

# Vision Screening of Ophthalmic Nursing Staff in a Tertiary Eye Care Hospital Outcomes and ocular healthcare-seeking behaviours

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## تَحْرِيّ الإبصار عند ممرضات وممرضين قسم العيون في مستشفى رعاية ثالثة النتائج والسلوكيات الساعية للحصول على رعاية صحية للعيون

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**ABSTRACT: Objectives:** This study aimed to evaluate ocular healthcare-seeking behaviours and vision screening outcomes of nursing staff at a tertiary eye care hospital. **Methods:** This study was conducted between April and September 2016 among all 500 nurses employed at the King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia. Data were collected on age, gender, use of visual aids, the presence of diabetes, a history of refractive surgery and date of last ocular health check-up. Participants were tested using a handheld Spot™ Vision Screener (Welch Allyn Inc., Skaneateles Falls, New York, USA). **Results:** A total of 150 nurses participated in the study (response rate: 30.0%). The mean age was 41.2 ± 8.9 years old. Distance spectacles, reading spectacles and both types of spectacles were used by 37 (24.7%), 32 (21.3%) and 10 (6.7%) nurses, respectively. A total of 58 nurses (38.7%) failed the vision screening test. Visual defects were detected for the first time in 13 nurses (8.7%). With regards to regular eye check-ups, 77 participants (51.3%) reported acceptable ocular healthcare-seeking behaviours; this factor was significantly associated with age and the use of visual aids ( $P < 0.01$  each). **Conclusion:** A high proportion of participants failed the vision screening tests and only half displayed good ocular healthcare-seeking behaviours. This is concerning as ophthalmic nurses are likely to face fewer barriers to eye care services than the general population.

**Keywords:** Vision Screening; Refractive Errors; Health Care Seeking Behavior; Nurses; Saudi Arabia.

**المخلص: الهدف:** هدفت هذه الدراسة لتقويم السلوكيات الساعية للحصول على رعاية صحية للعيون، ونتائج تحري الإبصار عند كل طاقم التمريض في مستشفى للرعاية الصحية للعيون. **الطريقة:** أجريت هذه الدراسة، بين شهري يناير وسبتمبر من عام 2016م، على كل الطاقم الطبي العامل في مستشفى الملك خالد بالرياض في المملكة العربية السعودية وعددهم 500 ممرض وممرضة. وجمعت في الدراسة معلومات عن العمر والجنس والمعينات البصرية، والإصابة بمرض السكري، وأي تاريخ مرضي لأي جراحة إنكسارية، وتاريخ آخر فحص طبي أجراه/أجرته الممرض أو الممرضة على العيون. تم فحص كل المشاركين في البحث عن طريق فاحص كاشف ضوئي محمول باليد (من إنتاج شركة ويبيش الألين المحدودة في مدينة اسكانيتيلز فولز في نيو يورك بالولايات المتحدة). **النتائج:** شارك في هذا البحث 150 من طاقم التمريض بالمستشفى (بنسبة مشاركة 30.0%). بلغ متوسط أعمار المشاركين 41.2 ± 8.9 سنة. بلغت أعداد ونسب من كانوا يستخدمون نظارات للإبصار البعيد، وللقراءة، أو النوعين معا 37 (24.7%)، 32 (21.3%) و 10 (6.7%)، على التوالي. ولم ينجح في اختبار الإبصار 58 ممرض/ممرضة (أي ما نسبته 38.7%). ووجد كذلك أن 13 ممرض/ممرضة (أي ما نسبته 8.7%) لديهم عيوب بصرية اكتشفت لأول مرة في الفحص الحالي. وبلغ عدد المشاركين والمشاركات في الدراسة الذين أبدوا سلوكيات مقبولة ساعية للحصول على رعاية صحية للعيون 77 مشاركا ومشاركة أي ما نسبته (51.3%). وكان ذلك العامل مرتبط على نحو معنوي بالعمر واستخدام المعينات البصرية ( $P < 0.01$ ) في كل حالة. الخلاصة: لم تنجح نسبة كبيرة من المشاركين في اختبارات الإبصار، ولم يظهر إلا نصف عدد المشاركين والمشاركات سلوكيات جيدة للسعي للحصول على رعاية صحية للعيون، وهذا أمر مقلق إذ أن ممرضى طب العيون يواجهون صعوبات أقل من عامة السكان في الحصول على خدمات الرعاية الصحية للعيون.

**الكلمات المفتاحية:** تحريّ الإبصار؛ الأخطاء الإنكسارية؛ السلوكيات الساعية للحصول على رعاية صحية؛ الممرضين؛ المملكة العربية السعودية.

### ADVANCES IN KNOWLEDGE

- The findings of this study indicate that the rate of refractive errors among nurses working at a tertiary eye care hospital in Saudi Arabia was high; moreover, many nurses did not have healthy ocular healthcare-seeking behaviours.

### APPLICATION TO PATIENT CARE

- Nurses should be encouraged to undergo periodic vision testing in order to ensure adequate patient care as well as for their own benefit.

**A**LTHOUGH PRESCHOOL- AND SCHOOL-AGED children undergo regular eye care tests, the vision screening of healthy adults is not standard practice.<sup>1-3</sup> In many countries, vision screening is a component of comprehensive physical assessments which prospective employees undergo during job recruitment.<sup>4</sup> In addition, the increasing number of senior citizens who continue to drive past 65 years of age has compelled many licensing agencies to incorporate vision screening into their relicensing requirements.<sup>5</sup> Some professions also have specialised visual needs with regards to their employees; the role of eye testing in relation to altered refractive status has been highlighted previously in a cohort of pilots.<sup>6</sup> However, healthy asymptomatic individuals rarely present for regular vision tests.

For young adults, the visual demands of precise near work has increased significantly due to the extensive use of smartphones and computers for communication, entertainment and work-related tasks.<sup>7</sup> This constant strain on the visual system can cause symptoms of asthenopia and changes in the refractive status of the eyes.<sup>8</sup> For healthcare staff, untreated or undiagnosed defective vision could compromise the quality of patient care and potentially result in early retirement.<sup>9</sup> Hence, even asymptomatic healthcare workers should ensure any visual issues are appropriately addressed in order to function effectively within the patient care environment and in daily life activities.

In 2016, the World Health Organization initiated a worldwide campaign to increase public awareness of important health issues for healthcare workers, as well as the general population.<sup>10</sup> This study consequently aimed to determine the refractive status and ocular healthcare-seeking behaviours of ophthalmic nurses at a tertiary eye care hospital in central Saudi Arabia.

## Methods

This study was conducted between April and September 2016 at the King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia. Using a convenience sampling method, all 500 ophthalmic nurses working in different departments of the hospital were invited to participate in a three-day refractive error screening campaign via a personalised email sent by the head of the Nursing Department. The demographic data of the participants was collected, including age, gender, use of visual aids such as spectacles or contact lenses, a previous history of refractive surgery and the presence/absence of diabetes. Participants were considered diabetic based on their fasting

blood sugar and glycated haemoglobin levels over the previous year and a confirmed diagnosis by a physician. Nurses following medical advice to use distance or reading spectacles or both were considered to be regular users of visual aids. If they used visual aids sparingly or not at all, they were considered to be irregular users.

For each participant, the Spot™ Vision Screener (Welch Allyn Inc., Skaneateles Falls, New York, USA) was used to determine the refractive status of each eye without visual aids. The instrument was held 1 m from the eyes during measurement; if a message was displayed stating that the eyes were too far or too close, the distance was adjusted accordingly until a successful measurement was acquired. At the end of the measurement, the screening instrument displayed a message within 10 seconds indicating if the subject had passed or failed the test. Failure indicated the presence of a substantial visual defect requiring assessment by an ophthalmologist or optometrist, either due to refractive error, corneal opacity, lenticular opacity, *nystagmus* or miotic pupils. A pass indicated that the participant was bilaterally emmetropic, either had no or marginal refractive errors and that their vision was probably >20/40. If the display indicated that the pupils were too miotic, the ambient room lighting was reduced and the test was repeated. The average time taken to perform the screening test was one minute.

Refractive errors were documented as spherical, cylindrical or axial. If the cylindrical error was <1 D, the spherical equivalent of the refractive error was calculated using the following equation:<sup>11</sup>

$$\text{sph} + (\text{cyl}/2)$$

where sph is the spherical value and cyl is the cylindrical value as determined by the screening instrument. The eye with the greatest refractive error was used to determine the refractive status of the participant. The nurses were diagnosed as anisometropic if there was a >1 D difference in the refractive error between each eye.<sup>12</sup> Mild and moderate myopia was defined as -0.5 D to -3 D and -3 D to -6 D in the worse eye, respectively. Severe myopia was defined as >-6 D in the worse eye.<sup>13</sup>

Ocular healthcare-seeking behaviours were determined using a questionnaire and confirmed via ophthalmic or optometric health records. Healthcare-seeking behaviour was deemed acceptable if the participants reported having undergone an eye/vision assessment in the preceding two years. Participants who had not undergone an ocular examination since being recruited or those who had undergone an examination more than two years prior to their

**Table 1:** Demographic characteristics and ocular healthcare-seeking behaviours among ophthalmic nurses at a tertiary eye care hospital in Saudi Arabia (N = 150)

Variable	n (%)
<b>Age in years</b>	
≤30	22 (14.7)
31–40	50 (33.3)
41–50	55 (36.7)
≥51	23 (15.3)
Mean ± SD	41.2 ± 8.9
<b>Gender</b>	
Male	20 (13.3)
Female	130 (86.7)
<b>Diabetes</b>	
Present	11 (7.3)
Absent	139 (92.7)
<b>Use of visual aids</b>	
Distance spectacles	37 (24.7)
Reading spectacles	32 (21.3)
Both distance and reading spectacles	10 (6.7)
Contact lenses	2 (1.3)
None	69 (46.0)
<b>Date of last ocular check-up</b>	
Within one year	12 (8.0)
Within two years	65 (43.3)
More than two years ago	37 (24.7)
Never*	36 (24.0)

\*After being recruited to their current place of employment.

participation in the study were considered to have poor ocular healthcare-seeking behaviour.

Data were collected using an Excel spreadsheet, Version 2003 (Microsoft Corp., Redmond, Washington, USA). The Statistical Package for the Social Sciences (SPSS), Version 22 (IBM Corp., Chicago, Illinois, USA), was used to analyse the data. For qualitative data, frequencies and percentages were calculated. If quantitative data were normally distributed, means and standard deviation were calculated for each variable. Associations between the outcome variables and determinants were assessed using odds ratios, 95% confidence intervals and two-sided *P* values. A *P* value of <0.05 was considered statistically significant.

This study was approved by the Institutional Research & Ethics Board of the King Khaled Eye

**Table 2:** Vision screening outcomes and ocular healthcare-seeking behaviours among ophthalmic nurses at a tertiary eye care hospital in Saudi Arabia (N = 150)

Variable	Outcome of vision screening, n (%)		95% CI
	Pass	Fail	
<b>Gender</b>			
Male	15 (75.0)	5 (25.0)	6.0–44.0
Female	77 (59.2)	53 (40.8)	32.4–49.2
<b>Diabetes</b>			
Present	6 (54.5)	5 (45.5)	16.1–74.9
Absent	86 (61.9)	53 (38.1)	30.0–46.2
<b>Date of last ocular check-up</b>			
Within two years	34 (44.2)	43 (55.8)	44.7–66.9
More than two years ago	25 (67.6)	12 (32.4)	17.3–47.5
Never*	33 (91.7)	3 (8.3)	0.0–17.3
<b>Age in years</b>			
≤30	17 (77.3)	5 (22.7)	5.2–40.2
31–40	35 (70.0)	15 (30.0)	17.3–42.7
41–50	30 (54.5)	25 (45.5)	32.3–58.7
≥51	10 (43.5)	13 (56.5)	36.2–76.8
<b>Total</b>	<b>92 (61.3)</b>	<b>58 (38.7)</b>	<b>18.0–28.4</b>

CI = confidence interval.

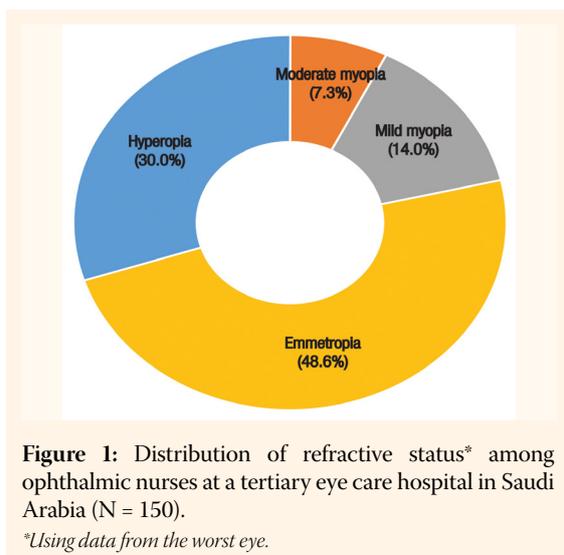
\*After being recruited to their current place of employment.

Specialist Hospital (local project #1641-R). Verbal informed consent to use their data for research purposes was obtained from all participating nurses. Participants who failed the screening test were advised to consult an optometrist and/or ophthalmologist for further management.

## Results

A total of 150 nurses participated in the study (response rate: 30.0%). Most participants were over 40 years old (*n* = 78; 52.0%) and just over half were using visual aids on the day of the screening (*n* = 81; 54.0%). In addition, 36 nurses (24.0%) had never undergone vision testing after being recruited to their current place of employment. None of the participants had previously undergone refractive surgery and two were irregular users of contact lenses for optical and cosmetic purposes [Table 1].

The outcomes of the vision screening tests are shown in Table 2. A total of 58 nurses (38.7%) failed the test; of these, 13 (8.7%) with distance vision defects were unaware that they required visual aids. Very few



participants under 30 years old failed the test (n = 5; 22.7%). While more than half of the participants had refractive errors, no participants were found to have severe myopia or anisometropia [Figure 1].

The ocular healthcare-seeking behaviour of the nurses and associations with different variables is presented in Table 3. An acceptable level of healthcare-seeking behaviour was noted in 77 participants (51.3%). Age and the use of visual aids were significantly associated with a higher rate of acceptable healthcare-seeking behaviour in terms of more frequent vision check-ups (P < 0.01 each).

## Discussion

Due to the increased visual demands of the modern digital era, universal vision and refractive error screening is not recommended as individuals are more motivated to actively seek out an eye care professional to maintain optimal vision. Hence, recommendations for vision screening in adults remain debatable.<sup>14</sup> However, evidence from developing countries indicates that unmet visual needs remain high, perhaps due to cost-related barriers to care.<sup>14–16</sup> Kumah *et al.* reported that 68.1% of Ghanaian teachers who underwent vision screening were presbyopic; 29.6% of these individuals did not wear corrective aids.<sup>15</sup> Studies from Zanzibar and Kenya also indicated that while 89.2% and 85.4% of adults were presbyopic, only 17.6% and 5.4% of these individuals wore spectacles, respectively.<sup>16,17</sup>

Although the current study was performed in a country with a rapidly evolving economy, the vision screening of nurses working at a tertiary eye care hospital indicated that several participants were unaware that they had a refractive error requiring an

**Table 3:** Determinants of acceptable ocular healthcare-seeking behaviours\* among ophthalmic nurses at a tertiary eye care hospital in Saudi Arabia (N = 150)

Variable	Healthcare-seeking behaviour, n (%)		OR (95% CI)	P value
	Acceptable (n = 77)	Unacceptable (n = 73)		
<b>Gender</b>				
Male	7 (9.1)	13 (17.8)	0.5 (0.2–1.2)	0.13
Female	70 (90.9)	60 (82.2)		
<b>Diabetes</b>				
Present	4 (5.2)	7 (9.6)	0.5 (0.2–1.9)	0.34
Absent	73 (94.8)	66 (90.4)		
<b>Visual aids</b>				
Using	56 (72.7)	25 (34.2)	5.1 (2.5–10.3)	<0.01 <sup>†</sup>
None	21 (27.3)	48 (65.8)		
<b>Age in years<sup>‡</sup></b>				
≤30	9 (11.7)	13 (17.8)	0.61 (0.2–1.5)	0.30
31–40	18 (23.4)	32 (43.8)	0.4 (0.2–0.8)	0.01 <sup>†</sup>
41–50	36 (46.8)	19 (26.0)	2.5 (1.3–5.0)	0.01 <sup>†</sup>
≥51	14 (18.2)	9 (12.3)	1.6 (0.6–3.9)	0.33

OR = odds ratio; CI = confidence interval.

\*Acceptable ocular healthcare-seeking behaviour was defined as having had an eye care check-up within the previous two years. <sup>†</sup>A P value of <0.05 was considered statistically significant. <sup>‡</sup>Healthcare-seeking behaviour was not significantly correlated to age group ( $\chi^2 = 6.2$ ; degrees of freedom = 3).

optical aid for optimal vision. Moreover, just under half of the ophthalmic nursing staff demonstrated poor healthcare-seeking behaviours in that they had not undergone an ocular assessment in the previous two years. These results indicate that proactive vision and refractive error screening is needed even for individuals with fewer barriers to adequate eye care, such as cost, distance and lack of access. Public health and education initiatives are therefore necessary to ensure the provision of rapid vision screening services to healthcare professionals in Saudi Arabia.

In the present study, none of the participants had previously undergone refractive surgery and just over half regularly wore distance or reading spectacles at the time of screening. This may be due to the fact that just over half of the participants were over 40 years old; at this age, hyperopia can manifest due to a loss of ciliary muscle tone.<sup>18</sup> Initially, hyperopic individuals may compensate for the refractive error by decreasing the distance of far objects to view them more clearly or simply ignoring the effect of the error. For near-sighted

individuals, a reading distance of >25 cm should be ensured. However, female nurses may avoid or delay wearing spectacles for aesthetic reasons.<sup>19</sup>

Contact lens use was also found to be very low among participants of the current study; this is surprising as the prevalence of contact lens use has been noted to be as high as 70.2% in Saudi Arabia.<sup>20</sup> This low rate of use might be due to the hot, dry and dusty climate and the widespread use of air conditioners in Saudi Arabia, which can cause tears or film abnormalities in contact lenses.<sup>21</sup> In the current study, the prevalence of diabetes was appreciably higher than that reported among Danish nurses (7.3% versus 4.4%).<sup>22</sup> A high prevalence of diabetes has been previously reported among Saudi Arabian adults (12.1%).<sup>23</sup> A high prevalence of risk factors for diabetes—such as obesity, poor diet and a sedentary lifestyle—could be the underlying cause of the high prevalence of diabetes in Riyadh.<sup>24</sup>

Rapid vision screening methods have previously been proposed for adults.<sup>25</sup> However, such methods often involve computer-assisted tools and are not portable. In contrast, the Spot™ Vision Screener (Welch Allyn Inc.) is a handheld unit that provides rapid measurements and has been validated in the detection of risk factors for amblyopia and uncorrected refractive errors in children.<sup>26,27</sup> In the clinical experience of the authors, significant uncorrected refractive errors are regularly identified in adults using the Spot™ Vision Screener (Welch Allyn Inc.); moreover, individuals with distance spectacles often fail the screening test and their prescriptions are outdated. However, in the majority of patients, the outcomes of the screening test using the Spot™ Vision Screener (Welch Allyn Inc.) are similar to that of their current prescriptions.

The current study is subject to some limitations. Vision screening was performed on a voluntary basis; as such, the findings of the current sample may differ from those who opted not to undergo screening and cannot be extrapolated for all nurses working at this tertiary eye care hospital. Moreover, to the best of the authors' knowledge, the Spot™ Vision Screener (Welch Allyn Inc.) has not been validated for use in adults. Further studies are recommended to validate this instrument for adult vision screening in comparison with other conventional tests or instruments. Lastly, the grading of refractive errors was not confirmed by other methods.

## Conclusion

A high proportion of ophthalmic nurses failed the vision screening tests; furthermore, only half reported adequate ocular healthcare-seeking behaviours. As nurses working at a tertiary eye care hospital are less likely to face barriers to eye care, the detection of uncorrected refractive errors among these individuals is concerning. These findings indicate the need for enhanced public health and education initiatives in Saudi Arabia to ensure the provision of rapid vision screening services to healthcare professionals.

## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

## FUNDING

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## References

1. Solebo AL, Cumberland PM, Rahi JS. Whole-population vision screening in children aged 4-5 years to detect amblyopia. *Lancet* 2015; 385:2308–19. doi: 10.1016/S0140-6736(14)60522-5.
2. Sharma A, Congdon N, Patel M, Gilbert C. School-based approaches to the correction of refractive error in children. *Surv Ophthalmol* 2012; 57:272–83. doi: 10.1016/j.survophthal.2011.11.002.
3. Hopkins S, Sampson GP, Hencicott P, Wood JM. Review of guidelines for children's vision screenings. *Clin Exp Optom* 2013; 96:443–9. doi: 10.1111/cxo.12029.
4. Pradeep TG, Bhandary A. Visual health assessment amongst in service police personnel. *Indian J Clin Exp Ophthalmol* 2016; 2:141–5.
5. Desapriya E, Harjee R, Brubacher J, Chan H, Hewapathirane DS, Subzwari S, et al. Vision screening of older drivers for preventing road traffic injuries and fatalities. *Cochrane Database Syst Rev* 2014; 2:CD006252. doi: 10.1002/14651858.CD006252.pub4.
6. Nakagawara VB, Montgomery RW, Wood KJ. Changing demographics and vision restrictions in civilian pilots and their clinical implications. *Aviat Space Environ Med* 2004; 75:785–90.
7. He M, Abdou A, Ellwein LB, Naidoo KS, Sapkota YD, Thulasiraj RD, et al. Age-related prevalence and met need for correctable and uncorrectable near vision impairment in a multi-country study. *Ophthalmology* 2014; 121:417–22. doi: 10.1016/j.ophtha.2013.06.051.
8. Toomingas A, Hagberg M, Heiden M, Richter H, Westergren KE, Tornqvist EW. Risk factors, incidence and persistence of symptoms from the eyes among professional computer users. *Work* 2014; 47:291–301. doi: 10.3233/WOR-131778.
9. Neal-Boylan L, Fennie K, Baldauf-Wagner S. Nurses with sensory disabilities: Their perceptions and characteristics. *Rehabil Nurs* 2011; 36:25–31. doi: 10.1002/j.2048-7940.2011.tb00062.x.

10. World Health Organization. World Health Day 2016: WHO calls for global action to halt rise in and improve care for people with diabetes. From: [www.who.int/mediacentre/news/releases/2016/world-health-day/en/](http://www.who.int/mediacentre/news/releases/2016/world-health-day/en/) Accessed: Aug 2016.
11. Millodot M. Dictionary of Optometry and Visual Science, 7th ed. Oxford, UK: Butterworth-Heinemann Elsevier, 2009. P. 116.
12. Gupta M, Rana SK, Mittal SK, Sinha RN. Profile of Amblyopia in School going (5-15 years) Children at State Level Referral Hospital in Uttarakhand. *J Clin Diagn Res.* 2016 Nov;10(11):SC09-SC11. doi: 10.7860/JCDR/2016/16026.8866.
13. American Academy of Ophthalmology. Refractive errors & refractive surgery PPP: 2013. From: [www.aao.org/preferred-practice-pattern/refractive-errors--surgery-ppp-2013](http://www.aao.org/preferred-practice-pattern/refractive-errors--surgery-ppp-2013) Accessed: Aug 2016.
14. Jessa Z, Evans B, Thomson D, Rowlands G. Vision screening of older people. *Ophthalmic Physiol Opt* 2007; 27:527-46. doi: 10.1111/j.1475-1313.2007.00525.x.
15. Kumah DB, Lartey SY, Amoah-Duah K. Presbyopia among public senior high school teachers in the Kumasi metropolis. *Ghana Med J* 2011; 45:27-30. doi: 10.4314/gmj.v45i1.68919.
16. Laviers HR, Omar F, Jecha H, Kassim G, Gilbert C. Presbyopic spectacle coverage, willingness to pay for near correction, and the impact of correcting uncorrected presbyopia in adults in Zanzibar, East Africa. *Invest Ophthalmol Vis Sci* 2010; 51:1234-41. doi: 10.1167/iops.08-3154.
17. Sherwin JC, Keeffe JE, Kuper H, Islam FM, Muller A, Mathenge W. Functional presbyopia in a rural Kenyan population: The unmet presbyopic need. *Clin Exp Ophthalmol* 2008; 36:245-51. doi: 10.1111/j.1442-9071.2008.01711.x.
18. Schachar RA. The mechanism of accommodation and presbyopia. *Int Ophthalmol Clin* 2006; 46:39-61.
19. [No authors listed]. Women need reading glasses for different reasons than men. *Harv Womens Health Watch* 2012; 20:8.
20. Abahussin M, AlAnazi M, Ogbuehi KC, Osuagwu UL. Prevalence, use and sale of contact lenses in Saudi Arabia: Survey on university women and non-ophthalmic stores. *Cont Lens Anterior Eye* 2014; 37:185-90. doi: 10.1016/j.clae.2013.10.001.
21. [No authors listed]. The epidemiology of dry eye disease: Report of the Epidemiology Subcommittee of the International Dry Eye Work Shop (2007). *Ocul Surf* 2007; 5:93-107. doi: 10.1016/S1542-0124(12)70082-4.
22. Hansen AB, Stayner L, Hansen J, Andersen ZJ. Night shift work and incidence of diabetes in the Danish Nurse Cohort. *Occup Environ Med* 2016; 73:262-8. doi: 10.1136/oemed-2015-103342.
23. Bahijri SM, Jambi HA, Al Raddadi RM, Ferns G, Tuomilehto J. The prevalence of diabetes and prediabetes in the adult population of Jeddah, Saudi Arabia: A community-based survey. *PLoS One* 2016; 11:e0152559. doi: 10.1371/journal.pone.0152559.
24. Jessa Z, Evans BJ, Thomson DW. The development & evaluation of two vision screening tools for correctable visual loss in older people. *Ophthalmic Physiol Opt* 2012; 32:332-48. doi: 10.1111/j.1475-1313.2012.00919.x.
25. Peterseim MM, Papa CE, Wilson ME, Davidson JD, Shtessel M, Husain M, et al. The effectiveness of the Spot Vision Screener in detecting amblyopia risk factors. *J AAPOS* 2014; 18:539-42. doi: 10.1016/j.jaapos.2014.07.176.
26. Aljohani NJ. Metabolic syndrome: Risk factors among adults in Kingdom of Saudi Arabia. *J Family Community Med* 2014; 21:170-5. doi: 10.4103/2230-8229.142971.
27. Harvey EM. Development and treatment of astigmatism-related amblyopia. *Optom Vis Sci* 2009; 86:634-9. doi: 10.1097/OPX.0b013e3181a6165f.

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