training, it was best assessed among the graduates of the three regions based on whether the surgical experience was meeting the requirements of the curriculum or not [Table 6]. The surgical requirement upon the completion of residency program for phacoemulsification was minimum 80 cases as a main surgeon. Half the graduates met this requirement upon graduation in Riyadh (50%), while the majority in other regions were not able to meet the requirements in the Eastern and Western regions (about 62% and 77%, respectively). The surgical requirement for extracapsular cataract extraction (ECCE) was minimum 15 cases as a main surgeon. Most of the graduates in Riyadh

achieved this requirement in 70.6% compared to Eastern and Western regions (33.3% and 38.5%, respectively), which was statistically significant when the regions were compared ( $P = 0.014$ ). The combined result for all graduates ( $n = 68$ ) in all regions for surgical requirements being met was found better for phacoemulsification in about 59% compared to ECCE in 47%.

## DISCUSSION

It is essential for countries to aim at a continuous process for the improvement of its postgraduate programs. Zhou *et al.* in Canada in 2009 assessed residents' satisfaction with their training in relation to international standards concluding the high standards of their ophthalmology training.<sup>[2]</sup> In the present study, we similarly evaluated residents' self-reported satisfaction in an attempt to explore the variation between our different local programs and to try and analyze some of the important training issues such as achieving surgical competency in order to identify any potential area(s) of deficiency in specific current Saudi program(s). We had full response from 87.5% of our residents and graduates who were included. The mean age was 29.6 years and the male-to-female ratio was approximately 2:1. We have observed an overall satisfaction with the main training programs in all three regions (Riyadh, Eastern, and Western) among senior residents and graduates (2009–2015), which was more evident in Riyadh area. However, we also observed that the level of satisfaction in that area was significantly higher among graduates compared to senior residents, which might be alarming and necessitates careful observation of the training quality in the following years (2015 onward). Interestingly, senior residents in Riyadh area were mostly either dissatisfied or were neutral regarding their program director's support, which is another alarming temporary issue. The highest level of satisfaction with the program director's support was significantly observed in the Eastern region compared to other regions and the same observation applied to rotation distribution ( $P \leq 0.001$ ). Furthermore, there were overall good levels of satisfaction with curriculum among senior residents, however, among graduates, the level of satisfaction was significantly better in Riyadh and Eastern regions ( $P < 0.001$ ).

Regarding the clinic-based training, there were some variations among programs in the three regions, which was expected because of variation in number of staffs in each subspecialty and other factors such as facilities, referrals, and load of patients. However, when this was studied among all 51 senior residents in the 3 regions, sufficient training was apparent in OC and uveitis in 74.5% and 72.5% (with  $P < 0.001$  and  $P = 0.00$ ), respectively, and to some extent in optics and refraction in 65% ( $P = 0.036$ ). The area of clinical training that proved to be deficient was RS training, which was reported to be significantly insufficient in 70.6% ( $P = 0.003$ ).

Similarly, the respondents in the residency programs in Canada reported insufficient exposure to optics/refraction (65%),

neuro-ophthalmology (45%), extracapsular cataract extraction (72.5%), and refractive surgery (72.5%).<sup>[2]</sup> McDonnell *et al.* also reported inadequate training in clinical and refractive surgical areas in residency programs in the United States.<sup>[3]</sup> In the Jordanian program, respondents reported insufficient exposure to optics/refraction (55.7%) and 75.4% of responders never did a single phacoemulsification during residency and 14.8% had training in refractive surgery.<sup>[4]</sup> RS is a relatively new and constantly changing field; it is perhaps not surprising that many programs have not started yet to develop and incorporate comprehensive training in refractive surgery in their curricula. In addition, most refractive surgical procedures occur in private settings, and this makes residents' access to learning difficult as we have generally stated before.<sup>[1]</sup> It is important for residency programs to update their curriculum to ensure that residents obtain adequate exposure to this increasingly popular area, possibly by improving residents' participation in such procedure in governmental setting or partnering with private clinics that perform refractive surgery. Indeed, in both comprehensive and subspecialty practicing, ophthalmologists found in their surveys that anterior segment knowledge and skills, including refractive surgery, were very important skills for residents to obtain.<sup>[5,6]</sup>

Research during residency was well enforced among senior residents in all three regions, however, among graduates, there was statistically significant deficiency regarding undertaking actual research in the 61.5% of graduates in the Western region.

Surgical exposure to most ophthalmic surgeries seemed to be unsatisfactory in all three regions' programs among graduates reflected in the number of cataract surgical procedures performed upon completion of their training. Half the graduates met the minimum number of 80 phacoemulsification (outlined by SCFHS) requirements upon graduation in Riyadh (50%), while the majority in other regions (Eastern and Western) were not even able to meet the requirements (about 62% and 77%, respectively). This inadequacy in surgical exposure during the years of residency training may compromise a major feeling of surgical incompetency in the future career of ophthalmology graduates.<sup>[1,7]</sup> Alfawaz has suggested useful technical and intellectual guidelines for trainees, teaching staff, and administrators to improve the surgical exposure in ophthalmology training programs.<sup>[8]</sup> The surgical requirement for ECCE, which was a minimum of 15 cases as a main surgeon, was achieved by most of the graduates (70.6%) only in Riyadh region program but not in the Eastern and Western regions. Another interesting observation was that meeting the surgical requirements by all graduates combined ( $n = 68$ ) in all regions was better for phacoemulsification in about 59% compared to ECCE in 47%. The surgical rates for this procedure have fallen in concern with the popularity and perfection of phacoemulsification techniques. Despite this, it is important for residents to obtain training in extracapsular cataract extraction since it is a procedure of last resort and it remains the only option for cataract removal in settings without phacoemulsification technology or for very dense lenses.<sup>[5,9,10]</sup>

At the time of writing this manuscript, the current situation in our programs has improved dramatically with implementation of surgical courses, outreach programs, and wet laboratory training using simulators as a part of the surgical skills training. Virtual simulation systems have been reported to help residents develop a baseline level of visual-spatial and fine motor skills before beginning their formal operative training experiences.<sup>[11-15]</sup>

The limitations of this study were the potential source of bias as the data represent self-reported evaluations by residents and the variation in the numbers of residents in each region. Furthermore, the survey includes large number of residents and graduates which represent over a relatively long duration with possible changes at the level of program directors and variability in the number of faculty in each program.

## CONCLUSION

Saudi postgraduate ophthalmology training programs retain a variable level of satisfaction among senior residents and graduates, which reflects an overall good level of achieving the key ophthalmology training competencies. Variation among regions has been observed with self-explanatory evidence of better surgical exposure in Riyadh region. Reassessment of the current new curriculum can later improve the educational experience of residents and can ensure that new graduates attain confidence in the clinical and surgical skills required to function as effective and modern-day ophthalmologists.

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## Conflicts of interest

There are no conflicts of interest.

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