

Original Research Article

A cross-sectional study of the actual use of eye drops in a Saudi community

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Abstract

Purpose: To investigate the actual use of eye drops with respect to their administration, storage, and disposal in a community in Saudi Arabia.

Methods: A cross-sectional observational survey was conducted online. All the relevant data were collected using a standardized questionnaire. The questionnaire consisted of three sections: demographic characteristics of the participants, attitude of participants with respect to the administration and storage of eye drops, and the participants' understanding of the role of pharmacist in enhancing patients' compliance with eye drop regimens.

Results: A total of 720 participants were included in the study, viz, 229 males (31.8 %) and 491 females (68.2 %). Majority of the participants (82.5 %) indicated that they avoided touching their eyes with the bottle tip. Likewise, most participants (90.8 %) reported that they applied eye ointment after administering eye drops while 30.6 % allowed an interval of < 5 min between eye drop and ointment administration. However, 30.5 % of the participants gave an interval of 5 – 10 min between eye drop and ointment treatment. Furthermore, 32.5 % reported that they consistently washed their hands before administering eye drops, while only 29.6 % occasionally washed their hands.

Conclusion: These results indicate that all the patients used eye drops improperly at some point in time, and thus, there is a need for counselling on the appropriate use of eye drops as an essential step towards successful treatment.

Keywords: Eye drops, Ophthalmic preparations, Adherence, Instillation

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INTRODUCTION

The eye is a complex organ with unique anatomy and physiology. Consequently, ophthalmic drug delivery is one of the most interesting and challenging endeavors facing the pharmaceutical

scientists [1,2]. Pharmaceutical companies produce lots of ophthalmic dosage forms. These products include ointments and eye drops which are used for treating diseases associated with ocular health. Eye drops constitute approximately 90 % of the ophthalmic dosage forms widely

used to manage acute and chronic ocular conditions [3,4].

The use and administration of eye drops should be done properly to maximize their therapeutic effects, and to reduce adverse reactions [5]. In fact, poor adherence to ocular treatment regimens could lead to ocular discomfort, loss of vision, or even blindness [3]. Factors that may contribute to non-adherence to treatment regimens include the shape and size of eye drop bottle, ease of application, and number of prescriptions and complexity of the drug administration protocols [6].

Some studies aimed at investigating the actual use of eye drops have been carried out. A Canada-based study showed that 92.6 % of patients with eye disorders used improper techniques in administering eye drops [7]. In a study done in India on the awareness of patients about ideal techniques for the use and administration of eye drops, it was revealed that almost 30% of patients who use eye drops believe that there is no problem with "back to back" eye drop instillation [8]. Unfortunately, there are only very few publications on the actual use of eye drops in Kingdom of Saudi Arabia. The aim of this cross-sectional study was to examine the behavior of individuals with respect to administration, storage and disposal of eye drop preparations. In addition, the study investigated the role of pharmacists in enhancing patients' compliance with the use of eye drops.

METHODS

Study design

The data reported here came from a cross-sectional study that made use of a questionnaire.

Sample size

The sample size was 643 randomly selected participants who live in Kingdom of Saudi Arabia and used eye drops previously.

Inclusion criteria

Patients using eye drops for any ophthalmic indications, are able to read Arabic, and accepted the survey conditions.

Ethical approval

This research was approved on November 17, 2016 by Regional Research Ethics Committee, registered at National Committee of Bio and Med Ethics Registration no. H-04-Q-001.

Data collection

Data were collected by using a standardized questionnaire (Appendix) which was distributed through social networking (Facebook and Twitter). The questionnaire was developed on the basis of other related studies and opinions from experiences. The questionnaire consisted of three sections. The first section contained questions on demographic information on participants, while the second section contained questions for assessing the behavior of individuals with respect to administration and storage of eye drops. The third and last section concerned questions aimed at investigating the role of pharmacists in enhancing patient compliance with the use of eye drops. Information about the use, administration and storage of eye drops were derived from literature [9,10].

Statistical analysis

The data were computed and analyzed with SPSS software. Data description was reflected as frequency distribution. Responses were compared using Chi-square test. Statistical significance was assumed at $p \leq 0.05$.

RESULTS

Demographic characteristics

There were a total 720 study participants made up of 229 (31.8%) males and 491 (68.2%) females. More than half of the participants (67.2%) were from central region of Kingdom of Saudi Arabia. More than half of the participants (63.3%) were aged between 18 and 35 years, while more than two-thirds (80.3%) of the participants were from college. The demographic characteristics of the participants are detailed in Table 1.

Techniques used in the administration of eye drops

Most of participants (82.5%) indicated that they never touched their eye with bottle tip. In addition, almost all the participants (90.8%) reported that they applied ointments after administering eye drop. Moreover, almost one-third of the participants (30.6%) allowed an interval less than 5 minutes between eye drop and ointment, while 30.5% said they allowed an interval of 5-10 minutes. On the other hand, 27.8% of the participants indicated that they did not usually determine the interval between ointment and eye drop applications. Furthermore, 32.5% of participants indicated that they always

washed their hands prior to administering eye drops, while 29.6% of the participants washed their hands occasionally. On the other hand, 37.8% of the study participants never washed their hands. These results are shown in Table 2.

Table 1: Demographic characteristics of the participants

Characteristics	Frequency	Percentage (%)
Age (years)		
18-35	455	63.3
35-50	169	23.5
>50	56	7.8
Sex		
Male	229	31.8
Female	491	68.2
Region		
Central	483	67.2
Western	83	11.5
Eastern	66	9.2
Southern	71	9.9
Education level		
College	578	80.3
High school	111	15.4

Table 2: Techniques used in the administration of eye drops.

Technique used in administration of eye drops	Frequency	Percentage (%)
Eye contact with bottle tip		
Always avoided	594	82.5
Occasionally avoided	99	13.8
Using both eye drop and ointments		
Eye drop applied first	718	90.8
Eye ointment applied first	46	6.4
Time interval between eye drop and ointment administration		
<5 min	220	30.6
5-10 min	25	30.5
Undetermined interval	200	27.8
No interval (applied at the same time)	80	11.1
Hand wash		
Always	234	32.5
Occasionally	213	29.6
Never	272	37.8

Role of pharmacists

It was revealed by 320 participants (44.4%) that dispensing pharmacists gave instructions only on the number of eye drops, while 232 participants (32.3%) reported that pharmacists gave instructions on the number of eye drops and administration techniques that should be used.

Storage and disposal of eye drops

Less than half (40.9 %) of the participants indicated that they kept their eye drops at the refrigerator door, while 42.7 % said they stored the eye drops in warm places such as the bedroom and kitchen.

Regarding the expiration of the eye drops, 44.9 %) reported that the eye drops had one month or less to expiry date. On the other hand, 41.7 % of participants did not know the expiry dates of their eye drops.

Regarding the disposal of eye drops, most of the participants (82.6 %) reported that they disposed of the eye drops immediately after expiry. Moreover, almost all the participants (95.5 %) indicated that on expiry, they threw the eye drops in the garbage bin. These data are shown in Table 3.

Table 3: Storage and disposal of eye drops

Storage and disposal of eye drops	Frequency	Percentage (%)
Storage of eye drops		
Inside the refrigerator	87	12.1
At refrigerator door	294	40.9
In warm places (e.g.; bedroom, kitchen)	307	42.7
Expiry dates of eye drops		
1 month or less	323	44.9
1 week or less	96	13.4
No idea	300	41.7
Disposal of eye drops immediately after expiry		
Yes	549	82.6
No	125	17.4
Disposal method used for eye drops		
Throw eye drops in the garbage bin	687	95.5

DISCUSSION

It has been reported that failure on the part of patients to adhere to eye drop regimen may contribute to poor prognosis of their ophthalmic conditions and the exacerbation of symptoms. It is noteworthy that 80 % of the patients administer their eye drops while sitting, standing, or in front of a mirror [13,21]. Surveys on the appropriate use of eye drops are essential because they provide data that enable researchers evaluate the overall understanding of the best technique to use, and to assess the contribution of pharmacists [20]. However, no specific technique

has been found to be optimal, which indicates that instructions should be tailored based on the need of the patient [1]. It is important that ophthalmic medication is given the same priority as medications that are administered systemically. This underlines the fact that appropriate storage of medications is essential. When stored incorrectly, many drugs undergo physical and chemical changes which may result in loss of their potencies [2].

When pharmacists dispense ophthalmic drops, they should demonstrate their correct use to the patients. This ensures that future applications of the medication will be done correctly using the proper technique. Many patients forget to administer eye drops at the right time, while others neglect to administer the medication altogether [13]. In this study, majority of the participants reported that they received no form of instructions from their pharmacists. However, it should be noted that although instructions on how to instil ophthalmic drops are essential, it is not likely that all patients would follow these instructions accordingly [14]. Indeed, it has been reported that a good percentage of those instructed may not recall the exact details of the instructions given [15]. Ultimately, several visits may be required for some patients to achieve the best outcomes [11]. Generally, instructions help to minimise the risks and optimise the potential benefits.

Several studies have shown that 15-52 % of ophthalmic patients touched the tip of the eye drop container to their eyes while applying the eye drops [11,13,19,23]. However, once instructions and corrections were received, the number of patients that touch their eyes with the tip of the eye drop container reduced significantly to 34 % [11]. Similarly, evidence suggest that instructions on the desirability of washing the hands prior to eye drop application may significantly increase this practice [12]. However, evidence also suggest that the number of eye drops administered overall (and the length of time between applications) may not change appreciably even after instructions [12]. Factors associated with poor administration technique include old age, poor vision, lower educational level, lack of supervision, low adherence, and a history of instruction [13,15-17]. Ultimately, these factors may create several barriers such as leakage of drops, missing the desired spot for drops, contamination, and use of inadequate force to release the drops [18].

Another crucial issue about ophthalmic drops is the question of storage. In the current study, 40.9 % of the participants stored their eye drops at

room temperature, and 30 % of this group stored their drops in a relatively warm place (kitchen). This is consistent with the findings from other studies, which reported that most patients keep their eye drops in their bedrooms, bathroom, or kitchen [22,23]. Although room temperature varies significantly from one bedroom to another based on the country in which a patient lives, it is almost universally the case that storing eye drops in the bathroom can increase the chances of contamination. Furthermore, the kitchen is not the best place for eye drop storage in view of the presence vapours, volatile oils, and fluctuating (often high) temperatures, all of which have negative impact on the drugs. Generally, it should be noted that the storage conditions of ophthalmic preparations vary based on manufacturer's recommendations. While some should be refrigerated, others may be kept safely at room temperature. This variability has created confusion among patients, which further emphasises the need for clear instructions and follow-up sessions.

Most guidelines advocate that in hospital settings, eye drops should be discarded after seven days and replaced if the treatment continues. However, in non-hospital settings, eye drop bottles should be replaced every 28 days. It is not uncommon, however, to find expired eye drops in domestic medicine cabinets [24,25]. In this study, it was found that 41.7 % of the participants continued to use their eye drops more than 28 days after opening them, irrespective of the expiry dates. This is indicative of the fact that most patients kept their eye drops in their medicine cabinets even after they had completed their course of treatment, without being aware of their expiry dates. Other studies have demonstrated that 68 % of patients discarded the eye drops more than 28 days after they had been opened. This problem can be solved either during dispensing or during follow-up visits [12].

CONCLUSION

While most of study participants have a good knowledge of the right way to administer eye drops, some of the participants are unaware correct way of storage and disposal of eye drops. Therefore, there is a need for pharmacist to spend more time to counsel patients on this.

DECLARATIONS

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

The authors declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by them.

REFERENCES

1. Waterman H, Evans JR, Gray TA, Henson D, Harper R. Interventions for improving adherence to ocular hypotensive therapy. *Cochrane Database of Systematic Reviews* 2013; (4): 1-82. Available from: doi:10.1002/14651858.CD006132.pub3.
2. Patel A. Ocular drug delivery systems: An overview. *World Journal of Pharmacology* 2013; 2(2): 47. Available from: doi:10.5497/wjp.v2.i2.47.
3. Shaw M. How to administer eye drops and eye ointment. *Nursing Standard* 2016; 30(39): 34-36. Available from: doi:10.7748/ns.30.39.34.s42.
4. Gaudana R, Jwala J, Boddu S, Mitra A. Recent Perspectives in Ocular Drug Delivery. *Pharmaceutical Research* 2008; 26(5): 1197-1216. Available from: doi:10.1007/s11095-008-9694-0.
5. Institute for Quality and Efficiency in Health Care (IQWiG). Using eye drops properly. [Internet] 2016. Available from: <https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072510/> [accessed 22nd October 2016].
6. Kass MA, Hodapp E, Gordon M, Kolker AE, Goldberg I. Part I. Patient administration of eyedrops: interview. *Ann Ophthalmol* 1982; 14(8): 775-9.
7. An JA, Kasner O, Samek DA, Lévesque V. Evaluation of eye drop administration by inexperienced patients after cataract surgery. *Journal of Cataract & Refractive Surgery* 2014; 40(11): 1857-1861. Available from: doi:10.1016/j.jcrs.2014.02.037.
8. Mohindroo C, Ichhpujani P, Kumar S. How 'Drug Aware' are our Glaucoma Patients? *J Curr Glaucoma Pract.* 2015; 9(2): 33-37. Available from: doi:10.5005/jp-journals-10008-1181.
9. <https://www.nps.org.au/australian-prescriber/articles/on-the-correct-use-of-eye-drops#authors>
10. <http://www.safemedication.com/safemed.MedicationTipsTools/HowtoAdminister/HowtoUseEysDropsProperly.aspx>
11. Gupta R, Tinwala S, Singh H, Dave A, Wadhvani M, Dada T. To Study the Effect of Instructions on Improving the Eye Drop Instillation Technique in Patients With Primary Adult Onset Glaucoma. *Investigative Ophthalmology & Visual Science* 2012; 53(14).
12. McVeigh KA, Vakros G. The eye drop chart: a pilot study for improving administration of and compliance with topical treatments in glaucoma patients. *Clin Ophthalmol* 2015; 9: 813-819. Available from: doi:10.2147/OPTH.S82909.
13. Tatham AJ, Sarodia U, Gatrad F, Awan A. Eye drop instillation technique in patients with glaucoma. *Eye* 2013; 27: 1293-1298. Available from: doi:10.1038/eye.2013.187.
14. Al-Busaidi A, Samek DA, Oscar Kasner. Eye drop administration in patients attending and not attending a glaucoma education center. *Oman J Ophthalmol* 2016; 9(1): 11-16. Available from: doi:10.4103/0974-620X.176094
15. Kholdebarin R, Campbell RJ, Jin YP, Buys YM. Multicenter study of compliance and drop administration in glaucoma. *Can J Ophthalmol.* 2008; 43: 454-461. Available from: doi:10.1139/i08-076.
16. Dietlein TS, Jordan JF, Lüke C, Schild A, Dinslage S, Krieglstein GK. Self-application of single-use eyedrop containers in an elderly population: comparisons with standard eye drop bottle and with younger patients. *Acta Ophthalmol.* 2008; 86: 856-859. Available from: doi:10.1111/j.1755-3768.2007.01155.x.
17. Newman-Casey PA, Dayno M, Robin AL. Systematic Review of Educational Interventions to Improve Glaucoma Medication Adherence: an update in 2015. *Expert Rev Ophthalmol.* 2016; 11(1): 5-20.
18. Davies I, Williams AM, Muir KW. Aids for eye drop administration. *Survey of Ophthalmology* 2017; 62(3): 332-345. Available from: doi:10.1016/j.survophthal.2016.12.009.
19. Schwartz GF, Hollander DA, Williams JM. Evaluation of eye drop administration technique in patients with glaucoma or ocular hypertension. *Curr Med Res Opin.* 2013; 29(11): 1515-22. Available from: doi:10.1185/03007995.2013.833898.
20. Stone JL, Robin AL, Novack GD, Covert DW, Cagle GD. An objective evaluation of eyedrop instillation in patients with glaucoma. *Arch Ophthalmol.* 2009; 127(6): 732-6. doi:10.1001/archophthalmol.2009.96.
21. Strungaru MH, Peck J, Compeau EC, Trope GE, Buys YM. Mirror-hat device as a drop delivery aid: a pilot study. *Can J Ophthalmol.* 2014; 49(4): 333-8. Available from: doi:10.1016/j.cjco.2014.04.012.
22. Tsai T, Robin AL, Smith JP. An evaluation of how glaucoma patients use topical medications: a pilot study. *Trans Am Ophthalmol Soc.* 2007; 105: 29-35.
23. Arunkumar S, Banagar B, Chanda. Eye drop instillation, a skill to be taught? *Journal of Educational Research & Medical Teacher* 2014; 2(2): 20-22.
24. Gupta N, Alam A, Bhardwaj, Amin F. Prospective survey study on assessment and education of home medicine cabinet in general population of community. *International Journal of Pharmaceutical Sciences & Research* 2011: 1237-1243.
25. Vuong T, Marriot JL. Unnecessary medicines stored in homes of patients at risk of medication misadventure. *Journal of Pharmacy Practice & Research* 2006; 36(1): 16-20. Available from: doi:10.1002/j.2055-2335.2006.tb00879.x.