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Skill Development for Self-Administration of Eye Medication among the Adult Patients Attending the Ophthalmology Department of a Tertiary Care Institute in Northern India

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Abstract— Background*: Eye problems have been on a continuous rise among adult population. Therefore, the need is to provide guidance and technical support by developing comprehensive eye care systems to address the problem of self administration of eye drops among the adult patients.* ***Objectives****: To develop the skill of self-administration of eye drops among the adult patients.* ***Methodology****: An operational research design was used and 35adult patients attending AEC OPD were enrolled by purposive sampling technique. Tool used were 1. Interview Schedule consists of (a) Socio-demographic data (b) Clinical profile of participants 2. Checklist regarding steps of administration of eye drops. After enrolment participants were interviewed as per interview schedule. They were asked to demonstrate self-eye drop administration by using refresh tear drops. After observing their skill, the demonstration of procedure was given by researcher as per protocol for administration of eye drops and this was followed by return demonstration evaluated by checklist. Maximum3 times return demonstration was done after making corrections. The data was analyzed using SPSS.* ***Results****: Most of the participants were able to perform correct procedure of self-administration of eye drops during last return demonstration. The incorrectly performed steps by participants was not touching the dropper, pressing the inner canthus, which also showed improvement from 31% - 67% and 0% - 71% respectively.* ***Conclusion****: Self eye administration skills were improved from pretest to last observation of posttest. The skill of self-administration of eye drops was developed in the participants.*

Keywords*— Self administration of eye drops, Adult population.*

I. INTRODUCTION

In the era where health care coverage and costs are important from public health point of view, it is important to estimate the magnitude of the burden of eye diseases[1].With an increase in screen time, the eyes need to take a lot of strain, which further leads to many problems of eyes. All around the world, an estimated 272.4 million individuals are visually compromised, of whom almost 42.7 million are visually impaired[2] Out of them, 175 million individuals are suffering from cataract and refractive errors. Eye problems were found significantly associated with age and sex. In India, ongoing evaluations express that commonness of visual impairment was 8.5%The commonness fluctuated from 4.2% to 13.7% over the diverse district[2]. Proper eye-drop administration could reduce the visual impairment burden to half. The commonness of low vision was 23.85%[2.] People falling in the age group of 70 years and above are five times more prone to being visually impaired than people falling in the age group of 50-59 years[3].

Various studies have revealed that eye problems comprise the third largest set of problems[4]. Amongst these, cataract poses a major threat to the general population and comprises nearly 51% of world blindness, which means 20 million people[4]. The problems show a major impact on the adult population aged above 19 years of age, as 55% of them are severely affected by one or the other eye disease. Various studies have shown that subjective difficulties were more among those aged above 60 years. Independent risk factors for worse administration technique were old age and worse visual acuity. It has been reviewed from previous studies that previous instructions regarding drop administration technique were significantly associated with good technique and increasing age was associated with poor technique. With facial sport device, there was less contamination of the container in eye tissue, but the individuals reported it being easier using the device.[5] In patients, specifically with glaucomatous damage, self-eye drop administration skills can be improved by step-to-step instructions. This will further lead to reduced eye infections due to dropper contamination, wastage of medication and ultimately maximize the effectiveness of treatment.[5]

Age-related macular degeneration tends to be the third most significant reason for visual disability in adults, while refractive mistakes involve 51% of the same consequences.[6] Incorrect eye administration also acts as a barrier to the good eye care, which furthers impacts the quality of life of the adults. It has been observed that when the treatment continues lifelong, a regular proper administration of eye drops is required by the patient, and the efficacy of the topical medication is completely dependent on the accuracy of self-administration. So, the need was felt to conduct a research study among the patients visiting the Advanced Eye OPD, PGIMER, Chandigarh to develop the skill of self-administration of eye drops.

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Objective: To develop the skill of self-administration of eye drops among adult patients.

II. METHODS

The cross-sectional operational study was conducted to develop self-administration of eye drops skills among adult patients. This study was conducted in AEC, OPD, PGIMER, Chandigarh. Purposive sampling technique was used and 35 study participants were enrolled for collecting data. Participants included adult patients (Age 18 years and above) requiring eye drop administration visiting AEC OPD and willing to participate. Patients having neuromuscular disorders like myasthenia gravis, Guillain Barre syndrome, hearing disability and People with abnormal mental status were excluded in the study.

Researchers developed research Tools and Protocol of self-administration of eye drops on the basis of a review of literature from Books, Journals and the internet. Tools include Interview Schedule and Checklist to assess the procedure of self-administration of eye drops. Interview schedule contains Socio-demographic profile and Clinical Profile. The checklist consists of 15 steps of self-administration of eye drops and, each correctly performed step was given one point. The total score was 15. On the basis of performance of participants score was divided into four categories i.e., score <5 (poor performance), score 5-10 (average performance), score 10-12 (good performance), score 12-15 (very good performance). The protocol used in the study was having steps of the procedure of self-administration of eye drops and was divided into three Pre Procedural, eight Intra Procedural and four Post Procedural steps according to which self-administration of eye drops was performed. Participants used the lubricant drops for eye administration.

Ophthalmology, Nursing and Community Medicine experts did the tools and protocol Validation. The suggestion of experts was incorporated into the final tool and protocol. Ethical Approval was taken from Ethics Committee of NINE, PGIMER, Chandigarh.

The tools and protocol were pilot tested on six participants and results revealed that it was feasible to conduct the study. Data was collected in the month of June, 2020 at AEC, PGIMER, Chandigarh. Informed written consent was taken from Participants. Participants were first interviewed as per the Interview Schedule. Then, Participants were asked to show the skills of self-administration of eye drops. The skills of the participant for self-administration of eye drops were assessed by using observation checklist and scoring was done for the pretest. After Pre-Test procedure of self-administration of eye drops (Refresh Tears) was demonstrated to Participants by Researcher as Per Protocol. The doubts of participants were clarified after the demonstration. The participants were asked for re-demonstration until they performed the correct procedure. Each re-demonstration was observed by using a checklist. Participants were corrected for any incorrectly performed step of procedure during return demonstration and asked to re-demonstrate again. Maximum three return demonstrations were performed by participants. During Trials scoring was done according to the checklist and performance of participants was compared with Pre-Test score to assess the level of improvement of skills. The data analysis was done by the descriptive and inferential statistical method.

III. RESULTS

Socio-demographic profile of the participants: The participants were in the age range of 23-75 years with a mean range of 47.45±14 yrs. Out of 35 participants, 10(28.6%) were 40-50 years while 4(11.4%) were in the age group of 20-30 years. More than half of the participants 26(74.35%) were males. 22(62.9%) participants completed secondary level education. Half of the participants 17(48.6%) were unskilled workers, while 7(20.0%) and 11(31.4%) were unemployed, and skilled workers respectively. Most of participants 33(94.3%) were married. More than half of them i.e., 23(63.7%) were following Hinduism. Most of the participants i.e., 25(71.4%) lived in a nuclear family and 28(80%) participants had at least two working members in the family. Per-capita income ranged from Rs.800 -10,000, with mean per capita income being Rs.5642.85±2924.87. Nearly half of the participants i.e., 15(42.9%) were from middle class. (Table-1)

Table 1:- Socio-demographic profile of participants (N=35)

Category	Frequency (%)
Age category	
2 20-30	4(11.4)
3 30-40	7 (20.0)
0 40-50	10 (28.6)
5 50-60	6 (17.1)
>>60	8 (22.9)
Sex	
Male	26(74.3)
Female	9(25.7)
Education	
Illiterate	4 (11.4)
Primary	6(17.1)
Secondary	8 (22.9)
Graduate and above	14(40.0)
No formal education	3(8.6)
Occupation	
Unemployed	7 (20.0)
Skilled worker	11(31.4)
Unskilled worker	17(48.6)
Marital status	
Unmarried	2 (5.7)
Married	33 (94.3)
Religion	
Hindu	23 (63.7)
Sikhism	11 (31.4)
Islam	1 (2.9)
Type of family	
Nuclear	25 (71.4)
Joint	10 (28.6)
Working family members	
≤2	28(80.0)
>2	7(20.0)
Per-capita income	
7 7533 and above (Higher class)	12(34.3)
3 3766-7533 (Higher middle class)	15(42.9)
2 2260-3765 (Middle class)	3(8.6)
1 1130-2259 (Lower middle class)	3(8.6)
1 1129 and above (Poor)	2(5.7)

Mean± SD (Range) Age (years): 47.45± 14.52 (23-75):
Per capita income (rupees): 5642.85± 2924.87 (800-10,000)

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Clinical profile of the participants: More than half of the participants, 19(54.3%) were having eye injury, 17.1% of participants were diagnosed with glaucoma, and 14.3% had cataract. No co-morbidity was reported by 22(62.9%) participants while others were having diabetes (11.4%) and hypertension (20%). Only 5.7% of participants reported previous eye injury. Family history of diabetes and hypertension was reported by 11(31.4%) and 9(25.7%) participants, respectively. More than half of the participants had no addiction, while alcohol consumption was reported by 10(28.0%) participants. (Table-2)

Observation of eye drop administration among participants: It was observed in the pre-test that administration and replacement of the medication were accurately performed by maximum participants i.e. 33(94.3%), whereas a few steps like- performing three checks, cleaning of the eye and pressing the inner canthus, were performed by least number of the participants. However, in the post-test observation no.3, it was observed that steps like hand-washing, identification of the medication, looking upward while instilling the medication, not rubbing the eye and replacing the medication after use was performed by more than 90% of the participants correctly. From pre-test to post-test observation 3 there was a consistent improvement in the step of not touching the dropper while instilling the medication from 31.4% to 80% and, pressing the inner canthus after eye administration by 85.7%. (Table - 3)

Table 2:-Clinical profile of participants (N=35)

Category	Frequency (%)
Diagnosis	
Eye injury	19(54.3)
Glaucoma	6(17.1)
Cataract	5(14.3)
Bullous keratopathy	3(8.6)
Retinal detachment	2(5.7)
Co-morbidities	
No co-morbidity	22 (62.9)
Diabetes	4 (11.4)
Hypertension	7 (20.0)
Previous trauma/ injuries of eye	2 (5.7)
Family history	
Diabetes	11 (31.4)
Hypertension	9 (25.7)
Both	14 (40.0)
Nothing significant	1 (2.9)
Treatment of eye disease	
Old patients	26 (74.3)
New patients	9 (25.7)
Any addiction	
Alcohol	10(28.0)
Smoking	4(11.4)
No addiction	21(60.0)

Table 3 :- Observation of eye drop administration among participants (N=35)

Components of check List	**Number of participants who performed correct steps of self-eye administration**			
	Pre-test Observation n(%)	**Post-Test observation**		
		Observation 1 n(%)	**Observation 2 n(%)**	**Observation 3 n(%)**
1. Hand washing	5(14.3)	30(85.7)	28(80.0)	34(97.1)
2.Identification of medication	10(28.6)	28(80.0)	30(85.7)	32(91.4)
3.Three checks Performed	1(02.9)	17(48.6)	21(60.0)	25(71.4)
4.Cleaning of eye	2(05.7)	20(57.1)	22(62.9)	26(74.3)
5. Don't touch the dropper	11(31.4)	13(37.1)	23(65.7)	28(80.0)
6. Look upward	33(94.3)	31(88.6)	33(94.3)	34(97.1)
7. Make pouch of lower eyelid	17(48.6)	21(60.0)	28(80.0)	29(82.9)
8. Bring dropper Close	9(25.7)	15(42.9)	16(45.7)	29(82.9)
9.Administration of the Medication	33(94.3)	28(80.0)	29(82.9)	34(97.1)
10. Release the lower eyelid	17(48.6)	22(62.9)	27(77.1)	30(80.0)
11. Press the inner canthus	0(00.0)	13(37.1)	25(71.4)	30(85.7)
12.Remove the excess fluid	8(22.9)	16(45.7)	18(51.4)	30(85.7)
13.Eye not be rubbed	22(62.9)	21(60.0)	22(62.9)	32(91.4)
14. Hand hygiene	18(51.4)	24(68.6)	25(71.4)	32(91.4)
15. Replaced Medication	33(94.3)	34(97.1)	33(94.3)	35(100)

Performance score of self administration of eye drops: Figure 1 depicts the score and practice of checklist of eye administration. In pre-test observation, average performance score was observed in 21(60%) participants who gradually increased to good performance score among 21(60%) participants and excellent performance score among 13(37.20%) participants in the post-test observation no.-3. Mean performance score showed a consistent increase from pre-test to post-test observation no.-3 i.e. from 6.25 to 12.91. (Fig. 1)

Comparison of pre-test and post-test observations: In every observation, there was a significant improvement in the skill as compared to the previous one. The mean difference between pre-test observation and post-test observation 1 was 3.25, which changed to a mean difference of 4.88 in the pre-test to post-test observation 2 and 6.65 in the pre-test to post-test observation- 3. The mean score difference after each observation was statistically significant ($p<0.001$) as per post hoc ANOVA Bonferroni test. (Table - 4)

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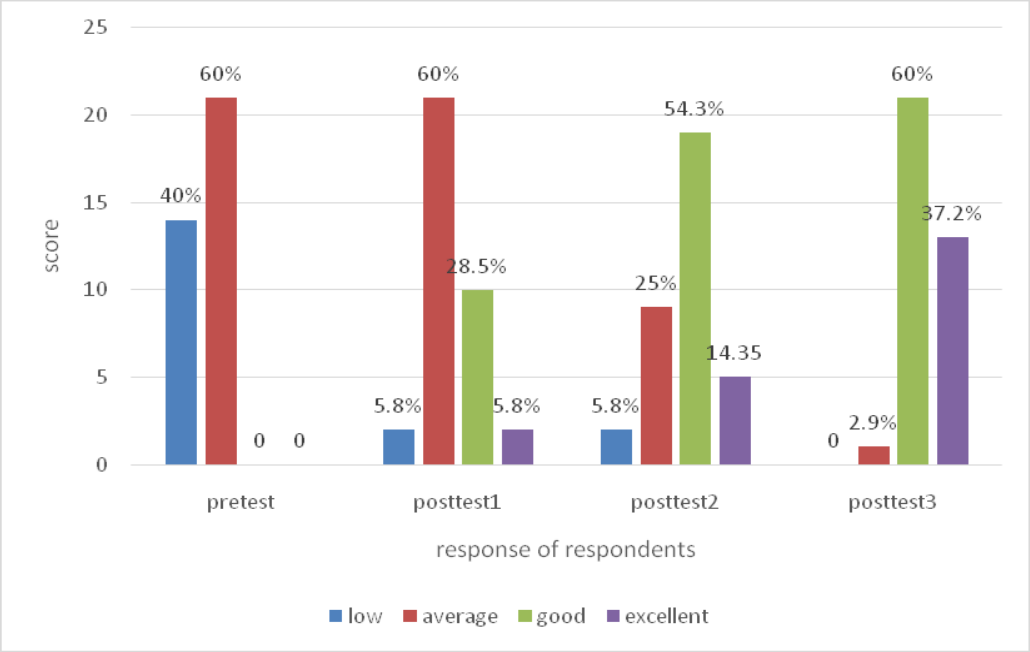

Figure-1: Performance score of self administration of eye drops

Table-4: Comparison of pre-test and post test performance score:-

Observations		Performance Score		
		Mean difference	Standard error	Significance
Pre- test observation	Post-test observation-1	-3.25	0.56	<0.001
	Post-test observation-2	-4.88	0.56	<0.001
	Post test observation-3	-6.65	0.56	<0.001
Post-test observation-1	Post –test observation-2	-1.62	0.56	<0.001
	Post-test observation-3	-3.40	0.56	<0.001
Post-test observation-2	Post-test observation-3	-1.77	0.56	<0.001

Table-5: Impact of the different variables on the performance score of observations:-

	Unstandardized coefficients		Standardized Coefficients	T	Significance	95.0% confidence interval for B	
Sex	-1.28	1.10	-.36	-1.16	0.25	-3.54	0.97
Age	-.02	0.02	-.20	-1.08	0.28	-.06	-.01
Occupation	-.21	0.59	-.10	-.35	0.72	-1.4	1.00
Education	-.21	0.24	-.16	-.90	0.37	-.70	0.27
Type of family	0.41	0.62	-.12	-.66	0.51	-.86	1.69

Impact of the different variables on performance scores: A linear regression analysis concluded that there is no significant impact of sex, age, occupation, education and type of family on the difference between the scores of pre-test and post-test observation-3. (Table-5)

IV. Discussion

Topical medications play an essential role in the treatment of eye disorders. To achieve a desired therapeutic outcome, proper administration of topical medication is important. Proper administration of eye drops includes compliance and performance. Correct administration of the eye drops is affected by various factors such as visual acuity, age and co-morbid conditions. Various studies have shown that patients experience difficulty in self-administration of eye drops.[6] Hence it was felt important to teach the correct self-administration procedure of eye drops to patients needing regular administration of eye drops.

There are many factors that influence self-administration of eye drops.[6] Most studies have reported default in eye drop administration include a feeling of having recovered from the illness, inability to purchase the medication, carelessness, refusal to take medication, and misunderstanding[3]. In the present study, patients were not able to instill the drops without touching the dropper. Either a drop was not instilled, or more drops were instilled.

In the present study, a demonstration of self-administration of eye drops was given and re-demonstrations were taken from respondents. Patients were approached to exhibit how they ordinally impart eye drops. The procedure was observed and evaluated. Regardless of whether the patient had been recently told the best way to impart drops, the quantity of eye drugs utilized, and self-perceived trouble of utilizing eye drops were likewise recorded. The performance score of eye-drop administration during pre-test of all participants was in the category of average performance or poor performance. During the first pre-test observation, 28.5% of participants scored

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good performance score, and 5.7% were able to obtain an excellent performance score. While doing the second post-test observation, 54.3% of participants achieved good performance score, and 14.3% of participants scored excellently. Third and last post-test observation implies that 60% score a good performance score and 37.2% scored excellently.

It is touching the eye lid with the tip of dropper contaminants the dropper, which can contaminate the eye and eye drops as well. This can further cause conjunctival inflammation, ocular surface irritation, and ultimately may lead to medication discontinuation. Instillation of contaminated eye drops after eye surgeries may cause bleb-related infections.[6] If microbial contamination goes unnoticed, there is the potential risk for serious complications, such as bacterial keratitis, especially if there is co-existing ocular surface disease.[6] In the present study, 31.4% of thirty-five patients did not touch the tip of the dropper in the first observation, which improved until the last observation.

Previous studies also found high rates of poor drop techniques. It was reported in the study of Brown *et al.*, that 13% of patients were not able to instill a drop in their eye after care attempt and 80% of them touched the dropper tip with eye lid or lashes.[8] Factors associated with poor eye instillation techniques were limited school education, older age and poor vision[7]. Likewise, in the present study, patients could not instill the drops without touching the tip of the dropper and drops were missed. And the necessity of hand washing was ignored due to lack of knowledge. All these mistakes during pre-test were improved during the last return-demonstration.

All patients should be educated about the correct eye drop administration technique as in the present study 37.2% of patients could only recall receiving any instillation previously. Moreover, patients showing poor technique were mostly unaware that they could have a problem with eye drop administration. During pre-test, patients were not performing three checks due to routinely administration of eye drops. Hand hygiene was another factor missed during instillation as patients were not aware of the importance of hand hygiene before and after instilling the medication. Most common problems reported by patients in the present study included squeezing the bottle dropper, targeting the eye drop, forgetting to instill drops in time, and difficulty puncturing the dropper and extra drops instillation. Brown *et al*., reported that older people had difficulty or have an unsuccessful self-administration.[8] Self-administration can be difficult for elderly patients and even more troublesome among glaucoma patients with depression of fields or due to the presence of other vision hampering ocular conditions.[6] Improper drop administration is equivalent to non-compliance and may result in poor ocular pressure control despite the patient's compliance with the medication.

The study design has limitations. Due to the COVID-19 pandemic, only fewer patients were available for the study. The sample size was reduced to 35. Patients may have felt being pressurized to perform in front of health professionals. This may have had a positive or negative effect on the performance of the procedure. We did not assess whether the patient was left or right-handed, which might have influenced the ability to impart the eye drops. The patients were not followed up, which would give important information about the success of treatment. Likewise, small sample size and not using a videotaped method for observation of eye instillation technique were the other limitations of the study.

To conclude, the study showed that self-administration skills improved from pre-test to the last observation of the post-test. Skills developed in participants, although participants took different time. Mostly participants performed well, and their skills got enhanced after doing the first return demonstration. Participants learned the correct technique of self-administration of eye drops by the end of the third return demonstration.

It is recommended that the drop administration strategy is routinely instructed and evaluated for patients. Proper preparation of patients with respect to self-administration of eye drops is routinely provided by nursing staff working in the Eye Centre to enhance and monitor patient's abilities and correct them. Nursing Educators should educate nursing students regarding the skills of self-administration of eye drops so that they can teach patients. Reinforcement of the correct eye drop instillation technique should be done during subsequent visits to the Eye Centre, with the periodic observation of the patient's skills in self-administration of eye drops. It will accordingly help in improving the adherence to the eye drops administration.

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