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Monitoring the technique of instillation of topical drops in the eye by the healthcare personnel in the Department of Ophthalmology of a tertiary care hospital: A cross-sectional study.

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Abstract

Background
Correct instillation of eye drops is critical for achieving the desired therapeutic effects in ophthalmic care. The patient should also be informed about the technique for instilling drops in the eyes to achieve optimal results.
Aim: To assess the technique of instillation of topical drops by the healthcare personnel in the department of Ophthalmology of a tertiary care hospital

Method
This is a hospital-based, cross-sectional, observational study conducted over 6 months involving 180 healthcare personnel, including junior residents, medical interns, optometry interns, and nursing students. A self-structured checklist was used to assess the protocol followed while using eye drops, and the observation was recorded. The ophthalmic personnel were then taught to rectify the lacunae, and the assessment was repeated.

Results
Among 180 ophthalmic personnel observed, only 56 subjects adhered to the correct instillation technique at first assessment. This number improved to 141 after proper training. Among junior residents (n=15), correct technique improved from 9 at presentation to 15 post-training, with a statistically significant p-value of 0.02. MBBS interns (n=140) demonstrated a marked improvement from 38 to 106, yielding a highly significant p-value of 1.14×10^{-15}. Optometrist interns (n=15) also showed significant improvement, with correct technique increasing from 6 students to 12 students (p=0.034). Although nursing staff (n=10) improved from 3 to 8 following training, the p-value of 0.059.

Conclusion
This study revealed the significance of monitoring the technique of instillation of drops among ophthalmic personnel. Proper audit and counselling help in inculcating the correct practice among healthcare personnel and patients.

Recommendations
This study highlights the need for ongoing monitoring and training of the healthcare team, ensuring strict adherence to standard guidelines for the instillation of topical eyedrops.

Keyword: *Instillation of eye drops, Hand hygiene/gloves, Uncapping of eyedrop bottle, Retraction of the lower eyelid, Instillation in the fornix, Contact of the bottle tip with the ocular surface*
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Introduction

Instillation of topical drops in the eyes is an essential mode of drug delivery. It serves as a primary route for the management of a wide range of ocular conditions

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such as infections, inflammation, glaucoma, and dry eye disease. For optimal therapeutic effect, topical therapy, especially drops, should be administered correctly, adhering to the technique while maintaining a safe environment for the health personnel and the patient.

Studies have shown that even trained healthcare providers often exhibit lapses in technique in administering topical therapy. [1,2,3] Errors such as inadequate hand hygiene, incorrect bottle positioning, contact of the bottle tip with the ocular surface, and improper timing between drops can lead to decreased efficacy, ocular injury, contamination, and increased risk of infection. [4,5,6.7]

This study aims to assess the current practice of instillation of topical drops among healthcare personnel in the department of Ophthalmology of a tertiary care hospital, and monitor their improvement after proper teaching and counselling.

Material and methods

Study design

The study employed a cross-sectional, hospital-based, observational study.

Study area

The study was conducted at Shri Mahant Indiresh Hospital, Dehradun, Uttarakhand, over a period of six months from January to June 2025.

Participants / Study size

180 students, including junior residents, MBBS interns, optometrist interns, and nurses posted in the department of Ophthalmology during the study period, were included in the study. All the subjects were learners in their respective fields.

Bias

All the participants were assessed by a single observer on the basis of a self-structured checklist to avoid any bias in observation.

Data collection

The parameters of the checklist were compiled from various articles in the literature.[8,9] Our checklist included the following parameters:

Hand hygiene/gloves

Uncapping of the eyedrop bottle

Retract the lower eyelid

Instillation site (fornix)

Avoid contact of the bottle tip with the ocular surface

Patient eye closure (for 1 minute)

Restoration of the cap

Gap between two eyedrops (minimum 5 minutes)

Mention the opening on the bottle

Each parameter was assigned a score of 1 if performed correctly by the trainee, else a score of 0 if incorrectly performed. A score <5 was considered incorrect. The aspects of topical instillation, which required correction, were demonstrated. Repeat assessment was done with a similar scoring pattern.

Statistical analysis

The data was recorded and analysed using SPSS version 26. A p-value of less than 0.05 was considered significant.

Ethical consideration

The study was a part of routine audits carried out in the department and hospital every 6 months to keep up to the level of patient care.

Results

The present study had 180 subjects, comprising 15 junior residents, 140 MBBS interns, 15 optometrist interns, and 10 nursing staff. The study assessed the adherence to the correct eye drop instillation technique at presentation and after training among different categories of healthcare personnel. Among junior residents (n=15), correct technique improved from 9 at presentation to 15 post-training, with a statistically significant p-value of 0.02. MBBS interns (n=140) demonstrated a marked improvement from 38 to 106, yielding a highly significant p-value of 1.14×10^{-15}. Optometrist interns (n=15) also showed significant improvement, with correct technique increasing from 6 students to 12 students (p=0.034). Although nursing staff (n=10) improved from 3 to 8 following training, the p-value of 0.059 indicated the change was not statistically significant, likely due to the smaller sample size. [table 1]

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Table 1: Adherence to correct instillation technique at presentation and post-training amongst various subject groups

Observation group	Correct at presentation	Correct post-training	P value	Inference
Junior resident (n=15)	09	15	0.02	Significant
MBBS intern (n=140)	38	106	$1.14x10^{-15}$	Highly Significant
Optometrist intern (n=15)	6	12	0.034	Significant
Nursing staff (n=10)	3	8	0.059	Not Significant

P-value <0.05 is considered significant.

In the current study, the practice of Hand Hygiene parameter was adequate in 31 % of subjects on presentation, which improved to 72.8% post-training. Only 27.2% subjects followed the correct method of uncapping the eye drop bottle cap, which improved to 81.1% subjects performing the correct method post guidance. Retraction of the lower lid during instillation of the eye drop was demonstrated by 23.8% subjects, which improved to 90.5% subjects performing correct instillation post guidance. Only 26% subjects instilled eyedrop in the lower fornix, which improved to 65% subjects performing correct instillation post guidance. 38.3% subjects avoided touching the ocular surface, which improved to 82.7% subjects performing correct instillation post guidance. In the present study, only 22.8% subjects asked the patient to close the eye for 5 minutes post instillation, which improved to 81.7% subjects giving the correct command post guidance. Only 30.5% subjects restored the eye drop by capping the bottle correctly, which improved to 68.8% subjects following the correct method post guidance. In the present study, only 41.6% subjects maintained a reasonable gap of 5 minutes between instillation of eye drops, which improved to 71.6% subjects maintaining the correct gap post-training. Only 12.7% subjects mentioned the date of opening the eye drop, which improved to 71.6% subjects post-training. [table 2,3,4,5]

Table 2: observation amongst junior residents regarding adherence to instillation technique (MBBS interns) n=140

Sno	parameters	correct at presentation		Correct post-training	
		Number	percentage	Number	percentage
1	Hand hygiene/Gloves	32	22	92	65.7
2	uncapping of the eyedrop bottle	41	29	108	77.1
3	Retract the lower eyelid correctly	28	20	124	88.5
4	Instillation site (fornix/elsewhere)	33	23.5	83	59.2
5	Avoid contact of the bottle tip with the ocular surface	48	34.2	111	79.2
6	Patient eye closure (for 1 minute)	26	18.5	108	77.1
7	restoration of the cap	37	26.4	90	64.2
8	gap between eyedrops (minimum 5 minutes)	60	42.8	90	64.2
9	mentioning the opening date on the bottle	12	8.5	60	42.8

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Table 3: observation amongst junior residents regarding adherence to instillation technique (junior residents) n=15

Sno	parameters	correct at presentation		Correct post-training	
		Number	percentage	Number	percentage
1	Hand hygiene/Gloves	13	86.6	15	100
2	uncapping of the eyedrop bottle	12	80	15	100
3	Retract the lower eyelid correctly	14	93.3	15	100
4	instillation site (fornix/elsewhere)	10	66.6	15	100
5	Avoid contact of the bottle tip with the ocular surface	14	93.3	15	100
6	Patient eye closure (for 1 minute)	13	86.6	15	100
7	restoration of the cap	12	80	15	100
8	gap between eyedrops (minimum 5 minutes)	11	73.3	15	100
9	mentioning the opening date on the bottle	10	66.6	15	100

Table 4: observation amongst junior residents regarding adherence to instillation technique (optometrist interns) n=15

Sno	parameters	correct at presentation		Correct post-training	
		Number	Percentage	Number	Percentage
1	Hand hygiene/Gloves	3	20	14	93.3
2	uncapping of the eyedrop bottle	2	13.3	15	100
3	Retract the lower eyelid correctly	4	26.6	15	100
4	instillation site (fornix/elsewhere)	1	6.6	12	80
5	Avoid contact of the bottle tip with the ocular surface	6	40	14	93.3
6	Patient eye closure (for 1 minute)	2	13.3	15	100
7	restoration of the cap	3	20	12	80
8	gap between eyedrops (minimum 5 minutes)	0	0	15	100
9	mentioning the opening date on the bottle	0	0	9	60

Table 5: observation amongst junior residents regarding adherence to instillation technique (nursing staff) n=10

Sno	parameters	correct at presentation		Correct post-training	
		Number	percentage	Number	Percentage
1	Hand hygiene/Gloves	8	80	10	100
2	uncapping of the eyedrop bottle	6	60	8	80
3	Retract the lower eyelid correctly	5	50	9	90
4	instillation site (fornix/elsewhere)	3	30	7	70
5	Avoid contact of the bottle tip with the ocular surface	1	10	9	90
6	Patient eye closure (for 1 minute)	0	0	9	90

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7	restoration of the cap	3	30	7	70
8	gap between eyedrops (minimum 5 minutes)	2	20	9	90
9	mentioning the opening date on the bottle	0	0	7	70

Discussion

The present study revealed a phasic assessment of fresh recruits in the department of Ophthalmology on adherence to the protocol of instillation of drops in the eye. Studies have reported that among the common errors were inadequate hand hygiene, failure to retract the lower eyelid correctly, improper capping, resulting in contact of the bottle tip with the ocular surface, and neglecting to check the expiry date/ shelf life after opening the eyedrop after first use. [1,3]

In the present study, the practice of Hand Hygiene was adequate in 31 % of subjects on presentation, which improved to 72.8% post-training. This could be attributed to their proper orientation and good guidance by faculty and consultants. However, in a study, only 35% of healthcare staff performed hand hygiene before the instillation of drops. [1]

In the current study, only 38.3% subjects avoided touching the ocular surface, which improved to 82.7% subjects performing correct instillation post guidance. [table 2,3,4,5] In one study, 42% failed to avoid touching the eye with the dropper tip, increasing the risk of infection [1]. Similarly, observation in another study showed that only 48% of nursing personnel in their study could correctly identify all steps of the standard instillation protocol. [2]

The current study also shows improvement in all the parameters after proper teaching, and thus emphasizes the role of proper guidance and meticulous training on the part of professionally skilled personnel, as seen in Table 1. An audit of one study showed that only 22% of hospital-based ophthalmic staff could demonstrate all essential steps correctly without supervision. [4] Many studies have shown a marked improvement in performance following structured training, which demonstrated that educational interventions significantly improved the instillation technique in 80% of ophthalmic interns at 3-month follow-up. [5]

A study noted that after a single 30-minute training session, correct technique increased from 40% to 85% among medical residents [6]. One study found that incorrect self-instillation or by healthcare providers may result in sub-therapeutic dosing, medication wastage, and poor compliance [7].

Conclusion

The present study highlights the need for good guidance in the instillation of topical therapy and adherence to the standard parameters. It holds relevance in the field of Ophthalmology, where topical drugs are routine and of immense importance. Such studies help to create a holistic approach towards the management of patients and disease. Such monitoring is necessary for the healthcare personnel and useful for society.

Limitations

We had a self-structured checklist, and all aspects covering the correct method of instillation of eyedrop, as mentioned in the literature, might not be covered. Also, data was analyzed over 6 months, including 180 students posted during that tenure. Performance and data observed might differ from another batch of students posted at another point in time.

Recommendations

The need of the hour is to formulate a standardized checklist and scoring system for monitoring the correct method of instillation of topical eye drops in the ophthalmic health care system.

Source of funding

The study had no funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

Dr. Vatssala Vats: concept of study and observer**,** manuscript writing

Dr. Priyanka Gupta: study design, data collection, analysis, manuscript writing and editing, and statistical analysis.

Dr. Stuti Mnagalam: Data collection, analysis, manuscript editing.

Author biography

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