

**The Frenchay activities index (FAI) measurement on the glaucoma patients with visual field defects**Hsieh-Ting Liu<sup>1,#</sup>, Chi-Ting Horng<sup>2,#</sup>, Jing-Hui Wu<sup>1</sup>, Yin-Hung Liu<sup>1</sup>, Syue-Chin Lien<sup>1</sup>, Lu-Yu Wu<sup>3,4,\*</sup><sup>1</sup>Department of Rehabilitation, Kaohsiung Armed Forces General Hospital, Taiwan. ROC.<sup>2</sup>Department of Ophthalmology, Fooying University Hospital, Taiwan, ROC.<sup>3</sup>Department of Nursing, Kaohsiung Armed Forces General Hospital, Taiwan. ROC.<sup>4</sup>Department of Nursing, Fooying University, Taiwan. ROC

# contributed equal the work and therefore should be considered equivalent authors

\* Corresponding author: Lu-Yu Wu; E-mail: [h56041@gmail.com](mailto:h56041@gmail.com); TEL: +886-7-749-6751

Address: Department of Nursing, Kaohsiung Armed Forces General Hospital. No.2 Jhong-Jheng 1st Rd. District of Lingya, Kaohsiung City, Taiwan. ROC.

**Abstract: Purpose:** To evaluate the various health-related quality of life of patients with glaucoma which may decrease vision and visual field sensitivity and finally result in disability. **Methods:** 50 chronic glaucoma patients (28 female; mean age: 57.3± 14.6 years old) under control for years were asked to complete questionnaires about daily activities from the Frenchay activities index (FAI) which may present the health-related quality of life and measure the degree of diminution of physical and psychologic level in clinics. Moreover, some descriptive results were also recorded from the glaucoma patients' complaints. In FAI, we further added 3 items including outing, banking and sports which is called FAI-18 and assess the activities of glaucoma patients in detail. **Results:** Three factors about FAI were identified – domestic chores, leisure and work, outdoor. In the answers, 0 to 3 may present the numbers or frequencies in special days. Finally we calculate the numbers of 18 items which may present the engagements of various activities and further hint us the problems which bother their daily life of quality. Therefore, the results could supply the nurses and occupational therapist how to care the associated glaucoma patients with visual loss or visual fields defect. In FAI-18, we found that reading, local shopping, paid work, taking car/bus, social activity, outings, banking and sports may impact on the patients with chronic glaucoma (the mean data < 0.55). Moreover, we found that 76 % glaucoma patients had the depressive mood. **Conclusion:** Glaucoma would result in blindness or loss of stereopsis and the life quality of an individual's general well-being and their ability would be affected. In our study, glaucoma should influence not only the life quality, various daily activities but also depressive mood. Therefore, the patients with glaucoma need the strong support from medical team including doctors, nurses, and even occupation therapists.

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**Keywords:** glaucoma, Frenchay activities index (FAI). occupational therapist

**Introduction**

Glaucoma is a leading cause of irreversible blindness worldwide which is also responsible for about a third of those currently blindness. The prevalence of glaucoma is about 1% in the population older than 50 years, and the rate increases with age, being particularly high in Black. With the shift toward an older population, the medical, social, and economic burdens imposed by glaucoma increased. In 2010, 60.5 million peoples in the world had glaucoma; prevalence is expected to increase to 79.6 million by 2020 [1,2]. Glaucoma is characterized by chronic and progressive damage to the optic nerve. This is has been shown to lead inexorably to blindness ta a rapid rate if treatment is not instituted within months, and up to 3 years in some cases. The rate of progression of visual field deterioration reduced significantly to 3% per annum, suggesting it might have taken at least 33

years for glaucomatous eyes to progress to blindness, but most did not present early enough at first onset of the disease, and so blindness appeared to ensure rapidly [3]. In Taiwan, one fourth patients of glaucoma subjects suffered from different levels of visual field defect when they are at the first visit in the ophthalmic clinics.

Two of the most important facets of the disease status of patients with glaucoma ate the extent of established optic nerve damage and the arte of progression of this damage. The combination of these static and dynamic components has a critical bearing on the patient's present and future visual function and on the clinical management used. Most patients did not suffer from severe vision loss firstly, however, it may adversely affect patients' quality of life (QoL) and reduce the visually related activities [4,5,6]. Advanced glaucoma would show that binocular field

loss correlated with blindness and disabilities [7,8]. Specific activity of daily living (ADLs) could be evaluated by modified Barthel indexes and Euro QoL-5D method. The life quality of glaucoma patients included color vision, social function, general health, distant vision, ocular pain, general vision and driving [9]. The content of household chores, gardening, stairs climbing and cycling about the ADLs were highly respected as a major health resource [10].

Many researchers used the different assessment of the relationship between QoL and visual clinical characteristics which further help to link the subjective patient appraisals of their QoL with object assessments of vision function and glaucoma [11,12,13,14]. In the past, there are several methods of evaluation in quality of life, i.e. Barthel index, Euro-QoL 5 D, VAS, GAL-9, NEI, VF-14, SF-20, VFQ-39 VFQ-25 (near activities, mental health, near activities, role activities, peripheral vision and dependency), CIGTS and AGIS (binocular classification) [15, 16]. All the research revealed that clinical measures with vision-specific quality of life. In other word, the correlation with clinical markers of disease severity provides evidence of clinical validity for the measure [51,52,53].

To summation, in every measurement, the highest averages in QoL was in color vision” and “social functioning”, whereas the lowest average were in “general health” and “general vision”. Vision-related QoL is a person’s satisfaction with human visual function and how visual ability impaction the life. Moreover, the Frenchy activities index (FAI), which systemically evaluate the function status as a measurement of the patient’s ability to perform the ADL especially after stroke rehabilitation, have become standard [17]. The assessment tool to determine various ADLs within 10 items including preparing meals, washing dishes, washing clothes, lighting housework, heavy housing, reading, local shopping, home/car maintenance, grading, paid working, taking car/bus, hobby, and social activity at early disease attack; however, travelling outing/car ridding, gardening, household maintenance, reading books and gainful work were assessed at late stage [67]. Recently, three parameters about outing, banking, and sporting were added for further evaluation (so called “FAI-18) [18]. This method of modified FAI-18 assessment is using the same key are s the original, however, every item had different scores varies in number between 0 and 3. Much of the FAI score is based on the frequency with which activities are performed. For example, we assessed the activity about washing up after meals in glaucoma patients. “0” is presented never, “1” is presented “less than one a week”, “2” is indicated “1-2 times per week” and “3” means “most day”. In other word, 17 items about

different activities are indicated as various numbers. Likewise, the lower the score the more needs help from others on everyday task because of their poor vision and reduced visual fields sensitivity [19]. FAI is described as fast, easy-to-use, reliable and sensitive instrument to measure functionality of glaucoma patients. QoL is not only due to the psychological and physiological impact, other than cost of illness also should be considerable. In fact, the victims of glaucoma not only needs the direct treatments (the average cost of medical anti-glaucoma medication was USD 40 per month) but also direct nonmedical cost (the cost of regular retune for follow up) and indirect cost (the waiting time in the clinics or hospitals, sometime may lose their income). However, most of the patients with glaucoma (53%) complained about quality of life. 24% of the patients were about the diseases progression despite treatment (40%) [20]. Because of the long-money medical demand, modern topical medication, especially with multiple schedules, leads to the vicious circles which multiple ultimately worsens the visual outcome. The current move from first-line surgical treatment to newer, more potent, better tolerated, but only one-time expensive surgery will be favored in un-developing countries. The economic loss from permanent medical cost should be diminished slowly [54]. During this study, we will discover the relationship between FAI-18 and glaucoma and try to explain the associated results.

## Methods

A total 50 patients with chronic glaucoma with mean age of  $57.3 \pm 14.6$  years were included. Moreover, the gender, education, comorbidities, the habits about smoking, alcohol consumption, physical and reading were also recorded. The diagnosis for glaucoma was confirmed by Dr. and the patients all received various types of therapies about medicine (maybe mixed use), different classification of laser, and even surgeries. The criteria for glaucoma were visual acuity loss, visual field defects, the optic nerve damage (cupping) and possible intra-ocular pressure (IOP) was checked by the same eye doctor (Dr. Horng) in detailed. Moreover, their IOPs were all stable (around the 18 mmHg). As for the reliable visual test were those with fixation loss of 20% or less, false-positive rates of 15% or less, and false-negative rates of 15% or less in the 24-2, 30-2 SAP program. Various types of glaucoma (by history or gonioscopy) from past medical records in our hospital for several years were recruited.

The FAI score was first developed in Swedish and now becomes popular in modern medicine. According to Turnbull’s report, FAI values were related to self-reported health status, self-reported levels of activity, and presence of long-standing

illness/disability [58]. They also concluded that FAI has good construct validity, particular in middle-aged and elderly, and is reliable. In our study, the mean age of our subjects was 57.5 years old. Hence, the results are highly valued. All users were provided with the same scenarios to assess and complete on paper. The FAI-18 scores are used to assess the daily activities in this research. There are 17 parameters (activities) were measured (three primary factors: domestic chores, leisure and work and outdoor activities). Therefore, we could analyze the results quantitatively. various ADLS within 10 items including preparing meals, washing dishes, washing clothes, lighting housework, heavy housing, reading, local shopping, home/car maintenance, grading, paid working, taking car/bus, hobby, and social activity at early disease attack; however, travelling outing/car ridding, gardening, household maintenance, reading books and gainful work were assessed at late stage. Recently, three parameters about outing, banking, and sporting were added for further evaluation. The digital FAI-18 ADL was designed to align with the paper version. There are 17 indoor-of-time and outdoor-of-time activities and each patient must select only one option for each in the chart. In general, the higher the score, the more independent the individuals is determined to be. Now FAI score is well popular to evaluate the patients with delirium, stroke and various physical disabilities and help the specialist to make correct diagnosis and treatment plan [55,56,57].

The experiments were all conducted in accordance with the Declaration of Helsinki with ethical approval for this study obtained from the Institution Review Board (IRB) of Kaohsiung Armed Forced General Hospital (Kaohsiung City, Taiwan, ROC) in our experiments. Total volunteers with the ocular pathology (e.g. amblyopia, strabismus, cataract, and keratopathy) were all excluded. The victims with diagnosis of glaucoma in one eye or two eyes and now receiving any types of treatments for many years were enrolled.

### Results:

50 patients aged  $57.3 \pm 14.6$  years with glaucoma were enrolled (one eye or both eyes) in our study. The patients (male: 22; female: 28) all received various treatments including medical, laser, surgical treatment and even combined therapies. Among 50 patients, 30 patients received the medical treatment and their condition showed stable (IOPs were within target IOP and the visual field maintained stable). Furthermore, 15 patients had received laser (e.g., laser peripheral iridectomy, and argon laser trabeculoplasty) and 5 patients had received surgical approach (surgical peripheral iridotomy, trabeculectomy, and even cyclo-destruction). Now their conditions were

also under control by medicine (i.e.; eye-drops).

Table 1: Description of sociodemographic, clinical and functional variable of the studied populations

| Variable            | Patients (n=50)   |
|---------------------|-------------------|
| Age mean (SD)       | 57.3 years (14.6) |
| Gender: Female (%)  | 28 (56%)          |
| Education           |                   |
| Elementary school   | 27 ( 54%)         |
| High school         | 18 ( 36%)         |
| Others              | 5 ( 10%)          |
| Comorbidities (%)   | 34 (68%)          |
| Hypertension        | 32 (64%)          |
| Diabetes            | 11 (22%)          |
| Heart disease       | 38 (76%)          |
| Depression          |                   |
| Smoking             | 20 (40%)          |
| Alcohol consumption | 31 (62%)          |
| Physical exercise   | 8 (16%)           |
| Reading             | 4 (8%)            |

In table 1, we found the incidence of glaucoma in sex is nearly equal (male: female = 44 %: 56 %). As for the education, 27/50 (54%) was the victim of glaucoma. We suspected that the older people got the disease because the education is not popular in their generation. Moreover, we found that there are 68% with hypertension and 64% with DM among 50 glaucoma patients. The results is consistent with the previous report that the patients with DM or hypertension also had poor hemodynamics which may impact the optic nerve and various retinal cells, and subsequently result in the development of glaucoma process [59,60]. Sarfraz et al demonstrated that peripapillary retinal nerve fiber layer thickness, which is believed to be thinned as a result of glaucoma. Furthermore, the nutrition of the retinal cells layers were supplied by retinal blood vessel. Hence the relationship between glaucoma, diabete and hypertension were very close [61]. Besides, we still found that 64% of glaucoma had a long history of diabetes. The findings are the similar as Zhao and co-workers that the pooled relative risk of the association between Primary open-angle glaucoma (POAG) and diabetes based on the risk estimates of the seven cohort studies was 1.36. Moreover, they proposed that diabetes mellitus is associated with a significantly increased risk of glaucoma. [69]. On the other hand, even 68 % of patients with glaucoma is also the victim of hypertension. Pan R et al. a research team from French reported that an excessive drop in nocturnal blood pressure can be harmful by increasing ischemic damage to the optic nerve. In case of

progression of glaucoma despite well controlled IOP, 24h BP monitoring is recommended. The relationship between IOP and systemic blood pressure has been close [70].

To our surprised, we found 40% patients have the habits of heavy smoking, and 62% glaucoma patients are drinking alcohol group. In previous survey, Isabel and his-workers devoted to study that the patients who have had a stroke are at high risk for recurrent stroke, myocardial infarction, and vascular death. Prevention of these events should be initiated promptly after stroke, because many recurrent events occur early, and should be tailored to the precise cause of stroke, which may require specific treatment. Lifestyle advice including abstinence from smoking, regular physical exercise, the Mediterranean-style diet, and reduction of salt intake and alcohol consumption are recommended for all patients with stroke. For most patients with ischemic stroke or TIA, control of risk factors, including lowering blood pressure under 140/90mmHg and LDL cholesterol under 1g/L, together with antiplatelet or oral anticoagulant therapy, depending on the cause of stroke, have been shown to decrease the risk of recurrent stroke and cardiovascular events. Aspirin, clopidogrel, or the combination of aspirin and dipyridamole, are all acceptable options for secondary prevention in patients with ischemic stroke or TIA of arterial origin. Dual therapy with aspirin and clopidogrel might be considered for 3 weeks after a minor ischemic stroke or TIA and for 3 months in patients. [71]. Furthermore, Chiam et al. tried to find the lifestyle and health factors related to primary open-angle glaucoma (POAG) among Asians. On the contrary, the authors suggested that a current smoking habit was protective against glaucoma [72]. However, In 2006-2007, Renard et al. reported 111 French ophthalmologists prospectively enrolled 339 cases of Primary open-angle glaucoma. The patients were given a detailed questionnaire developed by nutritionists and epidemiologist on lifestyle and environmental risk factors, including socio-demographic variables, dietary habits related to omega-3 fatty acids intake, smoking and alcohol drinking and professional exposure to pesticides and other chemicals. These exploratory observations suggest that POAG was associated with higher frequency of heavy smoking (40 pack-years or more) but not with moderate (20-40 pack-years) and light smoking (< 20 pack-years) [73]. As for alcohol consumption, Lee and his colleges found that in males, the multivariate general linear model adjusted for age, alcohol, smoking, exercise, systemic hypertension, diabetes, and IOP showed the quartiles for the anthropometric parameters BMI, fat mass/weight ratio and fat mass/muscle mass ratio were negatively associated with POAG. However,

muscle mass parameter/BMI ratio was significantly positively associated with POAG. In females, height and fat mass/BMI showed a significant relationship with the risk of POAG.

In the study, only 16% patient have the habit of physical exercise. We suggested that the constricted visual fields may limit the intention of out-of-door activity, especially rigorous exercise. The main reason that restrict the activity of the glaucoma patients is visual field defect (so called "scotomas"). According the disease progressing, early scotomas in glaucoma are typically found in Bjerrum's region 10-20 degrees from the fixation point,, thus sparing central visual acuity until the advanced stage of the disease, but some eyes develop defects threatening fixation in the earlier stages of glaucoma with a consequent greater risk of the reduced quality of life. Patients with a glaucomatous paracentral visual field loss may be at greater risk of losing useful visual acuity. Additionally, a paracentral visual field loss causes problems in the performance of a daily life activity by difficulty in reading and worsened driving performance [73,74,75]. Early peripheral scotoma was more common in primary open angle glaucoma with diabetes mellitus. Moreover, patients with arcuate scotoma had more frequently general hypertension. Hence, we must pay attention to the prevention from progression of elevated blood pressure and blood sugar in glaucoma patients. Besides, we also found 76% subjects with glaucoma had depressive mood. Cognition and depression are variables identified in the literature that may influence IADL. Therefore, the nurses and psychologists must participate aggressively in the medical team [76].

In table 2, we selected the mean data lower than 0.55 which presented these glaucoma patient would suffer from the types of activities. Therefore, we found that reading, gardening, walking outside, taking bus/car, social activities, outings banking and sports should be a big trouble to the daily life of glaucoma patients. Because the poor vision and constricted visual fields from the damaged retinal cells and optic nerve bundle, the patients could not see clear, loss of stereopsis, the narrow visual field which may hind the unknown dangerous objects. Under the above conditions, patients could be hurt the bodies and even result in traffic accidents or death. Clearly, the glaucoma patient may suffer from out-of-door activities and read small letters because of visual field loss which is the key points when we take about them.

Furthermore, some of the patients should loss the stereopsis, reduce contrast sensitivity and worse vision and constricted visual field. The similar findings were also reported by Füzéki et al, walking downstairs and physical exercising becomes the trouble problems to glaucoma patients. Therefore,

they may be worried and sad accompanied with depression [62,63]. Indeed, we found that patients with chronic glaucoma for several years may suffer from discomfort, anxiety and depression. We suggested that the patients were worried about the progression of diseases, the incompliance of the drug use, the possibility of blindness and the economic burden [23].

Table 2 Varimax factor analysis of FAI and FAI-18

| Item                    | FAT-18 |       |       |
|-------------------------|--------|-------|-------|
|                         | 1      | 2     | 3     |
| 1. Prepare meals        | 0.664  |       |       |
| 2. Wash dishes          | 0.718  |       |       |
| 3. Washing clothes      | 0.761  |       |       |
| 4. Ligh house work      | 0.812  |       |       |
| 5. Heavy house work     | 0.640  |       |       |
| 6. Reading              | 0.316  |       |       |
| 7. local shopping       | 0.492  |       |       |
| 8. Home/car maintenance |        | 0.787 |       |
| 9. Gardening            |        | 0.790 |       |
| 10. Paid work           |        | 0.532 |       |
| 11. Walk outside        |        | 0.479 |       |
| 12. Car/Bus             |        |       | 0.454 |
| 13. Hobby               |        |       | 0.654 |
| 14. Soial activity      |        |       | 0.525 |
| 15. Outing              |        |       | 0.512 |
| 16. Banking             |        | 0.530 |       |
| 17. Sports              |        |       | 0.532 |

\* Signifies new item included in FAI-18

### Discussion:

Glaucoma is characterized by chronic and progressive damage to the optic nerve. It is estimated that approximately 5,2 million people are bilateral from glaucoma; this presents 15% of the total burden of the world blindness [8,36]. It is an irreversible optic neuropathy that has potential sight threatening consequences. Disease causes different disabilities, a term which covers impairments, activity limitations, and participation restriction. Disability resulting from problems with communication, vision, hearing, and intellectual function with their daily living is dependent on others [65]. The comparative disability caused by different diseases is therefore of importance when assessing the impact of different disease and the resource allocated to their management. For example, the diseases of cerebrovascular accidents, traumatic brain injury, various tumors, the motor neuron diseases, Alzheimer's diseases, and degenerative disease due to old age all may impact the quality of human life [22,23]. How to improve and enhance the functional activities of quality became the important topic in the future. For example, Mangione et al. and Ringsdorf et al. had ever said the classic worlds

“ Patients' quality of life depends on the vision in glaucoma ” “ Blindness is painful next to the death' [53,63]. Recently, glaucoma was considered as one disease has substantial impact on patients' QoL, primarily because of reduced visual function and corresponding activity limitation. The physician began to pay attention to the problems associated with general health and public issues [4,24,25, 26,51,52].

Visual impairment often co-occurs with other condition including breathing problems, depression, emotional distress, diabetes, hearing impairment, hypertension, joint problems, low back pain and stroke. Each of these conditions was associated with poorer quality of outcomes and influenced individuals' functional capabilities [27,28]. Therefore, good vision is benefit for life quality. For example, the victims with age-related macular degeneration may impact their life. The patients with visual acuity in the better eye of 20/20 to 20/25 would be willing on average to trade 11% of their remaining life to obtain perfect vision in both eyes, where as those with visual acuity of counting fingers or light perception in their better eye would be willing to give up 60% of their remaindering life. Similarly, for diabetic retinopathy the investigators used both time trade-off and standard gamble techniques to demonstrate that vision loss is associated with a decrease in patients' ratings of their vision [29]. Among ocular diseases, glaucoma is the well-known diseases. The diagnostic criteria of glaucoma are optic nerve degeneration, visual field loss, and increasing intraocular pressure (IOP). Therefore, maintaining target IOP and retarding the visual field loss is very important for glaucoma.

The prevalence of glaucoma is about 1 % in the population older than 50 years, and the rate increases with age. Most blindness (75-80%) can be prevented. Patient with various glaucoma are characterized by visual loss, visual field defect which is the second leading cause of blindness in the world after cataract. The pathologic complications, poor vision quality and decreased quality of life are companied with glaucoma. It is also associated with increased healthcare costs and ocular-related morbidity. Visual filed defects in glaucoma tend to affect the mid-peripheral visual filed first and only later in the disease involve central vision and then, fixation. Therefore, the reduced visual sensitivity and visual acuity may impact the daily of activates of these victims [5,66]. Besides, this pattern of visual field loss in glaucoma has led to the impression that the glaucoma patient is asymptomatic until late in the disease. The damage of glaucoma generally results in typical changes in the optic disc morphology and visual field. However, only when visual field loss impinges upon or involves central vision does the patient become aware of a functional defect. Although

glaucoma cannot be prevented or cured, it is controlled, but once the visual field is lost it can never be regained [30,31]. Therefore the way to stop or retard the glaucomatous myopic progression in early stage for preventing from the associated complication becomes important. Recent studies about glaucoma are most focusing on the satisfaction of patients about their visual performance and their concern about the diseases [15,32,33,34,35].

Viswanathan et al. reported that mild-to-moderate glaucoma both the existing severity of visual field damage in glaucoma and its rate of deterioration are associated with corresponding subject perception of visual disability and deterioration [8]. Nelson and his co-workers demonstrated that The glaucoma patients with severe binocular field loss would perceive visual disability relating to certain tasks (particular involving dark adaption and disability glare, activities demanding functional peripheral vision such as tripping and bumping into objects and outdoor mobility tasks) [34]. Altangerel et al even revealed that glaucoma and its treatment, either medical or surgical can affect global quality of life as well as vision-related function [4]. Therefore, QoL is affected even in early visual field losses. The rate of progression of visual field deterioration reduced significantly to 3% per annum [7,30,31]. Furthermore undoubtedly puts significant stress on family finances cost of illness studies have shown that glaucoma is very important because direct medical costs are significant, with direct and indirect non-medical costs also being very considerable. The methods and plans to treat glaucoma will be highly respected by these evaluations. Besides, the medical team (e.g.; ophthalmologists, optometrists, special nursing, social workers, and occupational therapists) and medical costs should be devoted to right place correctly and actually.

Information for identifying a safe time to cross a street is often obtained through the visual system. To attain the highest quality of visual information, one must position the area of interest on the fovea or, in the case of persons with central visual field loss, the area on the retina yielding the highest resolution. Crossing the street can be a high-risk activity, especially in glaucoma patients who loss of various degrees of visual fields. Hassan and co-workers strongly suggested that when the glaucoma patient with visual defect, they had better turn their heads to compensate the blind area [77]. Falls are an important public health problems for older adults which is the high risk of glaucoma. The direct of falls can include serious injuries, nursing home admission, and even death. Wang et al revealed that the patients with bilateral eyes having visual field mean deviation worse than -4 dB in the worse eye. Those with eye

disease had worse cognitive scores, were more likely to be depressed, and had higher comorbidity. They also found that glaucoma subjects who had impaired vision and poor contrast sensitivity were to report as “activity limitation” due to a fear of falling were older, were more likely to be female, had greater comorbidity ( $P < 0.05$ ). Prior research has indicated that activities that cause a high degree of fear of falling including walking, outside when slippery, bending down to get something, taking a bath or shower, and taking the stairs. Therefore, we should strive to keep older adult with glaucoma as mobile as safely possible to help prevent morbidity associated with a sedentary lifestyle, mobility and mortality [78]. White et al. also reported that a large body of evidence indicates that older adults with glaucoma with visual impairment are more likely experience falls those with normal vision. Furthermore, the risk of falls and fractures increases with the severity of visual impairment and for those whose visual impairment is progressive. The authors identified that those at risk of fear of falling may help target potential interventions to reduce both the risk of fall and fear of falling among alder with visual impairment, especially glaucoma patients with visual field defect.

Furthermore, the side effects of medical treatment in lowering IOPs ( $\beta$  blockers,  $\alpha$  agonists, carbonic anhydrase inhibitors, and PG analogous) included cardiovascular disorders, asthma, dry eye, blepha-conjunctivitis, renal stone, electrolytic imbalance, pigmentation and eyelash growth) which possible impact the QoL. Besides, the benalkolium chloride preserved in topical drops, (anti-lowering agents) their tear film stability and my decline. In addition, they would develop dry eye symptoms and discomfort may increase. Therefore, some studies revealed that the patients with glaucoma with long-term use of lowering IOP agents may suffer from red eye, foreign body sensation, or dry eye. Moreover, this medication may affect the QoL and take the pleasure out of activity [37]. In other words, some patients with glaucoma may suffer from irritation while prescribed.

Several investigations have examined QoL in glaucoma patients. For example, SF-36, SF-24, and VFQ were very popular in research. In the past studies, glaucoma would affect individuals' abilities to drive, ambulate, participate in the community, read, adjusting to different levels of illumination, judge distances and see objects coming from the side. These functional illumination directly relate to sensory perception [6,38,39,40,41]. Therefore, loss of visual sensory information may result in activity limitations and participation restrictions (i.e. disability), particularly related to mobility. In our study, we found that the patients complained about feeding, hygiene,

toilet, dressing, defecation, pissing, walking, walking stairs and going to bed in Barthel index. Besides, they were worried about the discomfort, anxiety and depression from the Euro-QoL 5D. However, they could not care about the mobility, self-care and usual activity. How did we to explain the results? First, we boldly suggested that all the glaucoma patients may have the different levels of visual field defect which may bright about different dis-ability and inconvenience in the life. Secondly, the residual visual acuity in patients with may be useful enough for their life and compensate for the visual filed loss. Thirdly, every patient owns the different life-style. Therefore, the satisfaction of everyone may be different. Nevertheless, we must also pay attention to the associated psychological problems. Participants agreed that the digital Barthel index ADLs made it easier to change options, rather than simply scoring out on paper which can look on untidy and un-professional. Furthermore, participants felt that by using the digit BI ADL is benefitted the environment with the environment with less paper worker to print out and photography; in addition in taking quality of human life which ADLs measures the functional disability of an individual through scoring patients' performance in 10 different ADLs [42].

The Frenchay Activity Index (FAI) which included instrumental activities of daily living (IADL) items that require some decision making and organization on the part of the patient at home and outside of home. FAI is a 15 item questionnaire which records the frequency of domestic activities, shopping, leisure pursuits and visits away from home. Studies have supported its validity and reliability, and it has been widely used as a stroke outcome measurement. A recent randomized trial which investigated recovery of social activities measured using the FAI after stroke. In this study, we used FAI-18 to evaluate various activities among glaucoma patients. Indeed, social activity is an important domain of the handicap concept and an important aspect of the reintegration process. There has been greater success in the development of measures of social activity. The FAI is one such sample which may cover a wide range of condition a wider range of conditions than any other single index [64]. Furthermore, FAI could present ADL and personal physical disability of test done to assess the "function activity", essentially in term of some degrees of performance activity regarding movement, eating, self-care, bathing, clothing, etc. People with low score are more dependent on others to do their daily living then with higher scores [43,44]. People with low score are more dependent on others to do their daily living then those with higher score. In general, FAI continues to have a useful role in chronic diseases rehabilitation by virtue of its popularity,

communicability and simplicity. Depending upon the performance activity, this evaluation also helps to identify patients who may require support for daily and the efficacy of supportive care in improving their functional activities [45,46].

The cascading technique theoretically allows the transformation of the perception of vision loss to a death and perfect health scale, which then can be directly compared with utility values derived from other diseases states, such as angina and arthritis. For instance, it is reported that utility values for mild angina as 0.90, home dialysis as 0.64, and blindness as 0.39 [47]. According to the study of Jampel, glaucoma subjects and the suspects rates the utility of their vision as 0.71 and that blind rates the state of their visual state as 0.54 [33]. Therefore, the patients with glaucoma may suffer from physical and psychological impaction and they really need the health promotion and protection from the cooperation among ophthalmologists, optometrists, psychologists, social workers, special nurses, physical therapist and occupational therapists in their daily activities and even in their occupations [33].

Depending upon the performance activity, this evaluation also helps to identify patients who may require support for daily living and the efficacy of supportive care in improving their functional activities. Occupational therapy (OT) is a relatively low-cost allied health intervention specifically focusing on optimizing daily functioning and participation. Its aim is to enhance daily activity performance and facilitate engagement in activities (e.g.; self-care, productivity, leisure) at home or in the community [53]. The intervention of OT is (1) coaching to increasing insight and self-efficacy, training of performance strategies (2) Simplification of tasks, optimizing daily routines (3) advise on appropriate aids and home modifications (4) coaching caregiving and training skills in supporting the patients. Many trainee occupational therapists may propose the caring program of patients with glaucoma according the score of FAI, Barthel index ADL and even Uoro QoL-5D [37]. The occupational therapists also assist the specific ADLs, such as household chores, gardening, stair climbing and even cycling. They also may create and design tools that offer the best method of recommended care to each individual under assessment of an ADL. Therefore, it is believed that the patients with glaucoma may gain a lots of benefit from the well-trained occupational therapists [48,49,50].

### **Conclusion:**

In the past, glaucoma is only considered as one type of ocular disorders. Meanwhile, current scientific consensus and public guidelines emphasize the

significance of glaucoma not only a disease but also one problem of public health. It deserved further development of the treatment and rehabilitation [63,80]. We emphasized that the central visual field will be more highly correlated with QoL in our study. Furthermore, we found some physiological disorders by the Frenchay Activities Index which may impact the patients with visual field defects. Moreover, patients with glaucoma with some mood disorders were found. Therefore, we strongly suggested that the care about glaucoma patients which need medical team support together.

#### References:

1. Ekici F, Loh R, Waisbourd M, et al. Relationship between measures of the ability to performed vision – related activities, vision-related quality of life, and clinical findings in patients with glaucoma. *JAMA* 2015; doi: 10.1001/jamaophthalmol.2015. 3426.
2. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *Br J Ophthalmol* 2006; 90(3):262-7.
3. Smith RJH. The enigma of primary open angle glaucoma. *Trans Ophthalmol Soc* 1986; 105: 618-33.
4. Qui M, Wang SY, Singh K, et al. Association between visual field defects and quality of life in the United States. *Ophthalmology* 2014; 121(3): 733-40.
5. Altangerel U, Spaeth GL, Rhee DJ. Visual function, disability, and psychologic impact of glaucoma. *Curr Opin Ophthalmol* 2003; 14(2): 100-5.
6. Nelson P, Aspinall P, Papsaouliotis O, et al. Quality of life in glaucoma and its relationship with visual function. *J Glaucoma* 2003; 12(2): 139-50.
7. Mills RP, Drance SM. Esterman disability rating in severe glaucoma. *Ophthalmology*. 1986; 93: 371-8.
8. Viswanathan AC, McNaught AI, Poinosawmy D, et al. Severity and stability of glaucoma. *Arch Ophthalmol* 1999; 117:450-4.
9. Orta AÖF, Öztürker ZK, Erkul SÖ, et al. The correlation between glaucomatous visual field loss and vision-related quality of life. *J Glaucoma* 2015; 24: e121-7.
10. Martin ES, Finaly DD, Nugent CD, et al. An interactive tool for the evaluation of EGG. Visualization formation. “ in computer in Cardiology; 2013; 779-82.
11. Spaeth G, Walt G, Keener J. Evaluation of quality of life for patients with glaucoma. *Am J Ophthalmol* 2006; 141(1) (suppl): S3-14.
12. Altangerel U, Spaeth GL, Steinmann WC. Assessment of function related to vision (AFREV). *Ophthalmic Epidemiol* 2006; 13(1): 67-80.
13. Wei H, Sachyn AK, Myers JS, et al. A clinical method to assess the effect of visual loss on the ability to perform activities of daily living. *Br J Ophthalmol* 2012; 96(5): 735-41.
14. Skalicky SE, Martin KR, Fenwick E, et al. Cataract and quality of life in patients with glaucoma. *Clin Experiment Ophthalmol* 2015; 43: 335-41.
15. Millers RP, Janz NK, Wren PA, et al. Correction of visual field with quality measures at diagnosis in the Collaborative Initial Glaucoma Treatment Study (CIGTS). *J Glaucoma* 2001; 10: 192-8.
16. Mangione CM, Lee PP, Gutierrez PR, et al. Development of the 25-item national eye institute visual function questionnaire. *Arch Ophthalmol* 2001; 119: 1050-8.
17. Carod-Artal J, Egido JA, Gerhart-K, et al. Quality of life among stroke survivors evaluated 1 year after stroke. *Stroke* 2000; 31:2995.
18. Mackenzie AE, Chang AM. Predictors of quality of life following stroke. *Disabil Rehabil* 2002; 24: 259-65.
19. Quinn TJ, Langhorne P, Scott DJ, et al. Barthel for stroke trails: development, properties, and application. *Stroke* 2011; 42(2): 1146-51.
20. Adio AO, Onua AA. Economic burden of glaucoma in Rivers State, Nigeria. *Clin Ophthalmol* 2012; 6: 2023-31.
21. Robles N, Rajmil L, Rodriguez-Arjona D, et al. Development of the web-based Spanish and Catalan version of the Euroqol 5D-Y (EQ-5D-Y) and comparison of results with the paper version. *Health Qual Life Outcomes* 2015; 13: 72. Doi 10.1186/s12955-015-0271-z.
22. McManus J, Pathansali R, Hassan H, et al. The course of delirium in acute stroke. *Age and Aging* 2009; 38: 385-9.
23. Shah S, Cooper V, Improving the sensitivity of the Barthel index for stroke rehabilitation. *J Clin Epidemiol* 1989; 42: 703-9.
24. Elliott DB, Pseudovs K, Malkinson T. Vision-related quality of life *Optom Vis Sci* 2007; 84: 656-8.
25. McKean-Cowdin R, Wang Y, Wu J et al. Impact of visual field loss on health-related quality of life in glaucoma: the Los Angeles Latino Eye Study. *Ophthalmology* 2008; 115: 941-8.
26. Nelson P, Aspinall P, Papsaouliotis O et al. Quality of life in glaucoma and its relationship with visual function. *J Glaucoma* 2003; 12: 139-50.
27. Crews JE, Jones GC, Kim JH. Double jeopardy:



- the effects of comorbid conditions among older peoples with visual loss. *J Vis Impair Blind* 2006; 100: 824.
28. Cardol M, de Jong BA, van den Bos GA, et al. Beyond disability: perceived participation in peoples with chronic disabling condition. *Clin Rehabil* 2002; 16: 27-35.
  29. Livengood HM, Baker NA. The role of occupational therapy in vision rehabilitation of individuals with glaucoma. *Disabil Rehabil* 2015; 37(13): 1202-8.
  30. Mills RP. Correction of quality of life with clinical symptoms and signs at the time of glaucoma diagnosis. *Trans Am Ophthalmol Soc* 1998; 96: 753-812.
  31. Viswanathan A, McNaught A, Poinosawny D, et al. Severity and stability of glaucoma patient perception compared with objective measurement. *Arch Ophthalmol* 1999; 117: 450-4.
  32. Jampel HD. Glaucoma patient's assessment of their visual function and quality of life. *Trans Am Ophthal Soc* 2001; 99: 301-17.
  33. Jampel HD, Schwartz P, Pollack I, et al. Glaucoma patient's assessment of their visual function and quality of life. *J Glaucoma* 2002; 11: 154-63.
  34. Nelson P, Aspinall P, Papsouliotio O, et al. Quality of life in glaucoma and its relationship with visual function. *J Glaucoma* 2003; 12: 139-50.
  35. Neo G, Ferraro J, Lamoruexus E, et al. Association between glaucomatous visual field loss and participation in activities of daily living. *Clin Experiment Ophthalmol* 2003; 31: 482-6.
  36. Thylefors B, Negrel AD. The global impact. *Bull World Health Organ* 1994; 72: 323-6.
  37. Skalicky SE, Goldberg I, McCluskery P. Ocular surface disease and quality of life in patients with glaucoma. *Am J Ophthalmol* 2012; 153: 1-9.
  38. Aspinall PA, Johnson ZK, Azuara-Blanco A, et al. Evaluation of quality of life and priorities of patients with glaucoma. *Invest Ophthalmol Vis Sci* 2008; 49: 1907-15.
  39. Goldberg I, Clement CI, Chiang TH, et al. Assessing quality of life in patients with glaucoma using the Glaucoma Quality of Life-15(GQL-15) questionnaire. *J Glaucoma* 2009; 18: 6-12.
  40. Hochberg C, Maul E, Chan ES, et al. Association of vision loss in glaucoma and age-related macular degeneration with IADL disability. *Invest Ophthalmol Vis Sci* 2012; 53: 3201-6.
  41. Ramulu PY, Maul E, Hochberg et al. Real-world assessment of physical activity in glaucoma using an accelerometer. *Ophthalmology* 2012; 119: 1159-66.
  42. Wade DT, Collin C. The Barthel ADL Index: a standard measure of physical disability? *Int Disabil Studies* 1988; 10: 64-7.
  43. Miller WC, Deathe AB, Harris J. Measurement properties of the Frenchay Activities Index among individuals with a lower limb amputation. *Clin Rehabil* 2004; 18: 414-22.
  44. Hachisuka K, Saeki S, Tsutsui Y, et al. Gender-related difference in scores of the Barthel Index and Frenchay Activities Index in Randomly sampled elderly person living at home in Japan. *J Clin Epidemiol* 1999; 52(11): 1089-94.
  45. Wendel KA, Stahl A, Iwarsson S. Inter-rater agreement of a modified and extended Swedish version of the Frenchay Activities Index. *Eur J Ageing* 2013; 10: 247-55.
  46. Bode RK, Rychlik K, Heinemann AW, et al. Reconceptualizing poststroke activity level using the Frenchay Activities Index. *Top Stroke Rehabil* 2003; 9(4): 82-91.
  47. Torrance GW, Feeny D. Utilities and quality-adjusted life years. *Int J Technol Assess Health Care* 1989; 5: 559-75.
  48. Martin E, Nugent C, Bond R, et al, Trainee occupational therapists scoring the Barthel ADLS. *J Med Sys* 2015; 39:93. Doi: 10.1007/s10916-015-0293-4.
  49. Pyatak EA, Carandang K, Davis S. Developing a manualized occupational therapy diabetes management intervention: resilient, empowered, active living with diabetes. *OTJR (Thorofare N J)* 2015;35(3):187-94.
  50. Winner S, Yuen HK, Vogtle LK et al. Factors associated with comfort level of occupational therapy practitioners in providing low vision services. *Am J Occup Ther.* 2014;68(1):96-101.
  51. Van der Marck MA, Kalf JG, Sturkenboom IH, et al. Multidisciplinary care for patients with Parkinson diseases. *Parkinsonism Relat Disord* 2009; 15 (supple 3): S219-23.
  52. Brown MM, Brown GC, Sharma S, et al. Utility values and diabetic retinopathy. *Am J Ophthalmol* 1999; 128: 324-30.
  53. Mangioe CM, Lee PP, Gutierrez et al. Development of 25 item National Eye Institute Visual Function and quality of life. *Trans Am Ophthal Soc* 2001; 99: 30117.
  54. Theut Riis P, Vinding GR, Ring HC, et al. Disutility in patients with hidradenitis suppurative: a cross-sectional study using Euro QoL-5D. *Acta Derm Venereol* 2015. Doi: 10.2340/00015555-2129.
  55. Wade DT, Legh-Smith J, Hewer RL. Social

- activities after stroke: measure and natural history using the Frenchay activities index. In *J Rehabil Med* 1985; 7: 176-81.
56. Bond MJ, Harris RD, Smith DS, et al. An examination of the factor structure of the Frenchay activities index. *Disabil Rehabil* 1992; 14(1): 27-9.
  57. Piercy M, Carter J, Mant J, et al. Interater reliability of the Frenchay activities index in patients with stroke and their carers. *Clin Rehabil* 2000 14(4): 433.
  58. Pascual JC, Belinchón I, Ramos JM. Use of the barthel index, activities of daily living, in dermatologic surgery in patients aged 80 years and older. *Int J Dermatol* 2015; 54: 222-6.
  59. Rim TH, Lee SY, Bae HW, et al. Increased stroke risk among patients with open-angle glaucoma: a 10-year follow-up cohort study. *Br J Ophthalmol*. 2017 Jul 20. pii: bjophthalmol-2017-310415. doi: 10.1136/bjophthalmol-2017-310415.
  60. Lee SH, Kim GA, Lee W, et al. Vascular and metabolic comorbidities in open-angle glaucoma with low- and high-teen intraocular pressure: a cross sectional study from south Korea. *Acta Ophthalmol* 2017 Jul 5. doi: 10.1111/aos.13487.
  61. Sarfraz MH, Mehboob MA, Intisar-ul-Haq R. Correlation between central corneal and visual defect, cup to disc ratio and retinal fiber layer thickness in primary open angle glaucoma patient. *Park J Med Sci* 33(1): 132-6. Pickard AS, Johnson JA, Feeny DH. Responsiveness of generic health-related quality of life measurement in stroke. *Qual Life Res* 2005; 14(1): 207-19.
  62. Golicki D, Niewada M, Buczek J, et al Validity of EQ-5D-5L in stroke. *Qual Life Res* 2015; 24: 845-50.
  63. Füzéki E, Banzer W. Activities of daily and health. *Public Health Forum* 2013; 21: 4e1-2.
  64. Young J, Bogle S, Forster A. Determinants of social outcome measured by the Frenchay Activities Index at one year after stroke onset. *Cerebrovasc Dis* 2001; 12: 114-20.
  65. Brazil L, Thomas R, Laing R, et al. Vebally administered Barthel Index as functional assessment in brain tumor. *J Neurooncol* 1997; 34(2): 187-92.
  66. West SK, Looking forward to 20/20: a focus the epidemiology of eye diseases. *Epidemiol Rev* 2000; 22: 64-70.
  67. Frick KD, Foster A. The magnitude and cost of global blindness: an increasing problem that can be alleviated. *Am J Ophthalmol* 2003; 135: 471-6.
  68. Holbrook M, Skilbeck CE. An activities index for use with stroke patients. *Age Aging* 1983; 12: 166-70.
  69. Zhao YX, Chen XW. Diabetes and risk of glaucoma: systemic review and a meta-analysis of prospective cohort studies. *Int J Ophthalmol*. 2017 Sep 18;10(9):1430-1435.
  70. Martin-Du Pan R, Pruijm M, Burnier M, et al. Arterial hypertension and glaucoma: watch out for nocturnal blood pressure. *Rev Med Suisse* 2016; 12(350):1518-1521.
  71. Isabel C, Calvet D, Mas JL. Stroke prevention. *Presse Med* 2016; 45(12Pt2): e457-71.
  72. Chiam N, Baskaran M, Li Z et al. Social health and ocular factors associated with primary open-angle glaucoma among Chinese Singaporeans. *Clin Exp Ophthalmol* 2017 Jun 16. doi: 10.1111/ceo.13008.
  73. Kolker AE. Visual prognosis in advanced glaucoma: a comparison of medical and surgical therapy for retention of vision in 101 eyes with advanced glaucoma: *Trans Am Ophthalmol Soc* 1977; 75: 539-55.
  74. Fujita K, Yasuda N, Oda K, et al. Reading performance in patients with central visual field disturbance due to glaucoma. *Nihon Ganka Zasshi*. 2006; 110: 914-8.
  75. Coecklbergh TR, Brouwer WH, Cornelissen FW, et al. The effect of visual field defects on driving simulator study. *Arch Ophthalmol* 2002; 120: 1509-16.
  76. Perdicchi A, Abdolrahimzadeh S, Cutini A, et al. Evaluation of the progression of visual field damage in patients suffering from early manifest glaucoma. *Clin Ophthalmol* 2016; 10: 1647-51.
  77. Hassan SE, Geruschart DR, Turano KA. Head movement while crossing streets: effects of vision impairment. *Optom Vis Sci* 2005; 82: 18-26.
  78. Wang MY, Rousseau J, Boisjoly H, et al. Activity limitation due to a fear of falling in older adults with eye diseases. *Invest Ophthalmol Vis Sci* 2012; 53: 7967-72.
  79. White UE, Black AA, Wood JM, et al. Fear of falling in vision impairment. *Optom Vis Sci* 2015; 92: 730-5.
  80. Ross JE, Bron AJ, Clarke DD. Contrast sensitivity and visual disability in.