

Applying the Health Belief Model to predict preference for surgical intervention versus medical therapy among patients with open-angle glaucoma

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ABSTRACT

Objective To determine the factors influencing patient preference of surgical intervention versus medical therapy for open-angle glaucoma based on the Health Belief Model.

Methods and analysis The study is a cross-sectional study. The study was conducted on 309 patients having open-angle glaucoma attending glaucoma clinic at Alexandria Ophthalmology Hospital, Alexandria, Egypt. The patients were subjected to an interview questionnaire comprising demographic data, patient knowledge and beliefs about glaucoma, glaucoma medications and treatment options, and patient preference of treatment modality, based on the Health Belief Model.

Results About half of the patients (46%) were found to prefer surgical intervention. Patients were less knowledgeable about glaucoma, in general, but knowledge scores of patients preferring surgical intervention were significantly higher than those preferring medical therapy (Percentage Mean Score, PMS: 42.46%–37.37%, respectively). Male and female patients using more medications were significantly more likely to prefer surgical intervention ($p=0.015$ and $p=0.003$, respectively). Patients having preference for surgical intervention reported higher scores for perceived susceptibility and severity of long-term medical therapy (PMS=72.61% vs 54.62%–68.62% versus 52.83%, respectively), higher scores for perceived benefits of surgical intervention (PMS=92.90% vs 43.96%, respectively) and higher scores for self-efficacy (PMS=97.18% vs 50.37%, respectively). Meanwhile, they obtained lower scores for perceived barriers to surgical intervention (PMS=53.43% vs 86.07%, respectively).

Conclusions Male gender, increased number of used eye-drops and more knowledge about glaucoma were significantly associated with patient preference for surgical intervention. Perceived benefits and barriers and self-efficacy were the significant predictors for patient surgical preference.

INTRODUCTION

Glaucoma is the second-leading cause of blindness worldwide.¹ The most common type of glaucoma is open-angle glaucoma

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Glaucoma medical therapy and glaucoma surgery have a similar impact on both visual outcome and quality of life.

WHAT THIS STUDY ADDS

⇒ Patient gender, burden of used medication, knowledge and health beliefs affect patients' preference towards the way of treatment.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Increasing patient knowledge, patient participation in decision making and understanding health beliefs of patients are important to enhance patient care and improve the quality of care and patient satisfaction.

(OAG) ‘the silent thief of sight’. In 2020, the estimated number of people diagnosed as having OAG was more than 60 million.² This figure is likely to be an underestimation, as only half of all persons living with glaucoma are believed to be diagnosed.³ Glaucoma is a chronic progressive optic neuropathy characterised by death of the ganglion cells of the retina and distinctive patterns of loss of visual function.⁴ Intraocular pressure (IOP) appears to be the most important and modifiable risk factor in development of glaucoma.⁵ Control of IOP can be either by hypotensive medications, use of laser therapy including selective laser trabeculoplasty or undergoing surgical intervention by either conventional trabeculectomy, non-penetrating glaucoma surgery, glaucoma drainage devices (GDD) or more recent microinvasive glaucoma surgery (MIGS). This latter aimed at either freeing the patient from the use of medication or reduction in the number of used medications.⁶



Many studies examined the different treatment options available for managing glaucoma. The Collaborative Initial Glaucoma Treatment Study⁷ compared the medical and surgical treatment (trabeculectomy) as regard efficacy and life style. After 5 years, a group treated with trabeculectomy and a group treated with topical glaucoma medications showed similar visual field outcomes, also the impact on quality of life was similar in both groups.⁸ The introduction of MIGS has started to change the face of glaucoma management, decreasing the dependence on medications with minimal complications and variable degrees of IOP reduction.⁹

Any model either traditional or novel and any service delivery system either public or private should employ a patient-focused model as a cornerstone. Patient participation in decision making enhances safety, quality and provides greater satisfaction.¹⁰ The Health Belief Model (HBM) has been used as a generalised conceptual framework to understand and predict health behaviours across a spectrum of medical conditions.¹¹ It theorises that health behaviour is influenced by patients' perceived susceptibility to suffer the consequences of a health condition, perceived severity of the health condition, perceived benefits of a recommended treatment or health behaviour and perceived barriers to performing the health behaviour. Other constructs of the model are cues to action or triggers to instigate health behaviour and self-efficacy defined as confidence in one's ability to successfully perform a particular behaviour.¹²

PATIENTS AND METHODS

The study is a cross-sectional study. The study was conducted in the Glaucoma clinic of Alexandria Ophthalmology Hospital, Alexandria, Egypt between November 2021 and April 2022.

Patients were eligible for the study if they were 18 years or older, had a confirmed diagnosis of OAG based on European guidelines of glaucoma, 2020¹³ and were using one or more topical hypotensive medications for glaucoma. Patients were excluded if they underwent previous glaucoma surgery, had one or both eyes lost, or were indicated for surgery. All patients scheduled for their routine glaucoma visits who met the selection criteria and agreed to participate in the study were asked to complete the questionnaire prior to their medical visit.

During the data collection period, 342 patients who met the selection criteria were invited to participate in the study, of whom, 321 patients consented to take part in the study. After excluding 12 incomplete questionnaires, 309 questionnaires were analysed.

A structured questionnaire was prepared in English, then translated into Arabic by an expert in behavioural sciences who has very good command of the English language and the Arabic language as well. Patients were interviewed by two clinic-based research assistants who were well trained on a standardized interview manner to reduce information bias. The interviewers met the eligible patients during their routine visit, introduced

him/herself and explained to the patient the purpose of the research (online supplemental file 1).

The questionnaire comprised four sections: the first section included demographic data, and ocular history, the second section assessed patients' knowledge about glaucoma and the expected side effects of some glaucoma medications. It consists of 10 multiple choice questions. The total score ranged from 0 to 10, higher scores indicated more knowledge. The third section was composed of a single item that inquired about patient's treatment preference.

The last section of the questionnaire was the scale measuring HBM constructs. It consists of six subscales measuring perceived susceptibility and severity of the adverse effects of life-long glaucoma medications, perceived benefits of and barriers to surgical intervention, self-efficacy and cues for undergoing surgery. Responses to scale items were scored on a three-point Likert scale of 1 (disagree), 2 (neutral) and 3 (agree). The score was reversed for some items. Cues to action were measured using 'yes' or 'no' response options.

Given that there was no existing standard questionnaire available, the questionnaire was developed by the research team based on comprehensive review of related literature. Content validity was determined by a panel of experts in the fields of health behaviour, ophthalmology and clinical pharmacology. Most of the questionnaire items were reported by the three experts to be appropriate and relevant to the study. Minor amendments were made to the wording and order of the questions to achieve a more logical layout.

Construct validity was established via conducting confirmatory factor analysis for the HBM questionnaire (online supplemental table).^{14 15}

A pilot study was then conducted before the commencement of the study among 30 patients to test the face validity and reliability of the questionnaire. The time needed to complete the questionnaire was 10–15 min on average.

Reliability of the questionnaire was assessed by calculating Cronbach's α coefficient, using 'view alpha if item deleted' option, items that reduced Cronbach's α coefficient were deleted to achieve a final α coefficient more than 0.7. Cronbach's alpha coefficient for the Knowledge section was 0.75 and for HBM domains was 0.92.

Patients who had little information about glaucoma and its treatment options were given a brief clarification of the disease and its management modalities before getting into the HBM tool.

The results were analysed using SPSS software (V.20). Data were tested for normality, and cases with missing data were removed from the study. Descriptive statistics, χ^2 test and independent t-test were used to identify and compare the demographic information, influencing factors and the health beliefs of the two preference groups. Finally, logistic regression was used to determine the predictors of patient preference of surgical intervention. A $p < 0.05$ was considered statistically significant.

Table 1 Relation between demographic data and patient preference towards surgical treatment over continuation of medical therapy (n=309)

Demographic data	Q1. Do you prefer surgical treatment over continuation of medical therapy			χ^2	P value
	Total (n=309)	Yes (n=142)	No (n=167)		
	No (%)	No (%)	No (%)		
Gender					
Male	151 (48.87)	80 (56.34)	71 (42.51)	5.869*	0.015*
Female	158 (51.10)	62 (43.66)	96 (57.49)		
Age					
<40	13 (4.21)	9 (6.34)	4 (2.40)	6.083	0.193
41–50	43 (13.92)	14 (9.86)	29 (17.36)		
51–60	81 (26.21)	38 (26.76)	43 (25.75)		
60+	118 (38.19)	56 (39.44)	62 (37.13)		
70+	54 (17.48)	25 (17.61)	29 (17.36)		
Education					
University graduate	26 (8.41)	14 (9.86)	12 (7.19)	2.008	0.571
High school	53 (17.15)	23 (16.20)	30 (17.96)		
Primary school	56 (18.12)	22 (15.49)	34 (20.36)		
Illiterate	174 (56.31)	83 (58.45)	91 (54.49)		
Job					
Employed	21 (6.80)	10 (7.04)	11 (6.59)	6.508	0.089
Unemployed	59 (19.09)	35 (24.65)	24 (14.37)		
Retired	81 (26.21)	38 (26.76)	43 (25.75)		
Housewife	148 (47.90)	59 (41.55)	89 (53.29)		
Years of treatment					
<5	158 (51.13)	76 (53.52)	82 (49.10)	0.600	0.439
≥5	151 (48.87)	66 (46.48)	85 (50.90)		
No of drugs					
1	16 (5.18)	8 (5.63)	8 (4.79)	13.974*	0.003*
2	70 (22.65)	30 (21.13)	40 (23.95)		
3	113 (36.57)	39 (27.46)	74 (44.31)		
More than 3	110 (35.60)	65 (45.77)	45 (26.95)		
Payment					
Full	6 (1.94)	2 (1.41)	4 (2.40)	0.480	^{MC} p=0.909
Partial	7 (2.27)	3 (2.11)	4 (2.40)		
None	296 (95.79)	137 (96.48)	159 (95.21)		

χ^2 : Monte-Carlo p: p value for comparing between the studied categories.
*Statistically significant at $p \leq 0.05$.

RESULTS

The mean age of the studied patients was 61.02 years (± 10.77 years), nearly half of them were males (48.90%), a great percentage (56.30%) was illiterate, 47.90% were housewife and 6.80% were employed. Half the patients (49.90%) were treated for more than 5 years. The minority of patients (5.20%) were on treatment with only one hypotensive medication, (22.70%) were on treatment with two medications and the remaining percentage was distributed between those on three hypotensive medications (36.60%) and those on more than three medications (35.60%). A great majority of patients

(95.80%) paid nothing for medication (as medication was subsidised) (table 1).

Overall, 46% of patients showed preference towards surgical management of glaucoma, even if surgery will just result in decreasing number of used medications.

Males had a significantly greater tendency to choose surgical treatment than females ($\chi^2 = 5.87^*$, $p = 0.015$). The number of used medications significantly affected patient preference as patients tended to prefer surgical intervention with increasing number of IOP lowering medications used ($\chi^2 = 13.974$, $p = 0.003$) (table 1).

Table 2 Relation between score of patient knowledge and his/her preference towards surgical treatment over continuation of medical therapy (n=309)

	Q1. Do you prefer surgical treatment over continuation of medical therapy		U	P value
	Yes (n=142)	No (n=167)		
	No (%)	No (%)		
Patient's knowledge				
Total score				
Mean±SD	4.25±1.64	3.74±1.68	9985.50*	0.015*
% Score				
Mean±SD	42.46±16.42	37.37±16.76		

Table 2 shows that in general, patients were less knowledgeable about glaucoma, however, patients having preference for surgical intervention had higher knowledge scores than those preferring medical therapy

(42.46% and 37.37%, respectively) and this difference was statistically significant (U=9985.50, p=0.015).

Patients preferring surgical treatment had significantly higher perceived susceptibility to and seriousness of side

Table 3 Relation between HBM domains and patient preference towards surgical treatment over continuation of medical therapy (n=309)

	Q1. Do you prefer surgical treatment over continuation of medical therapy		U	P value
	Yes (n=142)	No (n=167)		
	No (%)	No (%)		
Health Belief Model				
(1) Perceived Seriousness				
Total Score				
Mean±SD	6.18±2.06	4.75±1.83	7220.00*	<0.001*
% Score				
Mean±SD	68.62±22.89	52.83±20.39		
(2) Perceived susceptibility				
Total score				
Mean±SD	6.54±2.07	4.92±2.04	6964.50*	<0.001*
% Score				
Mean±SD	72.61±23.02	54.62±22.70		
(3) Perceived benefits				
Total score				
Mean±SD	11.15±1.42	5.28±2.10	939.50*	<0.001*
% Score				
Mean±SD	92.90±11.82	43.96±17.47		
(4) Perceived barriers				
Total score				
Mean±SD	8.01±1.92	12.91±1.75	1057.50*	<0.001*
% Score				
Mean±SD	53.43±12.78	86.07±11.66		
(5) Self-efficacy				
Total score				
Mean±SD	8.75±0.85	4.53±2.12	1735.00*	<0.001*
% Score				
Mean±SD	97.18±9.40	50.37±23.55		
P value for comparing between the studied categories.				
*Statistically significant at p≤0.05.				
HBM, Health Belief Model.				

Table 4 Univariate and multivariate logistic regression analysis for the parameters affecting patient preference for surgical management versus medical therapy (n=142 vs 167)

	Univariate		*Multivariate	
	P value	OR (95% CI)	P value	OR (95% CI)
(1) Perceived seriousness	<0.001†	1.43 (1.27 to 1.62)	0.803	1.04 (0.79 to 1.36)
(2) Perceived susceptibility	<0.001†	1.43 (1.28 to 1.61)	0.555	1.08 (0.83 to 1.41)
(3) Perceived benefits	<0.001†	2.59 (2.12 to 3.15)	<0.001†	1.83 (1.41 to 2.37)
(4) Perceived barriers	<0.001†	0.35 (0.29 to 0.44)	0.002†	0.62 (0.46 to 0.84)
(5) Self-efficacy	<0.001†	3.03 (2.37 to 3.88)	0.049†	1.38 (1.00 to 1.89)
Gender				
Male				
Female	0.016†	0.57 (0.37 to 0.90)	0.849	0.90 (0.32 to 2.57)
No of drugs				
1				
2	0.604	0.75 (0.25 to 2.23)		
3	0.234	0.53 (0.18 to 1.51)		
More than 3	0.493	1.44 (0.51 to 4.13)		
Patient's knowledge	0.008†	1.20 (1.05 to 1.38)	0.72	1.06 (0.77 to 1.47)

*All variables with p<0.05 was included in the multivariate.
†Statistically significant at p<0.05.

effects and risks of long-term medication (72.61% vs 54.62% and 68.62% vs 52.83%, respectively), had higher perceived benefits of surgical intervention (92.90% vs 43.96%) and higher confidence in their ability to undergo surgical intervention (97.18% and 50.37%, respectively). However, these patients reported lower perceived barriers for surgical intervention than patients having preference for medical treatment (53.43% vs 86.07%) (table 3).

The significant variables in univariate analysis, that is, gender, number of drugs, patient knowledge and the five domains of the HBM: perceived susceptibility, perceived severity, perceived benefits, perceived barriers and self-efficacy, all were examined by means of logistic regression analysis with patient preference as the dependent variable. Logistic regression analysis showed that the most important predictors for patient preference for surgical intervention were higher perceived benefits of surgical intervention (OR=1.83, p<0.001), higher self-efficacy in undergoing surgery (OR=1.37, p<0.049) and lower perceived barriers to surgical intervention (OR=0.62, p<0.002) (table 4).

Figure 1 demonstrates that media and social contacts, and physician's recommendation of surgery, were the cues with higher likelihood of association with patient preference for surgical intervention.

DISCUSSION

In this study, the HBM was used to conceptualise a questionnaire to evaluate the psychological factors that might influence the patient preference for surgical management.¹⁶ The reliability and validity of the questionnaire were confirmed.

In this study, we examined patient preference toward surgical treatment versus medical therapy for OAG, and we explored some of the factors that may influence that preference. About half of the patients (46%) preferred surgical intervention to continuation of medical therapy.

Although trabeculectomy and topical glaucoma medications have shown evidence to be of equal effect and with little difference regarding quality of life, only few reports investigated the patient preference. Bhargava *et al*¹⁷ studied patient preference with conjoint analysis and found that according to patient view, the most important factors for choice of glaucoma treatment were the risks of visual loss and long-term blindness and that treatment methods used were of much less importance.

Thomas *et al*¹⁸ assessed the quality of life of patients undergoing iStent inject using The Vision Function Questionnaire, and Ocular Surface Disease Index questionnaire administered at baseline and at postoperative 1, 6, 12 and 24 months. They found that reducing dependence on drops through implantation of the iStent inject device with cataract surgery may result in improvement of the quality of life compared with cataract surgery alone over 24 months.

Gender of the patient was found to be a contributing factor that influenced patient preference, with male patients having more preference for surgical intervention than female patients. In a report about the difference in use of procedures among patients with coronary heart disease Ayanian and Epstein¹⁹ found that male patients were more confident to use surgical interventions whether investigational or therapeutic compared with females.

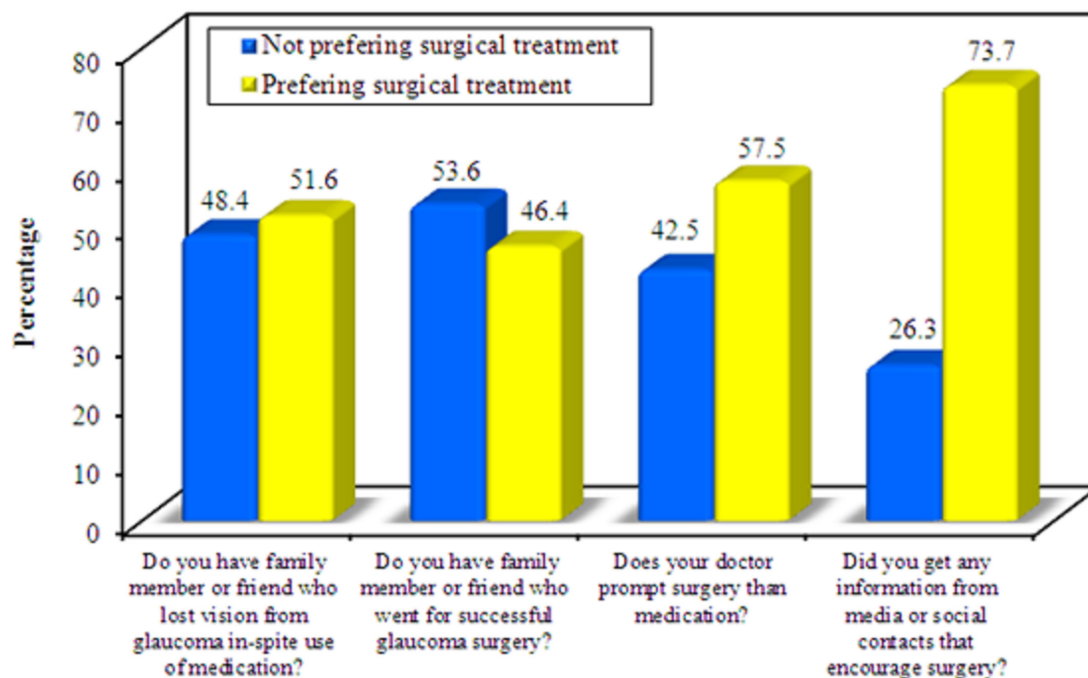


Figure 1 Relation between patient preference for surgical treatment over continuation of medical therapy and cues to action.

The number of medications used by patients had a positive association with patient preference for surgery spotlighting on the burden of compliance to long-term medication for OAG patients. Glaucoma drugs are usually lifelong, which makes patients more liable to side effects both local and systemic. Attending doctors usually tend to explain the surgical options more for those who use more medications, alleviating their fears and increasing their confidence about undergoing surgical intervention.

In a similar vein, Varadaraj *et al*²⁰ reported patient acceptance of slowly released glaucoma treatment strategies if they reduced or eliminated the use of drops. These findings emphasise the need for patient involvement in healthcare, which is the cornerstone of patient-centred care. patient involvement has been shown to increase patient satisfaction and trust, reduces anxiety and ultimately, enhances quality of life.²¹

Glaucoma knowledge score for participating patients was found to be relatively low. This study revealed that the level of knowledge affected patient preference where patients preferring surgical management had higher level of knowledge than those preferring continuation of medical treatment implicating the importance of knowledge in influencing attitude and preference and consequently behaviour and compliance.²² Patient knowledge about glaucoma may be affected by socioeconomic level as reported by Hoevenaars *et al*,²³ or by the duration of being an established glaucoma patient as indicated by Danesh-Meyer *et al*,²⁴ however, patient education about the disease and its treatment modalities remains a fundamental step towards enhancing patient knowledge and supporting informed choice and patient-centred care.

On reviewing literature, no previous study had used the HBM to assess patient preference for different

options of glaucoma treatment. Chang *et al*²⁵ studied preference of glaucoma surgery and demonstrated that the majority of patients preferred MIGS rather than conventional glaucoma surgery (trabeculectomy). A survey of the American Glaucoma Society about practice preferences for glaucoma surgery demonstrated that the use of GDD has increased and that of trabeculectomy has concurrently decreased over the past two decades.²⁶

We used the HBM to investigate the influence of patients' psychological make up on their preference of treatment. Perceived benefits of surgical intervention was the most important predictor of patient preference for surgical intervention. Apparently, alleviating the load of compliance to long term medication and minimising the damage to vision caused by glaucoma were significant motivators of patient preference for surgery. Other important predictors were; confidence in patients' ability to undergo surgical intervention including ability to discuss odds of success of the surgical procedure with the physician, ability to withstand stress of surgical intervention and ability to comply to physician's perioperative instructions; and perceived barriers to surgical intervention including cost, doubted effectiveness and safety. As the latter increases, the odds of patient preference for surgical intervention decrease.

The other components of the HBM showed significant association with patient preference in univariate analysis (but not in multivariate analysis) drawing attention to the need to address perceived susceptibility to and severity of adverse effects of long-term medication as well, to clear any misconceptions patients may have and pave the way for patients to make appropriate and informed decisions about their treatment.

Thus, employing the biopsychosocial approach in communicating with patients, which considers not only the medical and biological factors but also the patients' socioeconomic and psychological conditions, allows patients to make optimal health choices in light of their medical and psychosocial situation enhancing their satisfaction and adherence to treatment.

The most reported cues for surgical intervention were information obtained from media or social contacts and physician's recommendation, which displays the role of perceived social norms on human preference and behaviour.

The Glaucoma clinic of Alexandria Ophthalmology Hospital was selected conveniently, limiting the external validity of the study. This is a public hospital with less resources and is mainly serving patients having modest socio-economic standard. Thus, further studies having broader and more variable sampling units need to be conducted.

CONCLUSION

Gender, increased number of used medications, patients' knowledge and patient health beliefs were significantly associated with patient preference for surgical intervention. The most important predictors of patient preference for surgery were perceived benefits, self-efficacy and perceived barriers. Improving patient knowledge is likely to influence their choice and improve their active participation in decision making. We believe that demonstrating the benefits of surgical intervention, resolving the fears and barriers of patients, and enhancing the confidence in their ability to take action would be a meaningful contribution to the involvement of patients in decision making, which would increase patient satisfaction and lead to better results.

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