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Basic Demographic and Prevalence of Visual Function and Skill-Related Problems in Mild to Moderate Dementia Seen in a Memory Clinic in Kolkata

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Abstract:

Purpose: - Dementia is a progressive syndrome that affects the cognitive process, memory, and daily living skills which affects the overall quality of life. This study tried to find out the prevalence of eye problems in older age with different types of dementia, occupations, and different systemic diseases.

Materials and methods: - A total of 82 dementia patients aged between 50-80 years were selected depending on the clinical diagnosis of the neurologist, from a memory clinic in Kolkata, for a comprehensive eye examination, with more stress on high and low contrast visual acuity, depth perception.

Findings: The study comprised 82 dementia (59 male and 23 female) and 47 control (27 male and 20 female)patients. Exploratory Data Analysis (EDA)confirmed a significant difference (<0.001) between dementia and the control group regarding refractive error, the need for new spectacle, and visual and functional deficits.

Limitation: - Limitations include a small sample size, exclusion of severe dementia and a single data collection center.

Contribution of the study: - This study contributes to understanding visual function and skill-related problems in dementia, potentially helping optometrists improve diagnosis and management for this specific group of patients. These issues may also help in understanding the role of visual pathways in the genesis & course of dementia.

Keywords: Dementia, visual function, Demographic factors ,Stereo acuity, High contrast visual acuity, Low contrast visual acuity

I. Introduction

Dementia is broad term which encloses a range of neurological conditions, which marked by progressive deterioration of cognitive function such as memory, learning capability, calculations, comprehension, daily living activities. According to diagnostic and statistical tool for mental disorder('DSM-5") criteria dementia is recognized as a major neurocognitive disorder, Briefly, the

DSM-5 diagnosis of Major Neurocognitive Disorder, which corresponds to dementia, requires substantial impairment to be present in one or (usually) more cognitive domains. The impairment must be sufficient to interfere with independence in everyday activities (Hugo et.al,2014).There are five types of dementia Alzheimer's diseases, vascular dementia, lewy dementia, frontotemporal dementia(WHO,2021).Currently 55 million people are affected with dementia worldwide(WHO, 2021)& 5 out of every 100 elderly in India have dementia and more are at higher risk of developing this(Ardsi, 2010).By the year of 2026 estimated number of older people numbers with dementia is expected to increase 100% or more (Arvanitakis et al.,2019)The dementia syndrome is linked to a very large number of underlying causes and diseases in the brain. The common causes accounting for 90% of all cases are Alzheimer's disease, Vascular dementia, Dementia with Lewy bodies and Frontotemporal dementia. Some fewer common causes of dementia (like chronic infections, brain tumours, hypothyroidism, subdural haemorrhage, normal pressure hydrocephalus, metabolic conditions, and toxins or deficiencies of vitamin B12 and folic acid) are particularly important to detect since some of these conditions may be treated partially by timely medical or surgical intervention. Otherwise, altering the progressive course of the disorder is not possible. However, symptomatic treatments may delay the relentless course of the disease, ameliorate the troublesome behavioural symptoms and timely support can help People with Dementia (PWD) and carers alike (Arvanitakis et al.,2019).In one large study of over 1000 post-mortems, while 86% of all those with dementia had AD related pathology, only 43% had pure AD. 26% had mixed AD and cerebrovascular pathology and 10% had AD with cortical Lewy bodies (Arvanitakis,et.al,2019).**Alzheimer's disease**(Arvanitakis et al.,2019, Javaid et al.,2016)–Impaired memory , apathy, and depression gradual onset are the early characteristic of AD and Cortical amyloid causes and neurofibrillary tangles are the neuropathological reason of this diseases and symptoms are vividly seen in 50-75% of dementia cases are categorised as Alzheimer's disease which can be diagnosed by medical history,psychiatric & cognitive test like MMSE MCI ,physical examination, laboratory testing (Jethwa et al., 2015, Paik et al., 2020),**Vascular dementia** (Paik et al., 2020, Ardis et al.,2010)compare to Alzheimer's diseases this is less common , total 20-30% are comes under vascular dementia and in this cases, memory are less effected and mood fluctuations more prominent Physical frailty Stepwise multi-infarct disease progression is seen if we want to emphasis on neuropathology we can see that cerebrovascular diseases single infracts or more diffuse multi infract diseases are the main reason here ,**lewy body dementia** (Armstrong et al., 2009; Li et al., 2014)&**frontotemporal dementia(** Ardsi etal.,2010)are other two common types of dementia, in lewy body dementia patient may face marked fluctuation in cognitive ability, visual hallucinations. Cortical Lewy bodies are the neuropathological reason here. In frontotemporal dementia, personality and mood changes disinhibition language difficulties are mostly seen, No single pathology damage frontal and temporal difficulties lobes. Dementia patients faces lots of problems in daily living skills(Marquie et al., 2019)which are strongly related to visual systems (Pal et al.,2013)like decreased depth of perception thus having problems in climbing into stairs (Mittenberg et.al,1994. Mittenberg et al., 2000) bumping into objects (Dunskyet al,2019). Abnormal pursuit and saccadic eye movements (Molitor et.al,2015)which have direct relation with reading and writing skills, impaired colour vision, diminished vision these all together cause severe cognitive decline. About 4 percent of community-dwelling persons over age 65 have both cognitive and vision impairments, making the co-occurrence

of these problems more prevalent than such well-recognized conditions as Parkinson's disease and emphysema (Whitson et al. 2007) People with age-related macular degeneration (AMD) have higher rates of cognitive impairment than their peers, lower scores on cognitive tests, and a higher risk of incident dementia(Woo et al. 2012). Other studies suggest that, even without dementia, AMD patients still perform more poorly on tests of verbal fluency and memory (Zhuang et al., 2021). The prevalence of visual impairment in older adults is fundamental, and it carries negative impact on both patients and their caregiver (Zhang et al., 2023). Research has failed to demonstrate a clear genetic link between AMD and dementia (Welp et al.,2016) These results suggest more research is needed to fully assess the reasons behind the link between vision and cognitive impairment in adults with mild to moderate dementia.

.Table 1 Subtypes of dementia

Dementia subtype	Early, characteristic dementia	Neuropathology	Proportion of symptoms case
Alzheimer's disease	Impaired memory, apathy and depression Gradual onset (AD)	Cortical amyloid plaques and neuro-fibrillary tangles	50-75%
Vascular dementia	Similar to AD, but memory less affected, and mood fluctuations more prominent Physical frailty Stepwise progression (VaD)	Cerebro-vascular disease Single infracts in critical regions, or more diffuse multi-infarct disease	20-30%
Dementia with Lewy Bodies (DLB)	Marked fluctuation in cognitive ability Visual hallucinations Parkinsonism (tremor and rigidity)	Cortical Lewy bodies (alpha-synuclein)	<5%
Frontotemporal dementia (FTD)	Personality changes Mood changes Disinhibition Language difficulties	No single pathology – damage limited to frontal and temporal lobes	5-10%

II.Visual impairment and Cognition:

Several studies have reported that cognitive impairment is more common in elderly with vision impairment than in those without. It has also been reported that cognitive impairment progress ore rapidly in older adults with visual impairments. About 4 percent of community-dwelling persons over age 65 have both cognitive and vision impairments, making the co-occurrence of these problems more prevalent than such well-recognized conditions as Parkinson's disease and emphysema(Whitson et al., 2007). People with age-related macular degeneration (AMD) have higher

rates of cognitive impairment than their peers, lower scores on cognitive tests, and a higher risk of incident dementia(Baker et al., 2009).

Table 2:-Ocular condition associated in dementia

Articles	**Ocular conditions associated with dementia**
Cataract **(** Jefferis et al.**,**2011)	Cataract is the clouding of normally clear lens of the eye, and because of that patients gradually losses their vision. It has been studied that 64% patients with dementia is having cataract which is affecting the cognitive behaviour of patients as well**.**
Age related macular degeneration (Wen et al.,2021)	Age related macular degeneration is types of degeneration and deterioration of retina and choroids .As a results patients with AMD start with loosing their central vision 1st which give rise to cognitive declines .Studies shows connection between dementia and AMD
Diabetic retinopathy (Norregaard et al.,2022)	Diabetic retinopathy is caused by damage to the blood vessels in the tissue at the back of the eye (retina). Poorly controlled blood sugar is a risk factor. Early symptoms include floaters, blurriness, dark areas of vision and difficulty perceiving colours. Blindness can occur. Studies shows corelation between DR and dementia.
Depth perception (Piano et al.,2020)	Depth perception is the ability to see things in three dimensions (including length, width and depth), and to judge how far away an object is. We can measure it as stereo acuity and lots of studies shows that in dementia, its decreases.
Colour vision (Kim et al.,2022)	Colour vision is defined as the ability to discriminate among stimuli on the basis of their hue, independently of any other stimulus property. If any patients have colour blindness it will indicate that's patients will face problems in differentiate between colours
Contrast sensitivity (Hutton et al.,1993)	It is the ability to perceive sharp and clear outlines of very small objects. It is also defined as the ability to identify minute differences in the shadings and patterns. CS helps detect

	objects without a clear outline and distinguish them from their background contrast. Decreased contrast sensitivity will cause lots of problems in day-to-day life
Pursuit saccades (Molitor et al.,2015**)**	Saccades and smooth pursuit eye movements are two different modes of oculomotor control. Saccades are primarily directed toward stationary targets whereas smooth pursuit is elicited to track moving targets. Decreased pursuit and saccades will create problems in reading and writing or following objects.
Visual hallucination (Mendez et al.,1990)	The visual hallucinations involve seeing objects move when they are actually still and seeing complex scenarios of people and items that are not present.
Spatial agnosia (Mendez et 1990)	A disorder of spatial orientation, which may be tested by asking the individual to point to objects or other stimuli located in different parts of his or her visual field. Individuals can report objects in their visual fields, but not the spatial relationships of the objects to one another.

III. Literature Review

According to almost all studies, it has been observed that dementia is not rare in elderly population and according to the studies; the incidence of dementia will increase over time. It is estimated that by the year of 2026, dementia will increase by 100% among older populations. Older age patients go through lots of mental and physical issues

(Ohrnberger et al.,2017). Among all other health issues, vision related problems are alarming now a day which is creating different cognitive problems among older people. So, it's making their life dependent on others. This is eventually degrading their quality of life.

Table-3

Title	Objectives	Findings	Limitations
The Prevalence of Visual Impairment in People with Dementia (the PrOVIDe study): a cross-sectional study of people aged 60–89 years with dementia and	To measure the prevalence of eye conditions causing VI in people with dementia and to identify/describe reasons for under detection or inappropriate	The prevalence of VI is disproportionately higher in people with dementia living in care homes. Almost 50% of presenting VI is correctable with	Sampling bias is possible owing to quota-sampling and response bias. Areas for future research are the development of an eye-care pathway for people with

qualitative exploration of individual, carer and professional perspectives (((((Bowen et.al.2016)	management.	spectacles, and more with cataract surgery.	dementia; assessment of the benefits of early cataract surgery; and research into the feasibility of specialist optometrists for older people.
Visual impairment in aging and cognitive decline (Marquié et al.2019)	To find out visual impairment and cognitive decline from the patients of memory clinic	Detected that, patient living with Dementia presented with worse visual acuity, were less likely to receive adequate visualhealth care and exhibited suboptimal OCT scan image qualitycompared to those with MCI and SCD.	Thorough ophthalmological check uses not done, diabetes status is not recorded Did not have access to private medical record thus sometime it misses some important information
Visual manifestation in Alzheimer's diseases A clinic based study from India(Pal, S et al,2013)	To understand the frequency of visual dysfunction in AD and their relationship with dementia severity	Visual dysfunction are common in AD, elicitation of which helps us to understand the cause of disability so that appropriate steps can be taken	Findings need to compared in other linguistic population in the country before making the findings generalized Administrating the test for visual manifestation was hampered by concurrent presence of comprehension defect and attention problem which has led to a varying number of missing data in each of the components of the study Control group was not used
Disorder of visual system in Alzheimer's diseases	To find out different visual problems in Alzheimer's diseases	A range of disturbance of visual system is common in	There is lot research need in the management area

(Mendez,et al,1990)		AD like problem in Oculomotor system, visual fields,VEP,ETC	and the effect of strategies like colour coding, card holding, visuospatial guidance tools in AD patients
Alzheimer's diseases: A defining role for the optometrist(Maryke et.al,2014)	To understand the role of optometrist in patients with AD have visual dysfunction	Optometrist can take an important role, by early detection and prevention of ocular problems and public awareness	All the paper has specially emphasised on the different visual problems but the intervention part is not discussed as much
Quality of life assessment in older adults with dementia :A systemic review(Burks et al.2021)	The aim was to conduct a systematic review of the literature to determine how QOL was assessed in adults, 65 years and older with dementia, and identify factors that influence the reported scores.	In evaluating QOL in dementia, self- and proxy reports may complement each other to ensure that all perspectives are addressed	probably not have yielded much new information could not look at gender associations because not all the papers had the gender distribution of participants Limited in distinguishing assessments by type of dementia, for example, Alzheimer's dementia and vascular dementia. This review looked for measures that have been used in older persons with dementia, specifically those 65 years and older, and therefore was limited in scope to report those tools

Prevalence of visual impairment in dementia: The impact of dementia is not only on the individuals but on the families and communities. It creates a strong impact on cognitive skills, daily living activities, also social and emotional wellbeing. Dementia patients with deficits visual skills and visual function-related problem face more cognitive deficits as both of them are strongly related. Vision impairment(VI) is common in older people living with dementia and is associated with negative impacts on those with dementia and their caregivers (Zhang et.al,2023). The prevalence of

VI is disproportionately higher in people with dementia living in care homes. Almost 50% of presenting VI is correctable with spectacles, and more with cataract surgery. Areas for future research are the development of an eye-care pathway for people with dementia; assessment of the benefits of early cataract surgery; and research into the feasibility of specialist optometrists for older people (Bowen et.al 2016). longitudinal study of 2767 adults in the US found population attributable fractions up to 19.0% of prevalent dementia cases attributed to at least 1 vision impairment. These fractions varied across contrast sensitivity, near visual acuity, and distance visual acuity (Smith et.al,2024). Self-reported VI in the US Medicare population is associated with greater dementia likelihood over time, and dementia is similarly associated with greater VI likelihood over time. Associations are likely multifactorial and bidirectional and could be explained by intervening variables in the path from VI to dementia, or vice versa, or by common risk factors for pathological processes in both eyes and brain. These findings suggest the need for early identification of older adults with visual compromise and consideration of visual disability in the cognitively impaired (Chen et al., 2021). There is very less research work found visual impairment in dementia patient in india.

Demographic risk factors: -Several demographic conditions may be associated with dementia patients. The population of India is extremely diverse in terms of socio-economic, cultural, linguistic, geographical, lifestyle-related and genetic factors. Indeed, preliminary data from recently initiated longitudinal studies in India indicate that the prevalence of vascular and metabolic risk factors, as well as white matter hyperintensities, differs between urban and rural cohorts. More information on the complex role of vascular risk factors, gender and genetic influences on dementia prevalence and progression in Indian populations is urgently needed. Low-cost, culturally appropriate and scalable interventions need to be developed expeditiously and implemented through public health measures to reduce the growing burden of dementia. Here, we review the literature concerning dementia epidemiology and risk factors in the Indian population and discuss the future work that needs to be performed to put in place public health interventions to mitigate the burden of dementia (Ravindranath et.al,2021). Women, older adults, those with non-post-secondary attainment, below average income, and White background tended to report lower risk scores. Public health education and initiatives for dementia prevention should focus on lifestyle risk factors, in addition to considering the barriers related to the demographic factors identified that may prevent populations from accessing programs and information (Horst et.al.2021). The strongest demographic risk is increasing age (Wong et al., 2020), Some studies suggested that risk of dementia varies in different ethnic group as well. This important that we keep in mind that these demographic values will increase the risk factors but could not possibly disclose whether someone will have dementia or not. For that information we need more research work in this area.

IV. Methodology

Study design and setting: This comparative analytical study took place at a memory clinic in Kolkata. This study focuses on assessing the basic demographic and prevalence of visual skill and function-related problems in patients with mild to moderate dementia

Participants: A total of 82 dementia patients aged between 50-80 years were included in this study. Participants were selected based on the clinical diagnosis of a neurologist at the memory clinic. Mild

to moderate dementia patients graded based on 'DSM-5' and Clinical diagnostic rating(CD-R)criteria (Juva et.al.1994)were included in this study and patients with severe dementia, additional co-morbidity, recent or severe birth problems patients were excluded from the study.

a. Procedure

All participants underwent a comprehensive eye examination. Procedures are

1. Visual acuity at distance and near using log MAR chart for distance and near:
2. Refractive status with retinoscopy
3. Stereoacuity with random dot test & Titmus fly test

1.Visual acuity: - To find out how far away visual acuity changes when contrast changes, we shall examine the visual acuities at high and low contrasts in this section.

Normal Range:- In a healthy geriatric population "normal line gap" between high contrast and low contrast Log MAR visual acuity could be considered around 2-3 lines on a standard visual acuity chart, meaning that if someone has 20/20 vision at high contrast, their low contrast vision might be around 20/30 to 20/40(Chou et.al,2022).A larger gap suggested a potential contrast sensitivity issue(Johnson et. al, 1995),

a.High contrast Visual acuity: - Log MAR chart will be used from the 3meter distance of the patients to assess the distance visual acuity in both eyes.

Procedure-The patient is asked to sit at 3 meter distance from the chart and recognise the optotype. Smallest row of optotypes recognised by the patients determine their visual acuity. The scoring principal remain same with the standard log MAR chart. A log MAR score of 0.0 is corresponds to 20/20 or 3/3 vision. Patients had visual acuity less than 3/30 ,are held the chart near by(2 meter and 1 meter distance)and converted into log MAR acuity. This shorter distance visual acuity chart is more comfortable and accessible for the while providing accurate and standard result for cognitive impaired dementia patients. Higher the score (>3/30) indicate worse visual acuity .Measuring visual acuity in case of mild and moderate dementia is not only monitoring the progression but also can determine the impact of eye treatment, determine potential visual loss and determine the optical and non optimal strategies for optimal use of residual vision (Ciocler et.al,2013)

b.Low-contrast visual acuity chart: - For low contrast visual acuity we will use log MAR low contrast visual acuity chart (2.5% contrast) at 3-meter distance, In low contrast visual acuity chart optotypes are presented at a reduced contrast level.

Procedure:-Patients is positioned at 3meter distance are asked to identify the letter starting from the normal to low contrast condition. Higher the score(>3/30)indicate worse visual acuity under low contrast level.

Low contrast visual acuity chart is more sensitive than high contrast log MAR chart in detecting early visual impairment (Almidani et al,2024). With the help of low contrast visual acuity assessment in dementia patients,can determine visual function of the same population,

c.Near Visual acuity chart: - Assessing near visual acuity chart using log MAR for dementia patients is very important in dementia patient. Because it shows the capacity of a person to do daily living activities at near such as reading , writing, recognizing objects at near.

Procedure: - Patients needs to hold the log MAR chart at usual working distance in normal room illumination with needful addition power. The smallest row read accurately determine their near visual acuity.

2.Retinoscopy: - Streak retinoscopy is an objective method for measuring refractive error of eye.

Procedure: -A streak light is directed towards the patients retina ,and eye care practitioner ,observe the movement of reflex as light move across the retina .The direction and speed of the light reflex ,determine the refractive error of the patients. Streak retinoscopy helps dementia patients to determine the uncorrected refractive error which will help dementia patients to improve their vision and improve their cognitive deficits. Generally, retinoscope is a well-approved objective procedure by patients, but some patients with dementia may have difficulty in fixating their gaze. Eye care practitioners need to be patient during the process.

3.Test for Near depth perception(for near): - When viewed through a stereoscope or with the eyes fixed on a point in front of or behind the images, a stereo pair of images of random dots creates a sense of depth, with objects seeming to be in front of or behind the display level.

Normal range: - Stereo acuity generally decreases with age. In one study researchers found out ,stereo acuity results were grouped as either normal (20 arc seconds or better), Borderline (25 arc seconds to 40 arc seconds), and reduced stereopsis (50 arc seconds to 400 arc seconds)(Deepa et.al,2019) Another group of researchers found out Stereoacuity was reduced from about 16 sec are for the three younger groups to about 27sec arc for the older subjects. (Zaroff et al,2003) , though test results may vary between different test procedures (Adams et. al,2008)

By investigating through literature, took a cut off of 100-200 sec of arc as age normal range of near stereo acuity for geriatric patients.

a.Randot stereo test

A vectograph random dot stereo test is known as the randot test, will be used here to assess the stereo acuity of patients.

Here two types of tests are included to assess gross and finer level of stereopsis.

According to other studies, depth perception is one of the crucial components of visual abilities for cognition and elderly people actually struggle with their cognitions. I therefore want to assess the stereoacuity of dementia patients, order to identify and properly guide individuals who have diminished stereoacuity.

b.Titmus fly test:- It's a stereo depth perception test

Procedure: -Fly test uses polarized glasses(with prescription power if any) and presents a series of images including fly, circle, and animals. Patients are asked to identify which part of the image consists of depth. Analysing depth perception may give important insights regarding the extent of

visual processing impairments. Cognitive impairment in dementia patients may make the testing process a little difficult for the population but repeating easy instructions will be useful in this case.

V.Result:-For this study we have included a total 82 dementia patients and 47 control group patients. Data are tabulated below

Demographic data

	CONTROL	DEMENTIA	SIGNIFICANCE
GENDER(FEMALE:MALE)	20:27	23:59	0.093, CHI-Squared Test
Occupation (Unemployed:Smalll business or Skilled worker: teacher:Government Employee or Professional:Librarian:Office work:Homemaker:Businessman)	0:13:2:0:0:0:18:14	1:21:1:5:1:27:25:1	P<0.001***, Fisher' exact test
Education (Class 12 & Below: Graduate & above)	28:21	58:24	P=0.077,CHI-Squared Test
MEDICAL ILLNESS(None: Hypertension:Diabetes:Others:	31:15:1:0:0	16:30:22:9:3	P<0.001***, Fisher' exact test

Figure:-1

From the above data may conclude that among 82 dementia study groups,23(28%) were female and 59(72%) were male patients, and among 47 control group patients,20(42.6%) were female and 27(57.4%) were male. But there no significant difference was observed in the male-to-female ratios. So, here we may conclude that dementia risk is not sex-dependent.

Here we found out dementia affects individuals across various socioeconomic and education levels. No significant association was found between dementia and socioeconomic status or education.

A higher prevalence of systemic illness like blood pressure blood sugar and history of brain stroke was found in patients with dementia compared to the control group. These findings highlight the potential contribution of systemic illness in the progression of dementia.

High contrast & low contrast visual acuity and near vision in dementia patients

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The medians of Age are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.021[a]	Reject the null hypothesis.
2	The medians of HCVA-RE are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.
3	The medians of HCVA-LE are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.
4	The medians of LCVA-RE are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.
5	The medians of LCVA-LE are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.
6	The medians of RE-Near Vision are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.
7	The medians of LE-Near Vision are the same across categories of STUDYGROUP.	Independent-Samples Median Test	.000[a]	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

a. Yates's Continuity Corrected Asymptotic Sig.

Fig 2:- From the above chart it can be confirmed that dementia can occur and progress through different geriatric age groups also high contrast visual acuity low contrast visual acuity and near vision are not similar in different categories. While comparing the visual acuity with control group patients it shows that potential visual impairment and worse vision are more prominent in the dementia group, compared to the control group(Allen et.al,2020)

High contrast visual acuity and low contrast visual acuity line gap among control and dementia group

		STUDYGROUP		
		CONTROL	DEMENTIA	Total
contrast		46	1	47
	no response	0	5	5
	normal	0	5	5

	RE-less than age normal,LE-Less than age normal	1	60	61
	RE-Less than normal,LE-normal	0	1	1
	RE-Less than normal,LE-Less than normal	0	6	6
	RE-Less thas normal,LE-less than normal	0	1	1
	RE-Normal,LE-Less than age normal	0	3	3
Total		47	82	129

Fig 3:- While tabulating the high contrast and low contrast visual acuity in more depth, found out that the gap between high contrast and low contrast visual acuity (in the ideal case should be within two lines to call it a normal contrast level) is much more in case of dementia patients compared to the control group, which is directly leading towards the problem of contrast sensitivity among dementia patients, which could have severe implications in daily living activities(Polo et.al.2017).from the above chart we can gather much information like, among 82 dementia patients ,5 (6.1%)of them could not communicate or unable to perform the test because of the cognitive deficits. 5 (6.1%)of them have age normal contrast sensitivity While only the right eye has potential less contrast sensitivity or less contrast only in the left eye or both eyes also observed in 72 dementia patients

both eye low contrast 67(81.7%)

Right eye only low contrast 1(1.2%)

left eye only low contrast 3(4.9%)

Statical Significance of Distance objective refraction and near vision and acceptance subjective refraction

Null Hypothesis	Test	Significance	Decision
There is no difference in right eye spherical distance objective refraction between dementia and the control group	Fisher' exact test	<0.000	Reject null hypothesis
There is no difference in left eye spherical distance objective refraction between	Fisher' exact test	<0.000	Reject null hypothesis

dementia and the control group			
There is no difference in Right eye distance objective cylindrical refraction between dementia and control group	Fisher' exact test	<0.000	Reject null hypothesis
There is no difference in near vision in both eye between dementia and control group	Fisher' exact test	<0.000	Reject null hypothesis
There is no difference in acceptance of objective refraction between dementia and the control group	Fisher' exact test	1.000	Acceptance of null hypothesis

Fig 4:- From the above tabulation we can clearly state that there is a significant need for spectacle among dementia patients compared to the control group patients. Also, the above chart states that though there is a need for visual aids while discussing the acceptance of the given aids is not significant because of cognitive deficits

Null hypothesis	test	Dementia:Control	significance	Decision
There is no difference between high-contrast and low-contrast visual acuity among dementia and control group	Fisher' exact test	82:47:00	<0.000	Reject null hypothesis
There is no difference between Titmus fly stereo acuity test among dementia and control group	Fisher' exact test	82:47:00	<0.000	Reject null hypothesis

There is no difference between Randot stereo acuity test among dementia and control group	Fisher's exact test	82:47:00	<0.000	Reject null hypothesis

Statistical significance of contrast Random dot and Titmus fly stereoacuity test

Fig 5:-Above calculation ,showing the information regarding the contrast sensitivity among dementia and control group patients and its showing significant difference between two groups (P<0.000).

Also in second and third row tabulated data has been showing the significant difference among the random dot taste and Titmus fly test among dementia and control group,from this it can be concluded that stereo acuity is impaired in dementia patients.There is significant difference in stereoacuity deficits in dementia atients is observed compare to control group patients which may indicate age relate chages in crystalline lens and macula.High proportion of the population unable to complete the assessments indicates ,the need for alternate and simple ,easy to perform (compare to random dot and Titmus fly test)stereoacuity measuring tools is need for the hour.It also indicate the cognitive deficits among the patients.So,we can conclude that stereo acuity test should be mandatory for the dementia patients,walking to the optometris's clinic .early detection of deficits stereo acuity can save dementia patients

Stereocuity test in dementia patients

Stereo acuity status	Number of patients	percentage
Age-normal stereo acuity	5	6.1%
Reduced stereo acuity	49	59.8%
Deferred the test due to less vision	2	2.4%
Could not understand the test /could not communicate	26	31.7%
Total	82	100%

Fig 6

From the above tabulation, the clear statement can be made that 5 among 82 dementia patients have age normal stereoacuity.49 among 82 dementia patients have reduced stereoacuity, rest 2 of them differed due to less vision and 26 of them could not communicate or answer or understand the test due to cognitive deficits. where all of the control group patients understood the task promptly and participated well and they showed reduced but age-normal stereo acuity compared to the dementia patients.

Discussion

This comparative analytical study examined the medical and demographic characteristics of 82 dementia and 47 healthy individuals aged 50-80 years. There is no significance found for education, socio-economic, or gender distribution among control and dementia groups of patients. We need to have awareness of this disease among all elderly age groups, socioeconomic levels, education, and different occupations. All dementia patients used work, before dementia was diagnosed, which increases their dependency on other family members and has a high risk of impacting patients' quality of life and also affects the quality of life of caregivers(Hazzan et.al.2022,). A strong association between systemic illness and dementia particularly hypertension, diabetes, and stroke indicates a potential role of vascular health in dementia progression. the findings support the vascular risk factors and cognitive decline(Hachinski et.al.2019). Significant severe visual impairment in the dementia group may contribute to several factors. The neurodegenerative process associated with dementia can directly affect the visual pathway in the brain (Polo et. al,2017), also dementia-related cognitive deficits may affect visual processing and interpretation (McIntyre et.al.2019 Mahendra et.al 2017,). association between visual impairment and dementia has important implications for optometrists and eye care practitioners. Regular vision assessment for dementia patients should be a mandatory step for eye care practitioners and optometrists for early detection of visual problems. Appropriate and early intervention of corrective and low vision devices, cataract surgery in case of that is the reason for visual impairment, environmental modification could improve the quality of life for dementia patients. A high proportion of bilateral low contrast (81.7%), highlights the widespread nature of contrast sensitivity impairment among dementia population (Risacher et .al.2020), which may indicative of problems working in dim light conditions and which eventually hamper the quality of life of the patients. Our analysis demonstrates the higher need for vision correction for distance and near among this age group compared to the control group. Age-related changes in eye such as Presbyopia, cataract are more common in older adults, also have a high prevalence of dementia(Kini et.al.2020). while our study suggested the need for visual correction in this population, it also indicates the challenges with the subjective acceptance and use of the needful visual aids. Cognitive deficits associated with dementia , can impair the ability of use visual aids, remember to use them regularly, and understand the difference in visual outcome it provide in day-to-day life.(Cipriani et.al.2020). Education and counselling of patients and caregivers regarding the knowledge of visual aids are essential(Rosa et.al.2010). Easy and simple tips for spectacle use and positive reinforcement in daily life, may improve the acceptance of visual aids. There is a significant difference in stereoacuity deficits in dementia patients. Only 6.1% of 82 patients exhibited normal stereo acuity , and 59.4% exhibit potentially reduced stereo acuity compared to control group patients which may indicate age-related changes in the crystalline lens and macula and dorsal pathway(Kim et.al.2021). A high proportion of the population 31.7% unable to complete the assessments indicates the need for alternate and simple, easy-to-perform (compared to the random dot and Titmus fly test, among Titmus fly and random dot test, dementia patients understood the fly wing test and animal in “A’ row easily compared to other components of the test) stereo acuity measuring tools is need for the hour. It also indicates the cognitive deficits among the patients. So, it can be concluded that stereo acuity tests should be mandatory for all dementia patients, walking to the optometrist’s clinic. Early

detection of deficits in stereoacuity can save dementia patients from the risk of falls and accidents. Also, because of cognitive deficits ,optometrists need to choose the testing process carefully.

Conclusion:-Our findings conclude that dementia patients have a highly significant level of visual skills and function-related problems compared to those of the control group So, we need to practice providing routine screening of visual acuity, refractive error, contrast, stereo acuity to arrest any visual skill related problem at the earliest. Also, need to be very patient and choose easy, less time-consuming diagnostic procedures and solutions for a better quality of life. Also need to take details of the systemic history of systemic illness, use of visual aids also aware of healthy older individuals regarding dementia regardless of genderise economic or education level is crucial for early detection and intervention.

Strength of the study:- There is very little data available on visual skills in dementia, this is most probably 1st optometry-based research done on dementia from the eastern region of India. Also inclusion of well well-defined control group is the strength of the study.

Limitation:-It's a single centered, study with less sample size. A multicentered longitudinal research with a bigger sample size will reveal more information about the visual skill changes with the progression of the study. Other visual skills can be taken into consideration for detailed investigation.

Conflict of interest:-It's a self-funded project, and researchers have no conflict of interest. **Ethical approval** :-was obtained from the Sankara Eye Hospital, Punjub.

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