

A Study of Prevalence and Risk Factors of Senile Cataract in Tea Garden Community in Dibrugarh District, Assam, India

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Abstract: Purpose: To find out prevalence of senile cataract in tea garden community and its association with risk factors. Methods: A cross sectional study, community based study was undertaken among adults aged 40 years and above in 10 randomly selected tea gardens of Dibrugarh district. Those eligible were subjected to interview and ocular examination using Distant Direct Ophthalmoscopy. The lens opacity was graded and classified after dilation using LOCS III system at the slit lamp for cataract. Result: Out of 1200 eligible persons examined 384 persons were found to have cataract. Data analysis revealed prevalence of 32 %. On univariate analysis age, educational status, occupation, socioeconomic status, BMI, family history, history of sunlight exposure, smoking, alcohol consumption and severe diarrhea were found to be significantly associated with senile cataract and on multivariate analysis age, educational status, occupation, family history, smoking and alcohol consumption were found to be significantly associated with senile cataract. Conclusion: Senile cataract appears to have a multi factorial etiology. Though the study provided some clues to the etiology of senile cataract in tea garden community, further studies are needed to know the specific role of these factors in the causation of cataract, so that any preventive or control measures could be initiated in the community.

Keywords: Senile cataract, prevalence, tea garden community, risk factors

1. Introduction

Cataract is a major cause of avoidable blindness and visual impairment throughout the world. Its incidence is increasing due to increase in life expectancy of the population globally and especially in developing countries. Thereby increasing burden to health care system. According to 2010 World Health Organization (WHO) data, there are 39 million persons who are blind worldwide, with the three leading causes of blindness being cataract (51%), glaucoma (8%), and age-related macular degeneration (5%).¹ Globally, cataracts cause moderate to severe disability in 53.8 million (2004), 52.2 million of whom are in low and middle income countries.²

The WHO / NPCB (National Programme for Control of Blindness) survey has shown that there is a backlog of over 22 million blind eyes (12 million blind people) in India, and 80.1% of these are blind due to cataract.⁵ From a public health perspective, it is desirable to identify risk factors for the development and progression of cataract because although surgical intervention is an effective modality for restoring vision, there remain significant challenges in both delivery and utilization of cataract surgical services.³

India is the largest producer and consumer of tea in the world.⁴ Assam is the largest tea producing state in India and contributes about 60 per cent of the total production of India. Tea garden population constitutes approximately 1/5th of state's population. Dibrugarh is the hub of tea industry and situated in the eastern corner of the state. Their working condition, poor socio-economic conditions, ignorance due to

illiteracy, over-crowded, addiction to local homemade beer and unhygienic living conditions in the residential colonies make tea garden population vulnerable to various diseases and malnutrition. There may be some also specific health problems, which may be related to their occupation. Identification of major risk factors of senile cataract in the tea garden population will be crucial in planning strategies to reduce or delay the development of this condition. The findings allow us to discuss their health scenario against the backdrop of their socio-economic condition and lifestyles, which will have important public health implication.

2. Aims and Objectives

- To evaluate the prevalence of senile cataract in tea garden community in Dibrugarh district.
- To find out association of different risk factors with the prevalence of cataract.

3. Methodology

Ethical clearance was obtained from the institutional ethics committee of Assam Medical College and Hospital, prior to the commencement of the present study.

Selection of Patients

Inclusion Criteria:	Exclusion Criteria:
<ul style="list-style-type: none"> • Age more than 40 years. • Any significant opacity in the lens or its capsule suggestive of senile cataract. • Patient previously undergone cataract surgery aphakia or psudophakia 	<ul style="list-style-type: none"> • History suggestive of congenital, traumatic, or complicated cataract. • Features not suggestive of senile cataract on slit lamp examination. • Patients with hypertension and diabetes are not included in my study

A community based Cross-sectional Study was conducted among peoples of 40 years of age and above, resides in tea garden of Dibrugarh district for aperiod of one Year (June 2014 to May 2015).The sample size is calculated by using the formula:

$$n = \frac{Z^2pq}{d^2}$$

Where n = Sample Size
 Z = 1.96 for 95% confidence interval
 p = Prevalence of cataract among elderly population in tea garden
 q = (1-p)
 d = Allowable error (relative error)

Considering the prevalence of cataract among adult population aged 40 years and above to be 24.86%⁵ and the relative error to be 10% the sample size is calculated to be 1161 which is rounded off to 1200.A list of all the tea garden under the Dibrugarh district was prepared and 10 tea gardens were selected from the list by simple random sampling. The sample size of 1200 was equally allocated in those selected tea gardens, i.e.120 cases in each garden. Then in each of these selected tea garden the list of the individuals aged 40 years and above was prepared and from the list the required number of individuals i.e.120 from each garden were selected randomly for the study. Data were collected in a pre-designed pre tested schedule after obtaining permission from the tea garden authority to conduct my study. Written informed consent was taken from each of the participants.

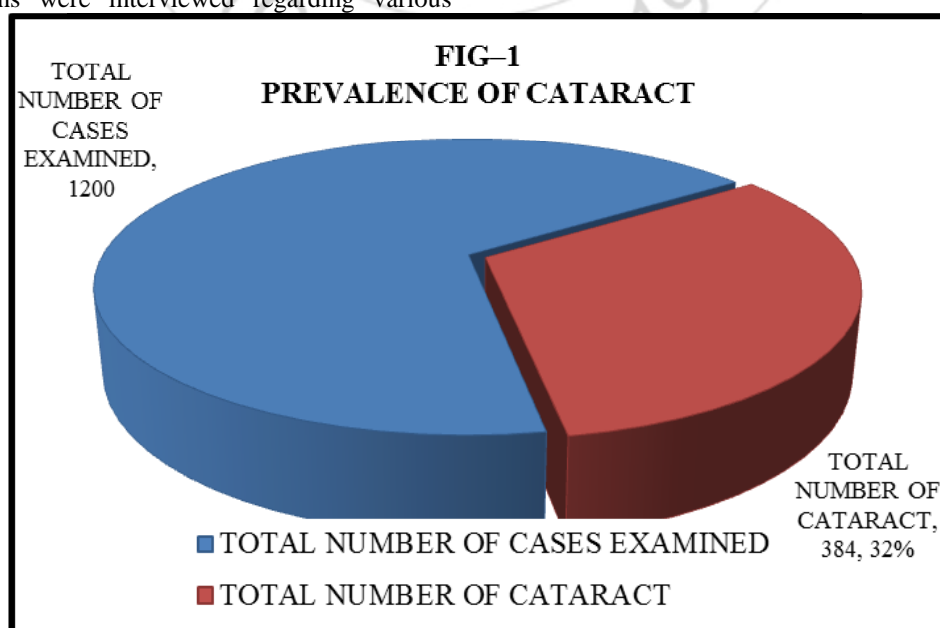
The eligiblepersons were interviewed regarding various

riskfactors namely age, sex, literacy status, socioeconomicstatus, family history, sun light exposure, smoking history, alcohol intake, history of severe diarrhea andintake multivitamin supplements using a pre-designed and pre-testedquestionnaire. This was followed by General PhysicalExamination and ocular examination using torch. Vision was tested in each eye separately with Snellen's chart in Assamese, Hindi, English or C chart. Patient had vision ≤6/36,were made fully dilated pupil by instilling tropicamide.8% and phenylephrine 5% eye drop into eyes then Distant Direct Ophthalmoscopy was done. Three slit-lamp images were taken and compared with standard color photographic plates of cortical cataract, nuclear opalescence, nuclear color and posterior sub capsular cataract and graded according to LOCS III classification. Those cases which were detected early and got operated were examined whether they were pseudophakic or aphakic either in both or single eye were included in my study. Anthropometric measurements height, weight were measured and BMI were calculated.

Statistical analysis was done using mean and percentage. Data are presented as tables, bar diagrams and pie diagrams wherever applicable.Univariate analysis was first done to test associations wherever necessary. Multiple logistic regression (MLR) was used for all the variables which were found significant during univariate analysis. The data was analysed using SPSS 16.0 software.

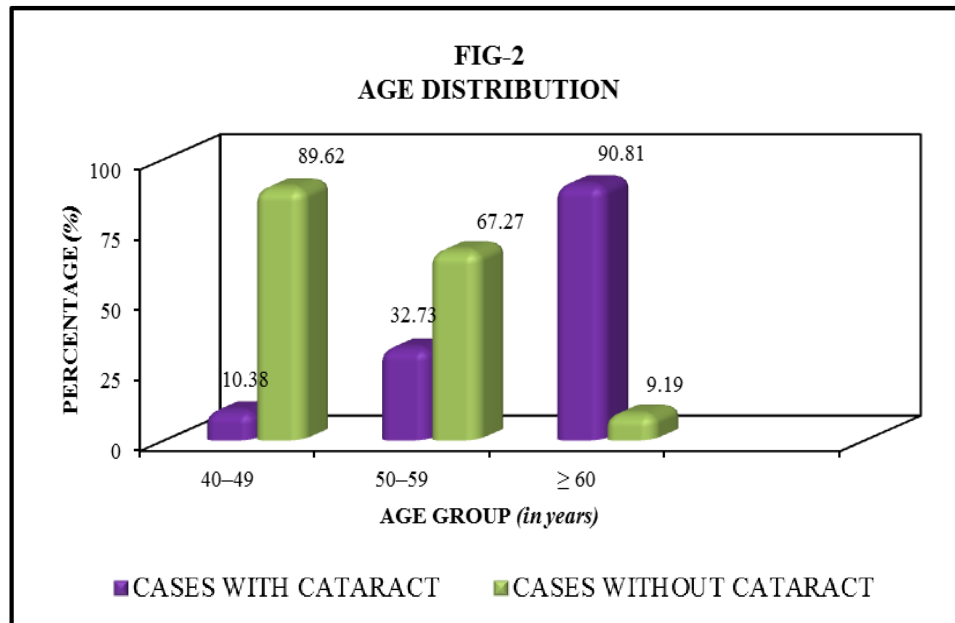
4. Results

Prevalence of Cataract



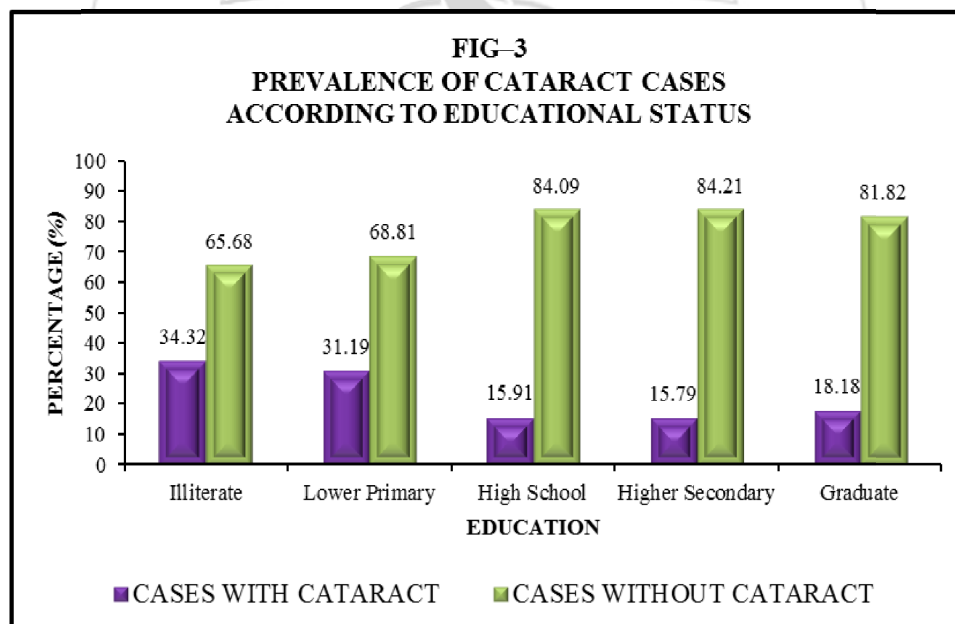
In our study, among 1200 total cases examined, 384 cases were found to have cataract i.e. 32%.

Factors Associated With Cataract:



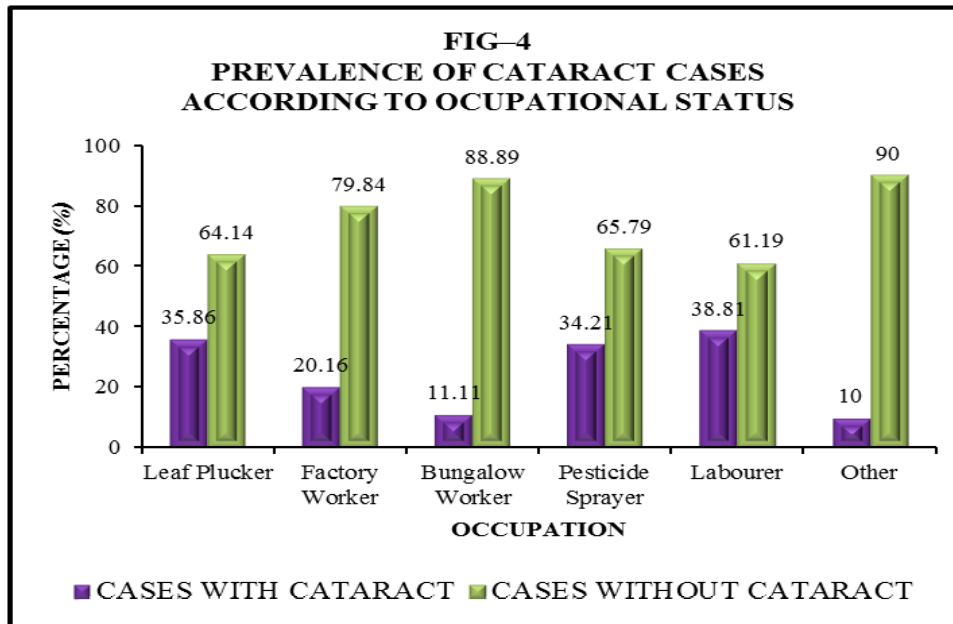
In our study prevalence of senile cataract increases with increasing age, maximum at age ≥ 60 years (90.81%), followed by 31.46% at 50-59 year range and lowest at 40-49 year range (10.38%). The prevalence of senile cataract was observed to be significantly associated with the

age. In our study (30.72%) cataract cases were male and (32.91%) cataract cases were female, thus a MALE: FEMALE RATIO of 1:1.51. No statistically significant association was observed between the sex of the study participants.



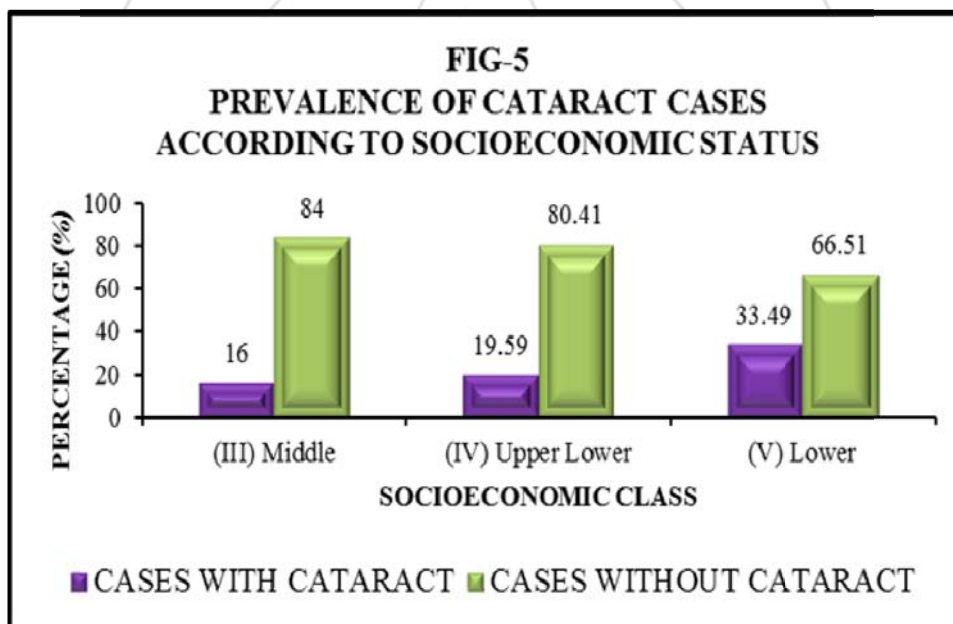
In our study illiterates were found to be having high prevalence of 302 (34.32%) than that of graduate 2 (18.18%). However, statistically significant association was

observed between educational status of the study participants.



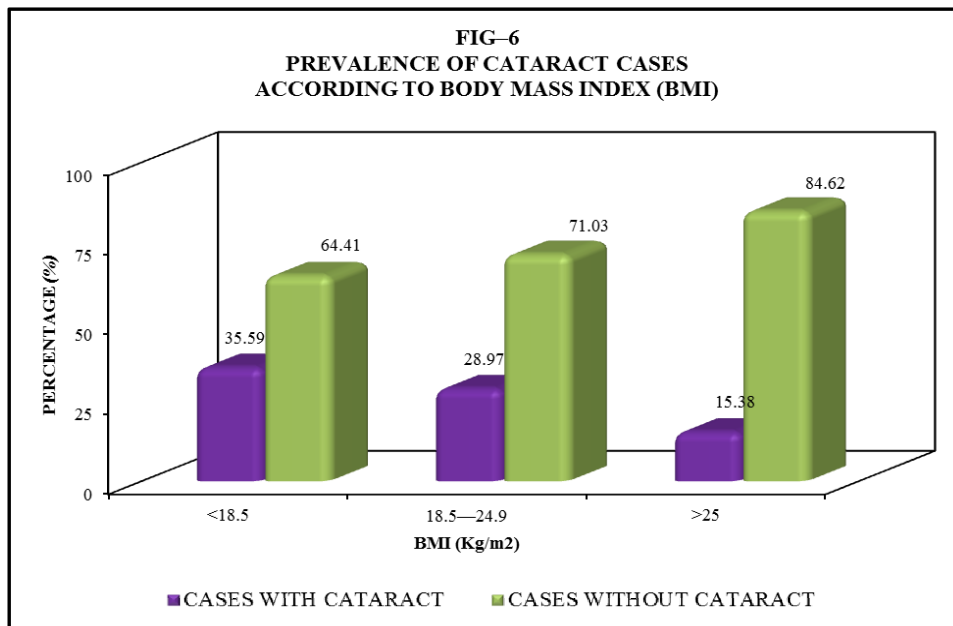
Maximum number of patients were outdoor workers. Prevalence is found to be maximum in labourer 38.81%, followed by leaf plucker 35.86%, pesticide sprayer 34.21%, factory worker 20.16%, bungalow worker 11.11%

and least incidence in others 10%. The association between occupations of the study participants is statistically significant.

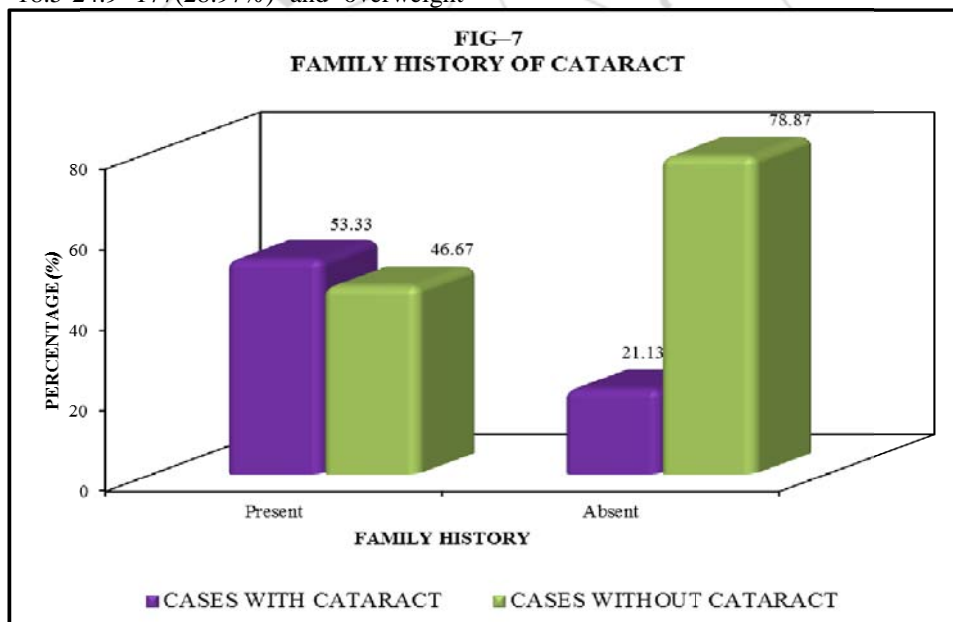


Most of the cases of cataract were of lower socioeconomic status, with 361 (33.49%) of the patients in the lower class, 19 (19.59%) of the patients in the upper lower and 7 (16%)

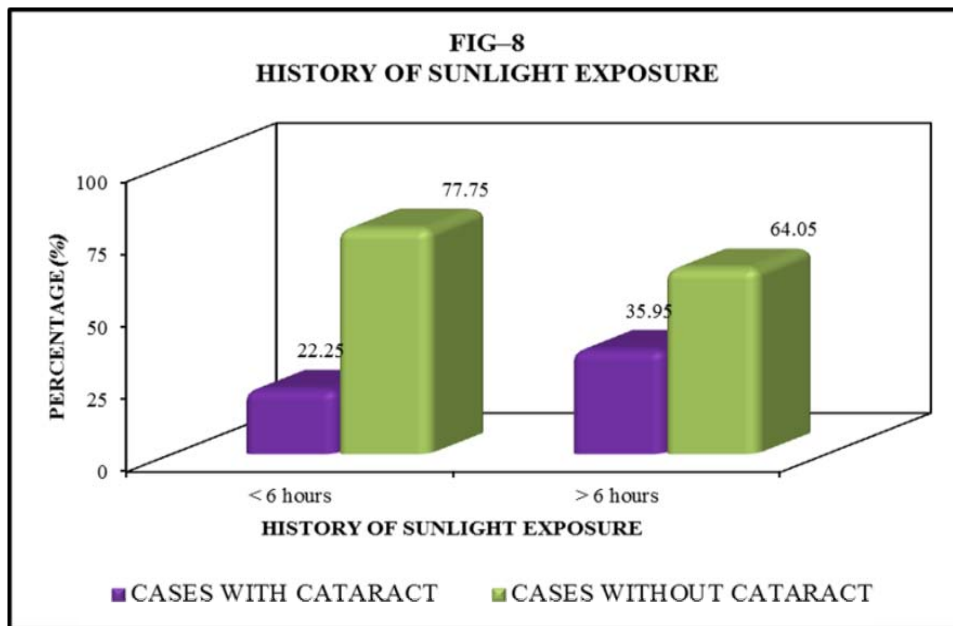
of the patients in the middle class. The prevalence of cataract was observed to be significantly associated with socioeconomic status of the participants.



In our study, prevalence of cataract found to be higher in underweight patients i.e. BMI<18.5 205(35.59%) than normal BMI i.e. 18.5-24.9 177(28.97%) and overweight i.e. BMI>25 2(15.38%). A statistically significant association was observed between BMI and prevalence of cataract.

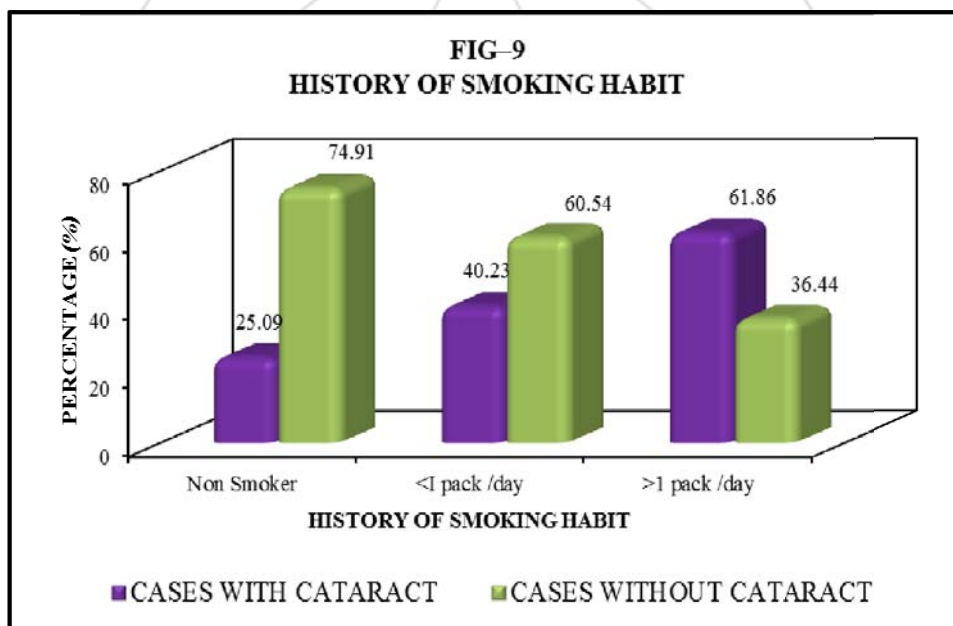


In our study, family history of cataract present in 53.33% and 21.13% did not have a family history. The prevalence of senile cataract was observed to be significantly associated with family history of cataract.



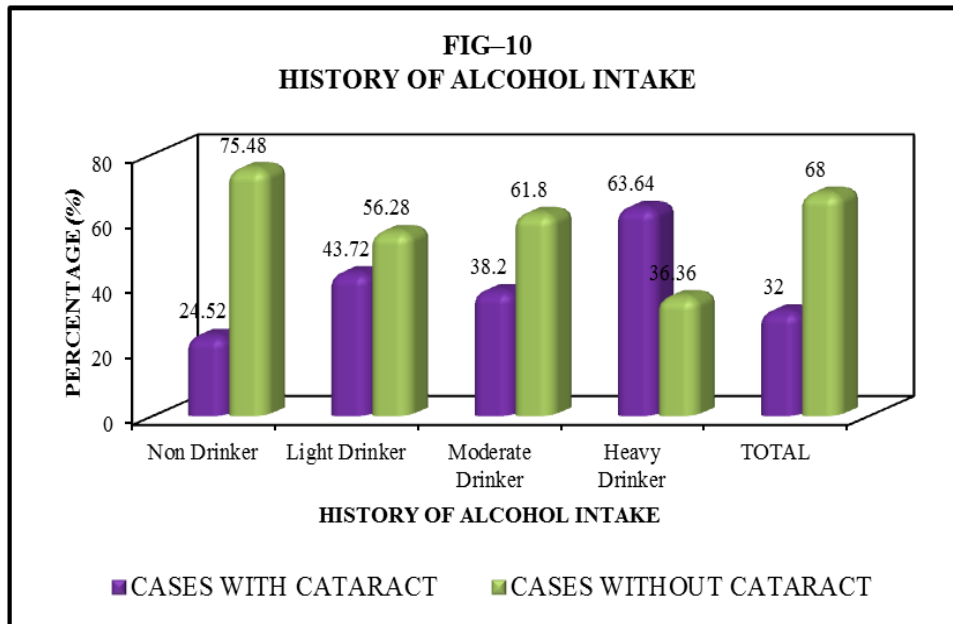
Prevalence is found to be more in those worked outdoor and exposed to sunlight >6 hours 307 (35.95%) than those worked indoor or exposed <6 hours 77(22.25%).The

association between duration of sunlight exposure of the study participants and prevalence of senile cataract was observed to be statistically significant.



Prevalence is found to be more in those who smoked>1 pack of bidi or cigarette 73(61.86%)than those smoked less than 1 pack 105(40.23%).Nonsmoker had lowest prevalence of

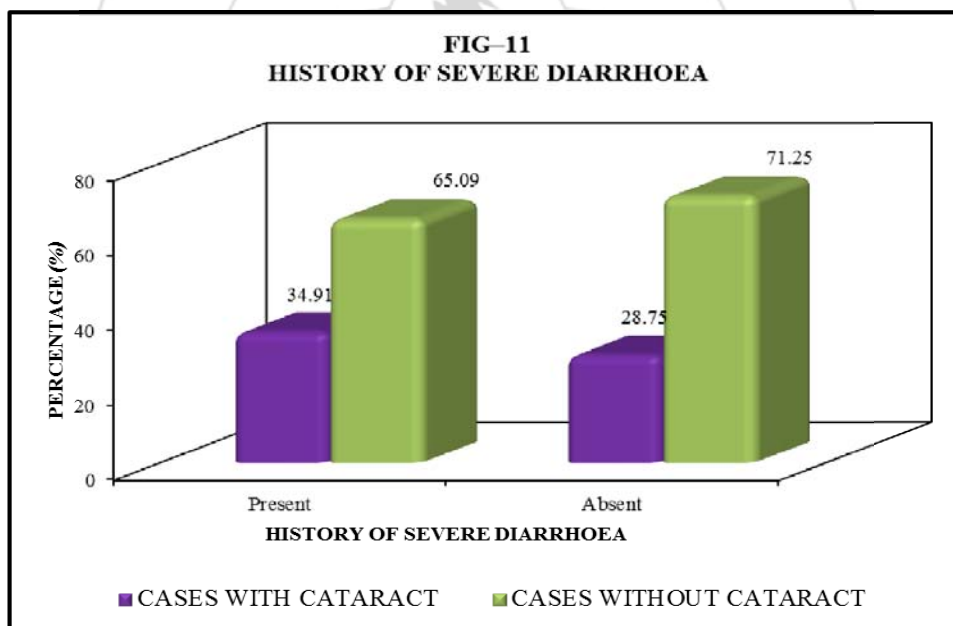
senile cataract i.e.206(25.09%).The association between smoking habit of the study participants and prevalence of senile cataract was observed to be statistically significant.



(One unit of alcohol is half pint 284ml of beer, or one glass wine or a single whiskey)

In this study cases those who were heavy drinkers with more than 4 (Unit/day) had prevalence 63.64%, followed by light drinker (0-2 unit/day) had prevalence of 43.72% and

moderate drinkers (2-4 unit/day) had prevalence of 38.20%. Nondrinkers had a lowest prevalence of 24.52% in this study. The association between alcohol intake and senile cataract was observed to be statistically significant.



Prevalence of cataract was found to be more in those having a positive history of severe diarrhoea 221(34.91%) than those who had not i.e (163) 28.75%. The prevalence of senile cataract was observed to be significantly associated with history of severe diarrhoea.

In our study, the maximum number of cataract patients had less history of multivitamins intake 293(32.77%) and cases without cataract have more history of taking multivitamins 91(29.74%) However, the association between prevalence of senile cataract and multivitamin intake was not found to be statistically significant.

UNIVARIATE ANALYSIS OF FACTORS ASSOCIATED WITH SENILE CATARACT

Variables	Cases		ODD'S RATIO (95% C.I.)
	With Cataract	Without Cataract	
Age Group (in years)			
40-49	54	466	Reference
50-59	162	333	4.20(2.99- 5.89)
>=60	168	17	85.28(48.09- 151.24)
Sex			
Male	153	345	Reference

Female	231	471	1.10(0.86-1.416)
Educational Status			
Illiterate	302	578	Reference
Lower Primary	63	139	0.87(0.62-1.20)
High School	14	74	0.36(0.20-0.65)
Higher Secondary	3	16	0.36(0.10-1.24)
Graduate	2	9	0.42(0.09-1.98)
Occupation			
Other	7	63	Reference
Leaf Plucker	222	397	5.03 (2.26-11.78)
Factory Worker	25	99	2.27 (0.93-5.56)
Bungalow Worker	6	48	1.12 (0.35-3.56)
Pesticide Sprayer	39	75	4.68 (1.96-11.19)
Labourer	85	134	5.71 (2.50-13.05)
Socioeconomic Status			
Lower	361	717	Reference
Upper Lower	19	78	0.48 (0.28-0.81)
Middle	4	21	0.38 (0.13-1.11)
BMI (Kg/m²)			
<18.5	205	371	Reference
18.5—24.9	177	434	0.74 (.058 – 0.94)
>25	2	11	0.32(0.072 - 1.50)
<i>Variables</i>	CASES		ODD'S RATIO (95% C.I.)
	With Cataract	Without Cataract	
Family History of Cataract			
Absent	168	627	Reference

Present	216	189	4.26(3.29-5.53)
History of Sunlight Exposure (in hours)			
< 6 hours	77	269	Reference
> 6 hours	307	547	1.96 (1.47-2.61)
History of Smoking Habit			
Non Smoker	206	615	Reference
<1 pack /day	105	158	2.02 (1.54-2.71)
>1 pack /day	73	43	5.06 (3.38-7.58)
History of Alcohol Intake			
Non Drinker	193	594	Reference
Light Drinker	108	139	2.26 (1.68-3.04)
Moderate Drinker	34	55	1.88 (1.20-2.97)
Heavy Drinker	49	28	2.00 (1.24-3.23)
History of Severe Diarrhea			
Absent	163	404	Reference
Present	221	412	1.33(1.04-1.70)
History of Multivitamins use			
Absent	91	215	Reference
Present	293	601	1.17(0.88-1.54)

On univariate analysis, age, occupation, family history, sunlight exposure, smoking, alcohol consumption and history of severe diarrhea were found to be significantly associated with senile cataract.

Multiple Logistic Regression Of The Factors Associated With Senile Cataract

VARIABLE IN THE EQUATION								
	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP (B)	
							Lower	Upper
Age			190.315	2	0			
40-49 years	-4.48	0.326	189.284	1	0	0.011	0.006	0.021
50-59 years	-3.116	0.299	108.88	1	0	0.044	0.025	0.08
Educational status			11.249	4	0.024			
Graduate	3.158	1.873	2.842	1	0.092	23.523	0.598	924.605
Higher secondary	2.668	1.331	4.02	1	0.045	14.405	1.062	195.451
High school	1.096	0.738	2.209	1	0.137	2.992	0.705	12.7
Lower primary	0.836	0.281	8.836	1	0.003	2.308	1.33	4.006
Occupation			24.704	5	0			
Other	-0.523	1.003	0.272	1	0.602	0.592	0.083	4.231
Bungalow	0.248	1.2	0.043	1	0.836	1.282	0.122	13.479
Factory	0.278	1.104	0.063	1	0.801	1.321	0.152	11.499
Pesticide	1.725	1.102	2.453	1	0.117	5.615	0.648	48.655
Leaf plucker	0.918	0.273	11.275	1	0.001	2.503	1.465	4.277
Socioeconomic status			1.117	2	0.572			
CLASS III	-1.218	1.61	0.572	1	0.449	0.296	0.013	6.94
CLASS IV	0.233	0.676	0.118	1	0.731	1.262	0.335	4.747
BMI			0.37	2	0.831			
≥25	0.183	0.926	0.039	1	0.843	1.201	0.195	7.38
18.5-24.9	-0.097	0.175	0.306	1	0.58	0.908	0.645	1.278
Positive Family history of cataract	-1.615	0.176	83.861	1	0	0.199	0.141	0.281
Sunlight exposure >6 hours	-1.067	1.057	1.018	1	0.313	0.344	0.043	2.733
Alcohol			31.852	3	0			
Non drinker	-1.65	0.384	18.46	1	0	0.192	0.091	0.408
Mild drinker	-0.741	0.406	3.341	1	0.068	0.476	0.215	1.055
Moderate	-1.013	0.47	4.654	1	0.031	0.363	0.145	0.911
Smoking habit			22.821	2	0			
Non smoker	-1.285	0.298	18.644	1	0	0.277	0.154	0.496
<1 pack	-0.673	0.319	4.469	1	0.035	0.51	0.273	0.952
Constant	4.982	0.509	95.934	1	0	145.768		

On multivariate analysis, age, educational status, occupation, family history, smoking and alcohol consumption were found to be significantly associated with senile cataract.

5. Discussion

In the present study we have taken the study population from tea garden community people of Dibrugarh who belonged to the age group of ≥ 40 years. It was found that the prevalence of senile cataract among tea garden people to be **32%**.

In our study, out of 1200 total cases, prevalence of senile cataract increases with increasing age, maximum at age ≥ 60 years (90.81%) lowest at 40-49yr range (10.38%). The prevalence of senile cataract was observed to be significantly associated with the age of the participants. Aravind Comprehensive Eye Study (2004) conducted a study in rural population of Southern India they found that the prevalence of definite age related cataracts of all types increased significantly ($p, 0.001$) with increasing age, from 15.7% among those aged 40-49 years to 79.4% among those aged >70 years. They found significant association of age with senile cataract.⁶ Husain R *et al.* (2005) in their study in rural population of Indonesia found that 82.8% of >60 yrs. of age study participants have cataract. They found significant association of age with senile cataract.⁷ Rim *et al.* (2014) in their study conducted in South Korean population found that 97.9% of study population of ≥ 80 had cataract. They also found a significant association of age with cataract.⁸

In our study, maximum number of patients was outdoor workers. Prevalence is found to be maximum in labourer (38.81%), followed by leaf Plucker (35.86%), pesticide sprayer (34.21%), factory worker (20.16%), bungalow worker 11.11% and least incidence in others 10%. The association between occupation of the study participants and prevalence of senile cataract was observed to be statistically significant. Bandhu.S.D *et al.* (2015) conducted a study of morphology of cataract in western India and they found in their study that the type of occupation was significantly associated with type of cataract.⁹ Kanagaranjan.P.*et al.* (2011) found that agricultural workers show significant association ($p < 0.05$) with cataract blindness.¹⁰

In our study, most of the cases of cataract were of lower socioeconomic status, with 361 (33.49%) of the patients in the lower class, 19 (19.59%) of the patients in the upper lower and 7 (16%) of the patients in the middle class. The prevalence of cataract was observed to be significantly associated with socioeconomic status of the participants. Study conducted by Ughade SN *et al.* (1998) observed significantly higher prevalence of any cataract in the extremely low socioeconomic group.¹¹ Krishnaiah S *et al.* (2005). Conducted a study among peoples of Andhra Pradesh observed significantly higher prevalence of any cataract in the extremely low socioeconomic group.¹² Similarly, Kuper H *et al.* (2008) observed that people with visual impairment due to cataract were poorer than those with normal sight in all three low-income countries (Kenya, Bangladesh, and the Philippines) in their study.¹³

In our study is found that most of the cataract cases were

underweight BMI i.e. < 18.5 205 (35.59%). 29.2% prevalence among normal BMI i.e. 18.5-24.9 and prevalence of 15.38 % among overweight BMI > 25 . A statistically significant association was observed between BMI and prevalence of cataract. Study conducted by Caulfield.L.E.*et al.* (1999) observed a significant association ($P < 0.05$) between low BMI and cataract specifically nuclear opacity.¹⁴ Foster.P.J.*et al.* (2003) observed a significant association between People with the lower quintiles of BMI and Nuclear cataract (test of trend, $p = 0.03$).¹⁵

In our study, 216 cases had a positive family history of cataract 53.33% and 168 did not have a family 21.13%. Family history was found to be significantly associated with cataract. Sreenivas S *et al.* (1999) found that family history of cataract was significantly associated with cataract in Angamally centre.¹⁶

Our study found that prevalence of cataract to be more in those worked outdoor and exposed to sunlight > 6 hrs. 307 (35.95%) than those worked indoor or exposed < 6 hrs. 77 (22.25%). The association between duration of sunlight exposure of the study participants and prevalence of senile cataract was observed to be statistically significant. Hiller.S.*et al.* using HANES data found the exposure of sunlight per day is significantly associated with senile cataract.¹⁷ Sreenivas.S *et al.* (1999) found a linear dose-response relation was also observed with the increased duration of exposure per day. Statistically significant relation of cataract was found to be more in those who exposure to sunlight > 4 hours of per day.¹⁶

In our study prevalence is found to be more in those who smoked > 1 pack of bidi or cigarette 73 (61.86%) than those worked smoke less than 1 pack 105 (40.23%). Nonsmoker had lowest prevalence of senile cataract i.e. 206 (25.09%). The association between smoking habit of the study participants and prevalence of senile cataract was observed to be statistically significant. Harding JJ.*et al.* 1988 conducted a clinic based case-control study of 300 cases and 609 controls in Oxfordshire, England, found that heavy smoking was associated with increased risk of cataract.¹⁸ Aravind Comprehensive Eye Study (2004) conducted a study in rural population of southern India found that moderate to heavy smoking statistically significant associated with nuclear and cortical cataracts in their study.⁶ Bandhu.S.D.*et al.* (2015) found in their study that Eighty-eight (44.4%) subjects of the study population consumed tobacco. The association between cataract morphology and tobacco consumption was found to be significant.¹⁰

In our study prevalence was found to be high in heavy drinkers (> 4 Units/day) i.e. 63.64%, followed by light drinker (0-2 unit/day) had prevalence of 43.72% and moderate drinkers (2-4 units/day) had prevalence of 38.20%. Nondrinkers had a lowest prevalence of 24.52% in this study. The association between alcohol intake and senile cataract was observed to be statistically significant. Harding JJ.*et al.* (1988) conducted a clinic based case-control study of 300 cases and 609 controls in Oxford shire; England heavy beer drinking was associated with a two-fold increased risk of cataract.¹⁸

In our study prevalence of cataract was found to be more in those having a positive history of severe diarrhoea 221(34.91%) than those who had not i.e. (163) 28.75%. The prevalence of senile cataract was observed to be significantly associated with history of severe diarrhea. Harding JJ.et al(1988) conducted a clinic based case-control study of 300 cases and 609 controls in Oxfordshire, England, found Severe diarrhoea appeared as a marginal risk factor for cataract when comparing all cases and all controls ($p=0.05$ X² test; relative risk 1.6) but was found to be a stronger risk factor in those aged 70 to 79 years. Nevertheless, severe diarrhoea is only a marginal risk factor in the Oxford population.¹⁷ Echebiri.S.I.et.al (2010) conducted Case-Control Studies in Lagos (Lagos group), South Western Nigeria, and Kano (Kano group), North Central Nigeria and Risk Factors for Cataract in Two Population Studies in Nigeria found that 22 (11.0%) cases with severe diarrhea had cataract. They found a statistically significant association between severe diarrhea and senile cataract.¹⁹

UNIVARIATE ANALYSIS FOR FACTOR ASSOCIATED WITH CATARACT

In the present study, on univariate analysis age, educational status, occupation, socioeconomic status, BMI, family history, history of sunlight exposure, smoking, alcohol consumption and severe diarrhea were found to be significantly associated with senile cataract. Ughade SN et al. (1998) in their study on univariate analysis found education, socioeconomic status, family history, alcohol intake, smoking, sunlight exposure and history of severe diarrhea were found to be significantly associated with senile cataract.¹¹ Rim et.al (2014) in their study on univariate analysis found age, education, occupation, socioeconomic status, BMI, alcohol intake and sunlight exposure were found to be significantly associated with senile cataract.⁸

MULTIVARIATE ANALYSIS OF FACTOR ASSOCIATED WITH CATARACT

In the present study, on multivariate analysis age, educational status, occupation, family history, smoking and alcohol consumption were found to be significantly associated with senile cataract. Ughade SN et al. (1998) in their study on multivariate analysis found education, socioeconomic status, literary status and history of severe diarrhea were found to be significantly associated with senile cataract.¹¹ Nirmalan PK, et al.(2004) on multivariate analysis age, sex, literary status, BMI and smoking were significantly associated with senile cataract.⁶ Rim et.al(2014) in their study on multivariate analysis found age, education, socioeconomic status, BMI, alcohol intake and sunlight exposure were found to be significantly associated with senile cataract.⁸

6. Conclusions and Recommendations

The present study concluded with the findings highlighting the huge burden of cataract in tea garden community of India and the role of increasing age, low literacy status, outdoor occupation, family history of cataract, low BMI, smoking habit, alcohol addiction and severe diarrhea in cataractogenesis pointing towards a multi-factorial

causation. Therefore, to tackle this problem of cataract, a multi-pronged strategy is required. Some of these identified risk factors like low literacy, outdoor occupation, low BMI smoking habit, alcohol addiction and severe diarrhea have the potential for being modified through various public health interventions including awareness generation regarding these factors and possible modes of prevention like use of protective equipment for eyes by those involved in outdoor occupations and improving nutritional status by not only emphasizing on the quantity but also the quality of diet health education and life style modification. Also, implementation of measures for improving literacy status is required which, directly or indirectly, has an impact, not only on cataract but also on overall health of an individual and that of the nation as a whole.

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