The Effectiveness of a Nurse-led Glaucoma Education on Patient Knowledge and Compliance Motivation Levels: A 1-year Prospective Case Series

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Abstract

Purpose: To evaluate the impact of a nurse-led glaucoma education program on patient knowledge and compliance levels in an Asian population.

Materials and Methods: A 1-year prospective case series involving 69 adult glaucoma patients. Each patient attended a standardized nurse-led glaucoma education session. A questionnaire was administered by a single nurse-clinician and analyzed at three time points (preeducation for baseline, immediately posteducation, and at the 1-year follow-up) to evaluate for associations with patient knowledge and compliance motivation levels.

Results: A total of 64 patients were included in the final analysis. Patients with higher educational qualifications or who were employed had better baseline knowledge of glaucoma. Younger patients had higher baseline compliance motivation levels. Immediately posteducation, both median patient knowledge score and compliance motivation levels had a statistically significant increase. Patients on more glaucoma eye drops had greater immediate improvement in confidence in eye drop application. Patients with more positive Humphrey visual field mean deviation values had a greater immediate improvement in confidence in their understanding of glaucoma. A total of 34 patients were readministered the questionnaire at the 1-year time point. Median score for patient knowledge was highest at this point. Employed patients demonstrated better patient knowledge at baseline and at 1-year time point compared to unemployed patients. Unemployed patients experienced a significant improvement in scores from baseline to immediately posteducation, but improvement from immediately posteducation to the 1-year time point was insignificant was insignificant.

Conclusion: Our study has examined the effectiveness of a nurse-led glaucoma education program in an Asian population, demonstrating improvement in both patient knowledge and compliance motivation levels up to 1 year after intervention.

Keywords: Compliance motivation, Glaucoma, Knowledge, Patient education.

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Introduction

Glaucoma is characterized by optic disc damage and visual field loss, for which intraocular pressure (IOP) is a major modifiable risk factor.[1] Patients with glaucoma usually remain asymptomatic and present late in the disease course when visual fields are significantly affected.[2–4] The global burden of glaucoma will continue to increase. The World Health Organization (WHO) statistics demonstrate glaucoma to be the leading cause of irreversible blindness,[5] with the global prevalence of glaucoma estimated to increase from 64.3 million (2013) to 111.8 million (2040).[6] A challenge in controlling glaucoma progression remains the patient's motivation and compliance to treatment.[7] Poor compliance may be attributed to a lack of patient awareness and education.[8–10] Among Singaporean patients, the adherence rate to glaucoma treatment has been reported to be as low as 19.7%.[11] Patient education programs aimed at improving patient compliance have been explored—patients with a better understanding and insight of their disease are expected to be able to better comply with treatment.[12]

Glaucoma has a higher incidence in Asian populations.[13,14] In Singapore, studies have reported the age-standardized prevalence of glaucoma in Chinese, Malays, and Indians to be 3.2, 3.4, and 1.95%, respectively.[15–17] However, to the best of our knowledge, no study thus far has evaluated the effectiveness of a nurse-led glaucoma patient education program in a tertiary center in Asia. This study aims to investigate the impact of a nurse-led education program on the knowledge and compliance motivation levels of glaucoma patients in an Asian population.

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Materials and Methods

This prospective interventional case series was approved by the institution's ethical review committee and was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki.

A A total of 69 patients were recruited from the National Healthcare Group Eye Institute, Tan Tock Seng Hospital, Singapore.

Each patient attended a standardized nurse-led glaucoma education session conducted by a glaucoma nurse-clinician. Each session comprised didactic glaucoma education modules as well as practical training in eye drop application. A questionnaire (Table 1) was administered to each patient at three time points—once before the education session, once immediately after the session, and once more 1 year after the session. The questionnaire was administered by a glaucoma nurse-clinician. All answers were recorded by the patient on the questionnaire response sheet.

Questionnaire

The questionnaire was developed by the authors (SJJ, AB, CH) to assess a patient's knowledge and compliance motivation levels. The authors modified validated questionnaires, including National Eye Health Education Program (NEHEP) Eye-Q Test, Gray's questionnaire, Prevent Blindness America Glaucoma Eye-Q test, and Hoevenaars' Questionnaire,[17,18] contextualizing the content to the local populace.

Table 1: Questionnaire for glaucoma education

Section A	
Domain	*Item synopsis (true/false/unsure)*
Knowledge of glaucoma disease, risk factors, investigations, and treatment	1. Glaucoma can lead to blindness
	2. High eye pressure can cause worsening of glaucoma
	3. Glaucoma always has symptoms
	4. Vision already damaged due to glaucoma can be reversed
	5. Glaucoma can be controlled
	6. A glaucoma exam consists only of testing your eye pressure. No other test is needed
	7. Medications (eye drops) can help to prevent glaucoma from getting worse
	8. Surgery may be required if your glaucoma is advanced
	9. If your family members have glaucoma, you are at higher risk of having glaucoma too
	10. Medications (eye drops) for glaucoma will make your vision much clearer
	11. It is okay not to come for your clinic appointments because glaucoma is not a serious disease
Section B	
Domain	*Item synopsis (5-point agree/disagree scale)**
Patient motivation and compliance	1. I am confident that I know how to put my eye drops correctly
	2. I am motivated to use my eye drops every day
	3. I will try my best to come for all my glaucoma appointments
	4. I understand glaucoma and its treatment
Patient satisfaction (to be answered only after the glaucoma education session)	5. I am satisfied with this glaucoma education session

*Agree/disagree scale response options (from 1 to 5): strongly disagree, disagree, neutral, agree, and strongly agree

The questionnaire consisted of two sections—(1) 11 true-false questions which assessed for patient knowledge on glaucoma and (2) four subjective rating questions which assessed patient compliance motivation levels for treatment and follow-up on a 5-point agree/disagree scale (Table 1). Patient knowledge levels of the disease were measured by the patient's total score from their responses to the 11 true-false questions, with the number of correct answers summed and ranging from 0 to 11. No negative marking was incorporated. Patient compliance motivation levels were assessed by comparing the medians of each of the four questions with a 5-point agree/disagree scale. The questions were designed to assess the patient's confidence in eye drop application, compliance motivation to eye drop application, follow-up, and insight into their disease.

Other data collected included patient demographics, visual acuity, glaucoma type and severity, number of eyedrops needed, and number of outpatient clinic visits.

Statistical Analysis

The data collected was analyzed at three time points—(1) before the education program, (2) immediately posteducation on conclusion of the nurse education session, and (3) 1 year posteducation. To determine the immediate effectiveness of the glaucoma education program, McNemar's test analysis and Wilcoxon signed-rank tests were used to analyze the differences in patient knowledge and compliance motivation levels before and immediately after the session. A statistically significant test indicated that the proportions or medians compared were different between the two time points. One-way analysis of variance (ANOVA) on ranks and Spearman's correlation analysis were used to evaluate associations between baseline level and the degree of improvement in knowledge and compliance motivation and the abovementioned patient characteristics.

At the 1-year posteducation time point, the Friedman test with *post hoc* analysis using Wilcoxon signed-rank tests (Bonferroni-adjusted α value) was conducted to measure knowledge and compliance motivation levels. One-way ANOVA with repeated measures was used to evaluate for associations between patient characteristics and knowledge or compliance motivation at the 1-year time point.

All statistical analyses were conducted with Statistical Package for the Social Sciences (SPSS) for Windows (version 25.0; SPSS, Inc., Chicago, Illinois, United States of America).

RESULTS

Out of the 69 patients recruited, five patients were excluded from the study as their questionnaire forms were either nonlegible or incomplete. A total of 64 patients were included in the final analysis. The mean age of the included patients was 66.3 ± 11.1 (range 29–87) years. The demographic data of the recruited patients are shown in Table 2.

Baseline Knowledge and Compliance Motivation Levels

Before participating in the education program, none of the patients ($n = 0$) could correctly answer all 11 true-false knowledge questions. The maximum score attained at baseline was 10 out of 11, which 3.1% of patients ($n = 2$) attained. The minimum score attained was 0 out of 11, which 1.6% of patients ($n = 1$) attained. Patients with higher educational qualifications ($\chi^2 = 14.87$, $p = 0.002$) or who were employed ($\chi^2 = 4.58$, $p = 0.032$) demonstrated better baseline knowledge of glaucoma. There was a trend toward younger patients

Table 2: Demographics of included patients in the study immediately posteducation (*n* = 64)

Demographic variable	n (%) or mean (SD)
Age, mean years (SD)	66.3 (11.1)
Race, *n* (%)	
Chinese	54 (84.3)
Malay	5 (7.8)
Indian	4 (6.3)
Others	1 (1.6)
Gender, *n* (%)	
Male	36 (56.3)
Female	28 (43.7)
Language, *n* (%)	
English	23 (35.9)
Mandarin	25 (39.1)
Malay	1 (1.6)
Others	5 (7.8)
Missing from data collection system	10 (15.6)
Highest education level, *n* (%)	
None	2 (3.1)
Primary education	6 (9.4)
Secondary education	18 (28.1)
Tertiary education	25 (39.1)
Above tertiary education	13 (20.3)
Working status, *n* (%)	
Employed	22 (34.4)
Unemployed/retired	42 (65.6)
Glaucoma subtype (right eye, left eye), *n* (%)	
None	7 (10.9), 3 (4.7)
POAG, normal-tension glaucoma	34 (53.2), 31 (48.4)
Glaucoma suspect, ocular hypertension	14 (21.9), 20 (31.3)
Primary angle closure glaucoma	6 (9.4), 5 (7.8)
Secondary glaucoma	2 (3.1), 3 (4.7)
Primary angle closure suspect, primary angle closure	1 (1.5), 2 (3.1)
Glaucoma severity, mean (SD)	
Best corrected visual acuity, best eye logMAR	0.13 (0.10)
Cup-to-disk ratio, best eye	0.62 (0.20)
Humphrey visual field mean deviation, best eye	−6.37 (7.10)
Number of eye drops used, mean (SD)	1.44 (0.72)
Number of visits to eye clinic, mean (SD)	
General clinic	7.53 (4.04)
Glaucoma clinic	2.89 (3.35)

having higher baseline compliance motivation levels ($r = −0.331$, $p = 0.08$).

Immediate Posteducation

Immediately after administration of the education program, the maximum score attained by all patients remained at 10 out of 11. However, more patients (12.5%, $n = 8$; compared to 3.1%, $n = 2$) were now able to attain this score. The minimum score was increased to 3 out of 11 (1.6%, $n = 1$). Figure 1 shows the results before and immediately after administration of the glaucoma education program. Table 3 shows the significance of changes in patient knowledge about glaucoma in each question using McNemar analysis. There was an improvement in the mean score of every

question, with the exception of question nine, which had a statistically significant decrease in its mean score. Analysis showed a statistically significant improvement in questions one, two, five, seven, and 10, an asymptotically significant improvement in questions four, six, and eight, and a statistically insignificant improvement in questions three and 11.

In terms of patient knowledge, Wilcoxon signed-rank test also showed that immediately posteducation, there was a statistically significant improvement in score ($z = 5.536$, $p = 0.00$) with a medium effect size ($r = 0.48$) as the median patient knowledge score increased from 5.6 to 7.8 out of 11.

For compliance motivation levels, there was an increase in the compliance motivation levels based on each of the four questions
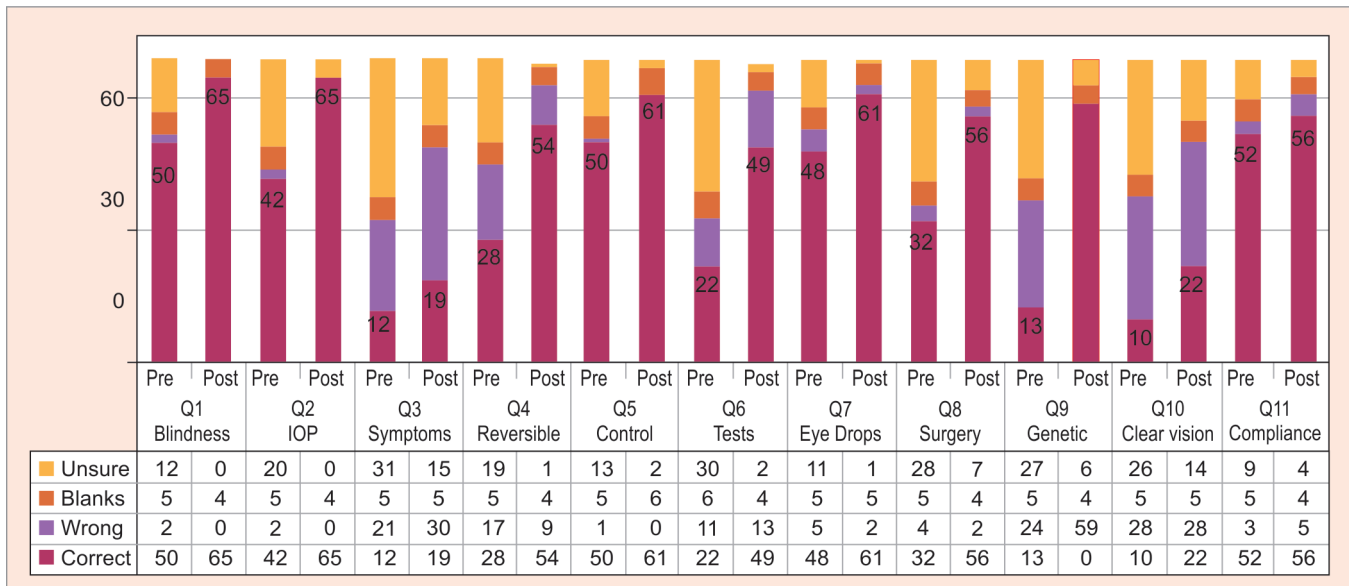
Fig. 1: Comparison of the proportion of answers for each question on patient knowledge between pre and posteducation. All questions had an absolute increase in the number of correct answers, with the exception of question nine (which tested on the genetic component of glaucoma) which had a decrease in the number of correct answers

Table 3: Comparison of patient knowledge mean scores between preeducation and immediately posteducation

Domain questions	*Preeducation* (SD)[†]*	*Posteducation* (SD)[†]*	*p-value (two-tailed)*
1. Glaucoma can lead to blindness	0.78 (0.42)	1.00 (0.00)	0.00
2. High eye pressure can cause worsening of glaucoma	0.66 (0.48)	1.00 (0.00)	0.00
3. Glaucoma always has symptoms	0.19 (0.39)	0.30 (0.46)	0.12
4. Vision already damaged due to glaucoma can be reversed	0.44 (0.50)	0.84 (0.37)	0.00[‡]
5. Glaucoma can be controlled	0.78 (0.42)	0.97 (0.18)	0.002
6. A glaucoma exam consists only of testing your eye pressure. No other test is needed	0.35 (0.48)	0.77 (0.43)	0.00[‡]
7. Medications (eye drops) can help to prevent glaucoma from getting worse	0.75 (0.44)	0.95 (0.22)	0.004
8. Surgery may be required if your glaucoma is advanced	0.50 (0.50)	0.86 (0.35)	0.00[‡]
9. If your family members have glaucoma, you are at higher risk of having glaucoma too	0.20 (0.40)	0.00 (0.00)	0.00
10. Medications (eye drops) for glaucoma will make your vision much clearer	0.16 (0.37)	0.33 (0.48)	0.003
11. It is okay not to come for your clinic appointments because glaucoma is not a serious disease	0.81 (0.39)	0.86 (0.35)	0.63

*mean score ranging from 0 (wrong answer) to 1 (correct answer); [†]SD, standard deviation; [‡], asymptotic *p*-value

with the 5-point agree/disagree scale (Fig. 2). Wilcoxon signed-rank test showed a statistically significant increase in median compliance motivation scores across all four questions immediately after glaucoma patient education (Table 4).

In terms of associations found, patients on more glaucoma eye drops demonstrated greater immediate improvement in confidence in eye drop application (improvement = 0.301, $p = 0.029$). Patients with more positive Humphrey visual field mean deviation values had a greater immediate improvement in confidence in their understanding of glaucoma ($r = 0.358$, $p = 0.006$). No other significant association could be found between immediate improvement of patient knowledge or other domains of compliance motivation and patient characteristics.

At 1-year Follow-up

Of the original 64 patients that were recruited, only 34 patients were readministered the questionnaire at the 1-year posteducation

time point. The remaining 30 patients were either lost to follow-up or declined to complete the questionnaire. Out of the 34 patients, 61.8% ($n = 21$) were males, and 38.2% ($n = 13$) were females. The difference in the medical median knowledge scores across the three time points—at preeducation (five out of 11), immediate posteducation (seven out of 11), and 1-year posteducation (eight out of 11) time points; were statistically significant. Results at the 1-year time point had the highest median score ($p < 0.001$). Pairwise comparisons using Wilcoxon signed-rank tests (Bonferroni-adjusted α value) were significant ($p < 0.017$).

With regard to compliance motivation, responses were statistically significant across all three time points involving patient confidence in eye drop application ($p < 0.001$), compliance to medication ($p = 0.002$), compliance to follow-up ($p < 0.001$), and insight of disease ($p < 0.001$). The mean scores were higher at the 1-year time point across all the above four components testing for compliance motivation.

Patients' Education Levels

Patients with at least tertiary education scored higher in the patient knowledge domain compared to patients with primary or lower educational levels at baseline (by 2.8 points, $p = 0.02$) and at the 1-year time point (by 1.7 points, $p = 0.005$). There was a statistically significant improvement in scores immediately posteducation for patients with secondary education or lower ($p < 0.05$), but the improvement was not significant from the immediate posteducation time point to the 1-year time point ($p > 0.05$). Patients with at least tertiary education had a statistically insignificant increase in knowledge scores at both the immediate (by 1.1 points, $p = 0.06$) and 1-year (by 1.2 points, $p = 0.14$) posteducation time points. Figure 3 shows the association between the patient's education level and the outcomes of the glaucoma education program on patient knowledge at the three time points.

Employment Status

Employed patients scored higher for the patient knowledge domain at baseline (by 2.3 points, $p = 0.006$) and at the 1-year time point (by 1.5 points, $p < 0.001$) compared to unemployed patients. Unemployed patients experienced a significant improvement in scores from baseline to immediate posteducation (by 2.7 points, $p < 0.001$), but the improvement from the immediate posteducation to 1-year time point was not significant (by 0.44 points, $p = 0.57$). Employed patients did not demonstrate a significant increase in scores at any time point compared to baseline (by 1.3 points, $p = 0.13$ at immediate posteducation; by 1.1 points, $p = 0.08$ at 1-year posteducation). Figure 4 illustrates the association between the patient's employment status and the outcomes of the glaucoma education program on patient knowledge at the three time points.

Patient age, gender, race, language, glaucoma type and severity, visual acuity, or number of outpatient clinic visits were not found to influence outcomes at the 1-year time point.
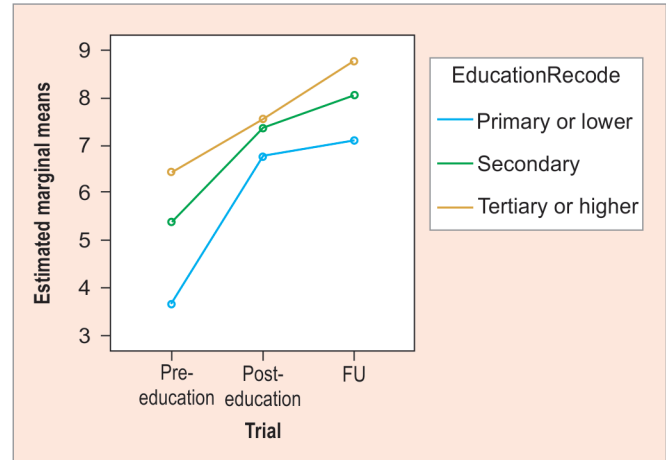

Fig. 3: Comparison of the estimated marginal means of the total score for patient knowledge across three time points for patients with different educational levels. Patients with higher educational levels consistently showed higher levels of knowledge on glaucoma at all three time points
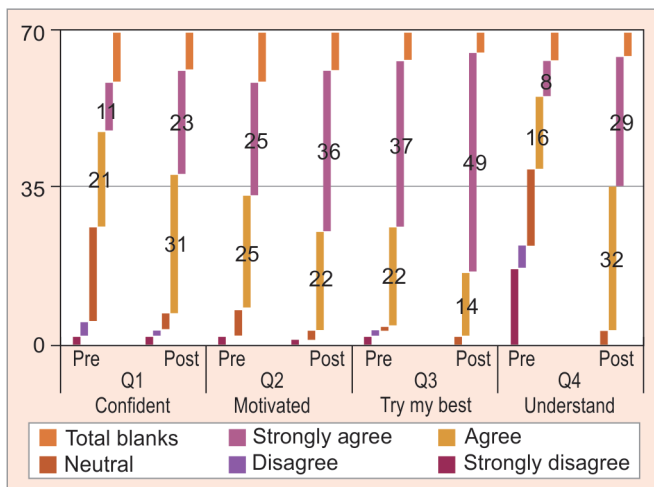

Fig. 2: Comparison of the proportion of answers for each question on compliance motivation between pre and posteducation time point
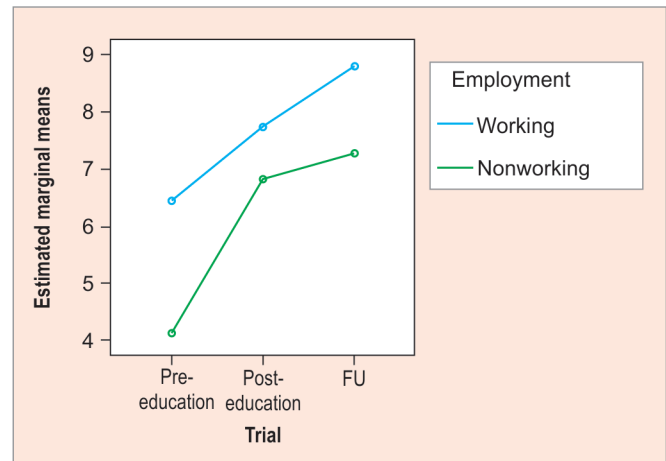

Fig. 4: Comparison of the estimated marginal means of the total score for the patient knowledge across three time points for patients with different employment status. Employed patients consistently showed higher levels of knowledge on glaucoma at all three time points

Table 4: Wilcoxon signed-rank test for comparison of compliance motivation median scores between preeducation and immediately posteducation

Domain questions	Preeducation*	Posteducation*	Absolute difference[†]	Z statistic	p-value	Effect size (r-value)
1. I am confident that I know how to put my eye drops correctly	3.62	4.18	+0.56	3.504	0.00	0.32
2. I am motivated to use my eyedrops every day	4.22	4.52	+0.30	2.284	0.02	0.21
3. I will try my best to come for all my glaucoma appointments	4.44	4.75	+0.31	3.079	0.02	0.27
4. I understand glaucoma and its treatment	2.89	4.41	+1.52	5.932	0.00	0.53

*median score from 1 to 5; [†], comparing posteducation and preeducation score

DISCUSSION

To the knowledge of the authors, this study is the first of its kind to evaluate the effectiveness of a nurse-led glaucoma patient education program on patient knowledge and compliance motivation levels in an Asian population. Our findings mirror prior studies in other populations, which have similarly shown improvement in both patient knowledge and compliance motivation immediately after patient education. Skalicky et al., in a randomized controlled trial involving 101 newly diagnosed glaucoma patients in Australia, demonstrated a significant increase in their knowledge levels 4 weeks after the glaucoma patient education intervention.[19] The EQUALITY study conducted in Alabama, America, involving 518 subjects with a follow-up period of 2–4 weeks, showed a post-intervention improvement in patient knowledge.[20] Djafari et al.[21] demonstrated better patient compliance to treatment, perception of the importance of treatment, and eye drop instillation technique after a glaucoma educational intervention program involving 165 subjects in Montreal, Canada, over a follow-up period of 1 year.[21] Kim et al. and Rosenthal et al. also reported similar short-term improvements in patient knowledge and compliance motivation levels after a glaucoma educational intervention program.[22,23]

Immediate Effectiveness of Program on Patient Knowledge Levels

Our study demonstrated an immediate improvement in the mean scores of 10 out of the 11 (90.9%) true-false questions on patient knowledge. Only question nine, section A, which tested the patient's knowledge on the genetic component of the risk factors of glaucoma, demonstrated a decrease in the mean score from 0.20 to 0.00 (out of 1.00) immediately after patient education, with none of the patients answering the question correctly. This may reflect the higher complexity of the concept of genetically determined risk factors in glaucoma, which the general population may find challenging to comprehend. It also reflects the need to improve this aspect of our patient education program. At baseline, patients who were employed or had higher educational levels displayed better baseline knowledge of glaucoma before undergoing the education program. This association is unsurprising and has been demonstrated in studies. Maharana et al. showed that patients who were educated until high school or above were more likely to be aware of glaucoma [odds ratio (OR), 24.74].[24] Kim et al. have also demonstrated a similar association in their studies.[22] Danesh-Meyer et al. have suggested that patients with higher socioeconomic and education levels presented to an ophthalmologist earlier had easier access to various sources of education and were more motivated to understand the disease.[2,25–28] Paasche-Orlow et al. demonstrated that lower educational levels, on the other hand, are associated with limited health literacy, which could negatively affect patient knowledge.[22,29,30]

Our results did not show any association between the patient's baseline knowledge and their age, gender, race, language, glaucoma type or severity, visual acuity, or number of outpatient clinic visits. This was similarly consistent with the results from other studies.[21,23]

Immediate Effectiveness of Program on Patient Compliance Motivation Levels

Younger patients appeared to possess higher baseline compliance motivation levels. Osman et al. demonstrated that noncompliance to glaucoma treatment was higher among the older patients.[31] Our collective findings may suggest that it may be more crucial for glaucoma patient education programs to target the elderly population.[32] While previous studies found that patients with lower education levels had lower compliance motivation levels,[33] we did not find this association in our study.

Interestingly, our study has revealed that patients on both ends of the disease severity spectrum, that is, patients treated with more eye drops (suggesting greater disease severity) and patients who had less severe visual field defects (suggesting lower disease severity), may be able demonstrate significant improvement in compliance motivation levels immediately after patient education. While it was not possible to collect data in our study to support this postulation, it is plausible that patients with less severe glaucoma may have been more recently diagnosed and feel that, with only mild glaucomatous damage, their remaining good vision is "worth" preserving, hence are more motivated to comply with treatment. Patients with more advanced disease, having understood that they are at risk of losing their vision entirely should their glaucoma progress, may be similarly motivated to comply with treatment due to fear of complete visual loss.

1-year Follow-up on Patient Knowledge Levels

At the 1-year time point, patients continued to show sustained improved levels of knowledge. The median score in the domain of patient knowledge was the highest at the 1-year follow-up time point. This contrasts with the results of two other studies, which suggested that long-term impact of glaucoma education programs on patient knowledge was minimal after 6 months.[22,23] Various factors could account for this difference—these two studies were conducted in the years 1983 and 1997, respectively, when access to information was limited; in a more recent study by Djafari et al., participants who have undergone an education program demonstrated higher scores on eye drop instillation technique ($p = 0.0002$) compared to the control group even after 1 year of follow-up;[21] supporting the findings in our study.

1-year Follow-up on Patient Compliance Motivation Levels

The median score in the domain of compliance motivation was also the highest at the 1-year time point, suggesting the long-term effectiveness of the education program. Djafari et al. further demonstrated that participants in the intervention group had higher scores on questions regarding the importance of glaucoma eye drop therapy ($p < 0.0001$) after 1 year of follow-up.

The association between specific patient characteristics and patient knowledge levels appeared to be similar both immediately after administration of the glaucoma education program as well as 1 year later. Higher education levels and employment status were consistently associated with higher knowledge scores, with no other demographic factors influencing the outcomes of the nurse-led education program at the 1-year time point. Nonetheless, unemployed patients or those who possessed lower educational qualifications could still demonstrate a significant improvement in patient knowledge scores immediately after the education program, indicating that these intervention programs are still effective for these patient groups. Together, these findings may suggest a need for patient education programs to aggressively target those who are unemployed or possess lower educational qualifications.

Dropped Off Cohort at 1-year Follow-up

A total of 30 patients (46.9%) dropped off at the 1-year follow-up. Patients who dropped off tended to be unemployed or retired

Table 5: Demographics of dropped off patients in the study ($n = 30$)

Demographic variable	n (%) or mean (SD)
Age, mean years (SD)	66.8 (13.2)
Race, *n* (%)	
Chinese	26 (86.7)
Malay	2 (6.7)
Indian	2 (6.7)
Others	0 (0.0)
Language, *n* (%)	
English	9 (30.0)
Mandarin	12 (40.0)
Malay	1 (3.3)
Others	2 (6.7)
Missing from data collection system	6 (20.0)
Highest education level, *n* (%)	
None	2 (6.7)
Primary education	3 (10.0)
Secondary education	12 (40.0)
Tertiary education	9 (30.0)
Above tertiary education	4 (13.3)
Working status, *n* (%)	
Employed	6 (20.0)
Unemployed/retired	24 (80.0)
Glaucoma subtype (right eye, left eye), *n* (%)	
None	2 (6.7), 1 (3.3)
POAG, normal tension glaucoma	16 (53.3), 14 (46.7)
Glaucoma suspect, ocular hypertension	6 (20.0), 8 (26.7)
Primary angle closure glaucoma	5 (16.7), 4 (13.3)
Glaucoma severity, mean (SD)	
Best corrected visual acuity, best eye logMAR	0.13 (0.12)
Cup-to-disk ratio, best eye	0.60 (0.21)
Humphrey visual field mean deviation, best eye	−8.57 (8.29)
Number of eyedrops used, mean (SD)	1.68 (0.90)
Number of visits to eye clinic, mean (SD)	
General clinic	9.03 (4.52)
Glaucoma clinic	3.23 (3.25)

($p = 0.02$) or had more severe visual field loss ($p = 0.02$), reflecting more advanced glaucomatous disease (Table 5). Our results echo published literature of high drop-off rates (60.5% in the first year) from a glaucoma service.[34] Gupta et al. also reported that dropout after glaucoma surgery is high among patients from lower socioeconomic and education strata.[35] Further, the dropped-off cohort did not fare as well in immediate posteducation compared to those who completed the 1-year follow-up ($p = 0.03$). While not statistically significant, our study found that the drop-off cohort had lower baseline knowledge and compliance motivation levels ($p = 0.70$).

CONCLUSION

In conclusion, our study has examined the effectiveness of a nurse-led glaucoma education program in an Asian population, demonstrating improvement in both patient knowledge and compliance motivation levels up to 1 year after intervention.

Nurses are a valuable resource for patient education and may be an effective avenue for patient education, given the time limitations faced in a busy ophthalmology service. Subjects with lower education levels, who are unemployed as well as patients on both ends of the glaucoma severity spectrum, appeared to benefit most. Further research involving a larger study cohort over a longer follow-up period will better evaluate the longer-term impact of such a patient education program.

Limitations

Firstly, the small sample size of patients may not only affect the significance of study findings but also render the findings less representative of the local population.

Secondly, there is inherent selection bias as most of the patients seen in the glaucoma nurse education clinic were referred by ophthalmologists who deemed these patients to be already poorly compliant and less knowledgeable.

Thirdly, a significant proportion (30 patients, 46.9%) of the original 64 patients who underwent the initial glaucoma education program dropped off and could not be included in the final analysis of results at the 1-year time point. This may have affected the analysis and results of our study.

Finally, the study questionnaire administered has not been formally validated. However, the questionnaire content was adapted from validated questionnaires[17,18] and contextualized for the local populace.

References

1. Mantravadi AV, Vadhar N. Glaucoma. Prim Care 2015;42(3):437–449. DOI: 10.1016/j.pop.2015.05.008

2. Taylor SA, Galbraith SM, Mills RP. Causes of non-compliance with drug regimens in glaucoma patients: a qualitative study. J Ocul Pharmacol Ther 2002;18(5):401–409. DOI: 10.1089/10807680260362687

3. Attebo K, Mitchell P, Cumming R, et al. Knowledge and beliefs about common eye diseases. Aust N Z J Ophthalmol 1997;25(4):283–287. DOI: 10.1111/j.1442-9071.1997.tb01516.x

4. Fraser S, Bunce C, Wormald R. Risk factors for late presentation in chronic glaucoma. Invest Ophthalmol Vis Sci 1999;40(10):2251–2257. PMID: 10476790.

5. Deokule S, Sadiq S, Shah S. Chronic open angle glaucoma: patient awareness of the nature of the disease, topical medication, compliance and the prevalence of systemic symptoms. Ophthalmic Physiol Opt 2004;24(1):9–15. DOI: 10.1046/j.1475-1313.2003.00155.x

6. Degineh H, Giorgis AT. Glaucoma awareness among ophthalmic patients at Menelik II Hospital, Addis Ababa, Ethiopia. Ethiop J Health Dev 2013;27(3):230–234.

7. R S, Sinha A, Shetty N. A study of awareness of glaucoma among ophthalmology out patients in a 2-Tier City, Tumkur. Indian J Clin Exp Ophthalmol 2015;1(3):156–158.

8. Loon SC, Jin J, Jin Goh M. The relationship between quality of life and adherence to medication in glaucoma patients in Singapore. J Glaucoma 2015;24(5):e36–e42. DOI: 10.1097/IJG.0000000000000007

9. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. Health Educ Q 1988;15(2):175–183. DOI: 10.1177/109019818801500203

10. Kingman S. Glaucoma is second leading cause of blindness globally. Bull World Health Organ 2004;82(11):887–888. PMID: 15640929.

11. Tham YC, Li X, Wong TY, et al. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology 2014;121(11):2081–2090. DOI: 10.1016/j.ophtha.2014.05.013

12. Baskaran M, Foo RC, Cheng CY, et al. The prevalence and types of glaucoma in an urban Chinese population: the Singapore Chinese Eye Study. JAMA Ophthalmol 2015;133(8):874–880. DOI: 10.1001/jamaophthalmol.2015.1110

13. Shen SY, Wong TY, Foster PJ, et al. The prevalence and types of glaucoma in Malay people: the Singapore Malay Eye Study. Invest Ophthalmol Vis Sci 2008;49(9):3846–3851. DOI: 10.1167/iovs.08-1759

14. Narayanaswamy A, Baskaran M, Zheng Y, et al. The prevalence and types of glaucoma in an urban Indian population: the Singapore Indian Eye Study. Investigative Ophthalmol Vis Sci 2013;54(7):4621–4627. DOI: 10.1167/iovs.13-11950

15. Cook TD. Major research analysis provides proof: patient education does make a difference. Promot Health 1984;5(6):4–5, 9. PMID: 10317577.

16. Pantalon A, Feraru C. Non-parametric tests in detecting glaucoma progression. Rom J Ophthalmol 2017;61(3):212–218. DOI: 10.22336/rjo.2017.39

17. Rosdahl JA, Muir KW. Finding the best glaucoma questionnaire: a qualitative and quantitative evaluation of glaucoma knowledge assessments. Clin Ophthalmol 2015;9:1845–1852. DOI: 10.2147/OPTH.S90332

18. Gray TA, Fenerty C, Harper R, et al. Preliminary survey of educational support for patients prescribed ocular hypotensive therapy. Eye (Lond) 2010;24(12):1777–1786. DOI: 10.1038/eye.2010.121

19. Skalicky SE, D'Mellow G, House P, et al. Glaucoma Australia educational impact study: a randomized short-term clinical trial evaluating the association between glaucoma education and patient knowledge, anxiety and treatment satisfaction. Clin Exp Ophthalmol 2018;46(3):222–231. DOI: 10.1111/ceo.13016

20. Rhodes LA, Huisingh CE, McGwin G Jr, et al. Eye Care Quality and Accessibility Improvement in the Community (EQUALITY): impact of an eye health education program on patient knowledge about glaucoma and attitudes about eye care. Patient Relat Outcome Meas 2016;7:37–48. DOI: 10.2147/PROM.S98686

21. Djafari F, Lesk MR, Giguere CE, et al. Impact of a brief educational intervention on glaucoma persistence: a randomized controlled clinical trial. Ophthalmic Epidemiol 2015;22(6):380–386. DOI: 10.3109/09286586.2015.1083036

22. Kim S, Stewart JF, Emond MJ, et al. The effect of a brief education program on glaucoma patients. J Glaucoma 1997;6(3):146–151. PMID: 9211136.

23. Rosenthal AR, Zimmerman JF, Tanner J. Educating the glaucoma patient. Br J Ophthalmol 1983;67(12):814–817. DOI: 10.1136/bjo.67.12.814

24. Maharana PK, Rai VG, Pattebahadur R, et al. Awareness and knowledge of glaucoma in Central India: a hospital-based study. Asia Pac J Ophthalmol (Phila) 2017;6(3):243–249. doi: 10.22608/APO.2015166

25. Danesh-Meyer HV, Deva NC, Slight C, et al. What do people with glaucoma know about their condition? A comparative cross-sectional incidence and prevalence survey. Clin Exp Ophthalmol 2008;36(1):13–18. DOI: 10.1111/j.1442-9071.2007.01624.x

26. Hoevenaars JG, Schouten JS, van den Borne B, et al. Socioeconomic differences in glaucoma patients' knowledge, need for information and expectations of treatments. Acta Ophthalmol Scand 2006;84(1):84–91. DOI: 10.1111/j.1600-0420.2005.00587.x

27. Saw SM, Gazzard G, Friedman D, et al. Awareness of glaucoma, and health beliefs of patients suffering primary acute angle closure. Br J Ophthalmol 2003;87(4):446–449. DOI: 10.1136/bjo.87.4.446

28. Smith LK, Thompson JR, Woodruff G, et al. Social deprivation and age at presentation in amblyopia. J Public Health Med 1994;16(3):348–351. PMID: 7999389.

29. Paasche-Orlow MK, Parker RM, Gazmararian JA, et al. The prevalence of limited health literacy. J Gen Intern Med 2005;20(2):175–184. DOI: 10.1111/j.1525-1497.2005.40245.x

30. Juzych MS, Randhawa S, Shukairy A, et al. Functional health literacy in patients with glaucoma in urban settings. Arch Ophthalmol 2008;126(5):718–724. DOI: 10.1001/archopht.126.5.718

31. Osman EA, Alqarni BA, AlHasani SS, et al. Compliance of glaucoma patients to ocular hypotensive medications among the Saudi population. J Ocul Pharmacol Ther 2016;32(1):50–54. DOI: 10.1089/jop.2015.0052

32. Olthoff CM, Schouten JS, van de Borne BW, et al. Noncompliance with ocular hypotensive treatment in patients with glaucoma or ocular hypertension an evidence-based review. Ophthalmology 2005;112(6):953–961. DOI: 10.1016/j.ophtha.2004.12.035

33. Granstrom PA. Glaucoma patients not compliant with their drug therapy: clinical and behavioural aspects. Br J Ophthalmol 1982;66(7):464–470.

34. Ashaye AO, Adeoye AO. Characteristics of patients who dropout from a glaucoma clinic. J Glaucoma 2008;17(3):227–232. DOI: 10.1097/IJG.0b013e31815768b3

35. Gupta V, Chandra A, Yogi R, et al. Prevalence and causes of patient dropout after glaucoma surgery. Ophthalmic Epidemiol 2013;20(1):40–44. DOI: 10.3109/09286586.2012.741278