

***RISK OF CATARACT
FORMATION WITH
EXPOSURE TO BIOMASS
SMOKE***

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INDOOR AIR POLLUTION

- In the concern of air pollution, we cannot neglect the air pollution inside homes, offices and schools, because people spend about 80-90% of their time inside buildings where air circulation may be restricted due to enclosed environment.

- In *developing countries* the most important indoor air pollutant is the combustion products of *unprocessed solid biomass fuels* such as wood, animal dung, crop residues used for cooking

- Incomplete combustion of these unprocessed biomass fuels release large amounts of toxic pollutants such as
 - * *carbon monoxide*
 - * *oxides of nitrogen*
 - * *sulfur dioxide*
 - * *aldehydes*
 - * *polycyclic aromatic hydrocarbons*
 - * *respirable particulate matter*

HEALTH IMPACT

- Epidemiological studies in developing countries have linked exposure to indoor air pollution from biomass with 4 major categories:
 1. *Acute respiratory infection*
 2. *Chronic obstructive lung disease*
 3. *Lung cancer*
 4. *Pregnancy related problems such as still birth, & low birth weigh.*

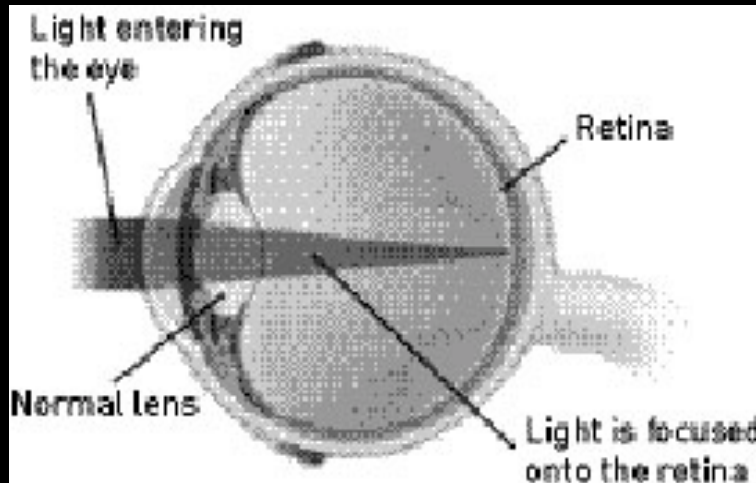
- Other than these 4 categories of illness, indoor air pollution is believed to be associated with blindness and change in the immune system.

SITUATION IN SRI LANKA

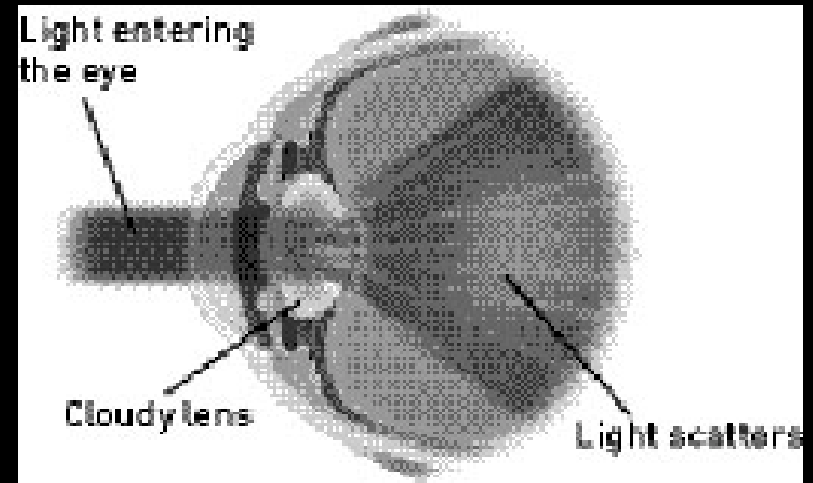
- In Sri Lanka, it is estimated that more than 80% of population is using firewood and other forms of biomass for their daily cooking activities, and their major consuming energy device is the low efficiency 3-stone or the semi-enclosed mud stove.
- This incomplete combustion mostly take place indoors with poor ventilation , which leads to some of the highest over recorded levels of air pollution.
- *But, unfortunately, yet, assessments on indoor exposure to cataract formation have not expanded in Sri Lanka*

CATARACT

- A cataract is a cloudy area in the lens of the eye. A normal lens is clear and focuses light into the back of the eye. When a cataract develops some of this light is blocked out and or scattered. As this cataract develops, it becomes harder for a person to see.



Before the cataract development



After the cataract development

- The development of cataract is a normal part of the aging process, but it can result from a number of other reasons.
- Cataracts due to aging are a result of natural changes in the lens that coincide with other changes in the body.
- Traumatic cataracts may result from an injury or blow to the eye.
- Formation of cataract can be accelerated due to several factors, include the use of certain drugs or medications, exposure to harmful chemicals or excessive sun light, smoking, alcohol consumption and some diseases.

AIMS & OBJECTIVES

- The overall aim is to conduct a case control study and to identify the confounding risk factors for the cataract development.

HYPOTHESIS

- The main hypothesis of this study is to access the exposure to biomass smoke coming from indoor cooking activities is risk factor for the cataract development

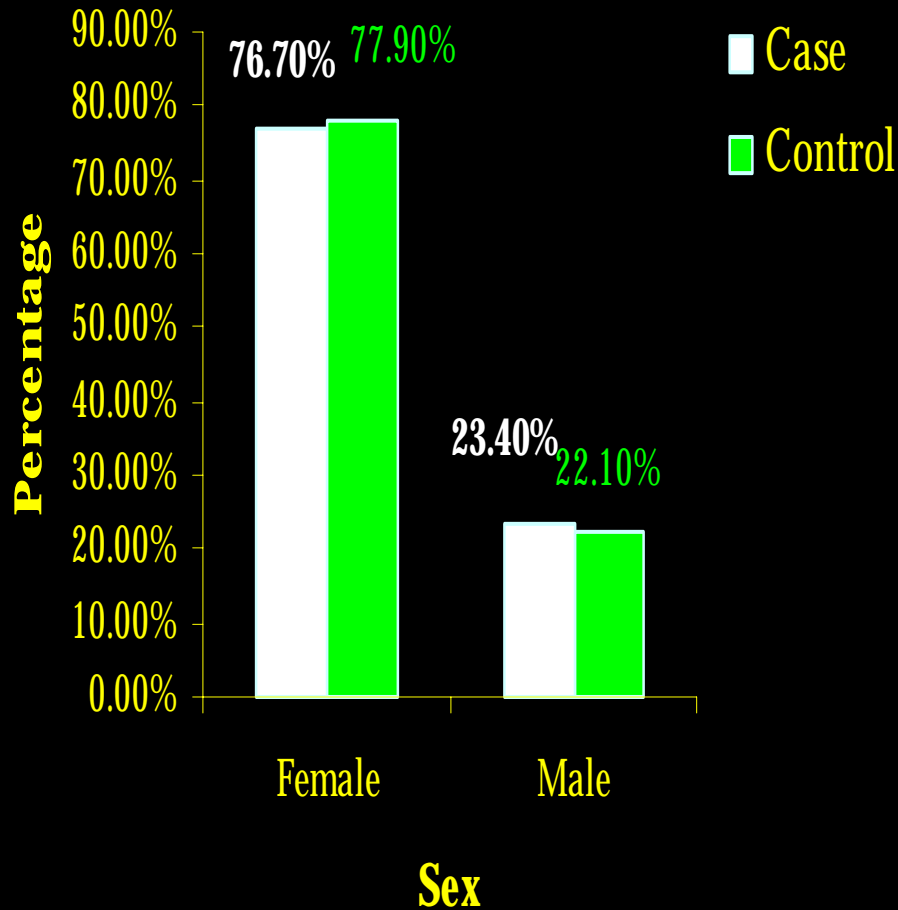
METHODOLOGY

- In this Case-Control study utilized face-to-face (personal) interviews and a questionnaire, a list of qualified cases and controls were interviewed at the National Eye Hospital Colombo.
- Collected cases and control ratio was 1:1 where 197 cases with 151 females, 46 males and 190 controls with 148 females, 42 males.

➤ *DATA PROCESSING*

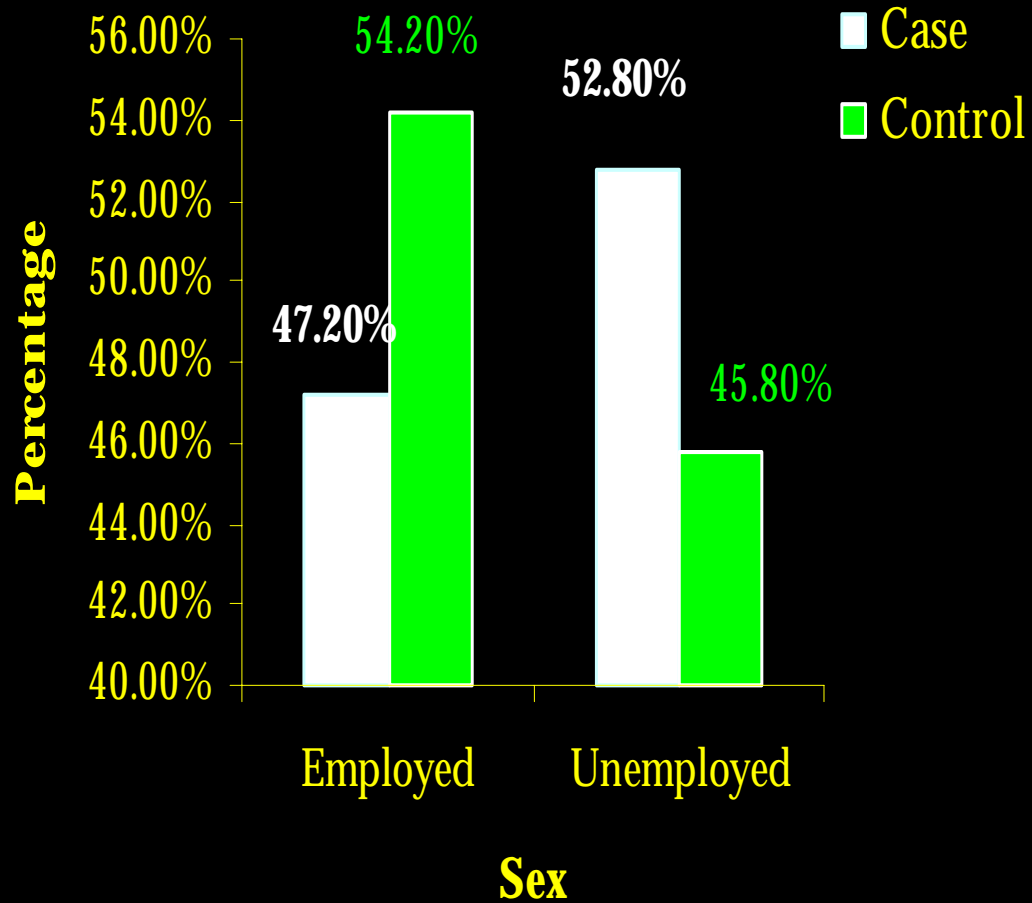
- * The data was processed using *SPSS* computing package.
- * To determine the relationships between the variables Chi-Square test was used.
- * Fisher's Exact test was used for the variables, which were not valid by the Person Chi- Square test.

➤ *Variation in the Respondents with their Demographic characteristic*



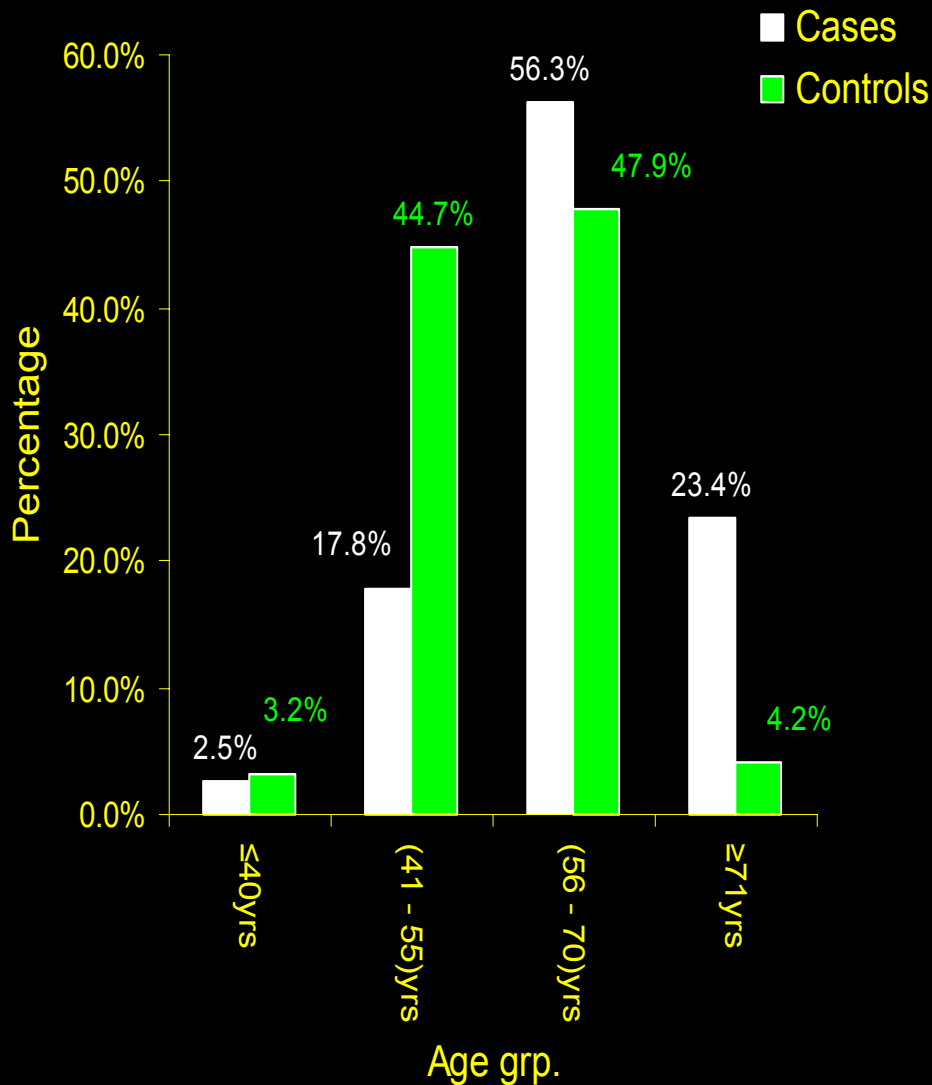
• Majority of the study population, 77% from the total, were females. Both the males and females had equal representation in both case and control categories.

➤ *Variation of the Respondents with their Occupational status*



- Both the case and control had equal distribution in terms of their employment status

➤ *Variation in the Respondents with their Age*

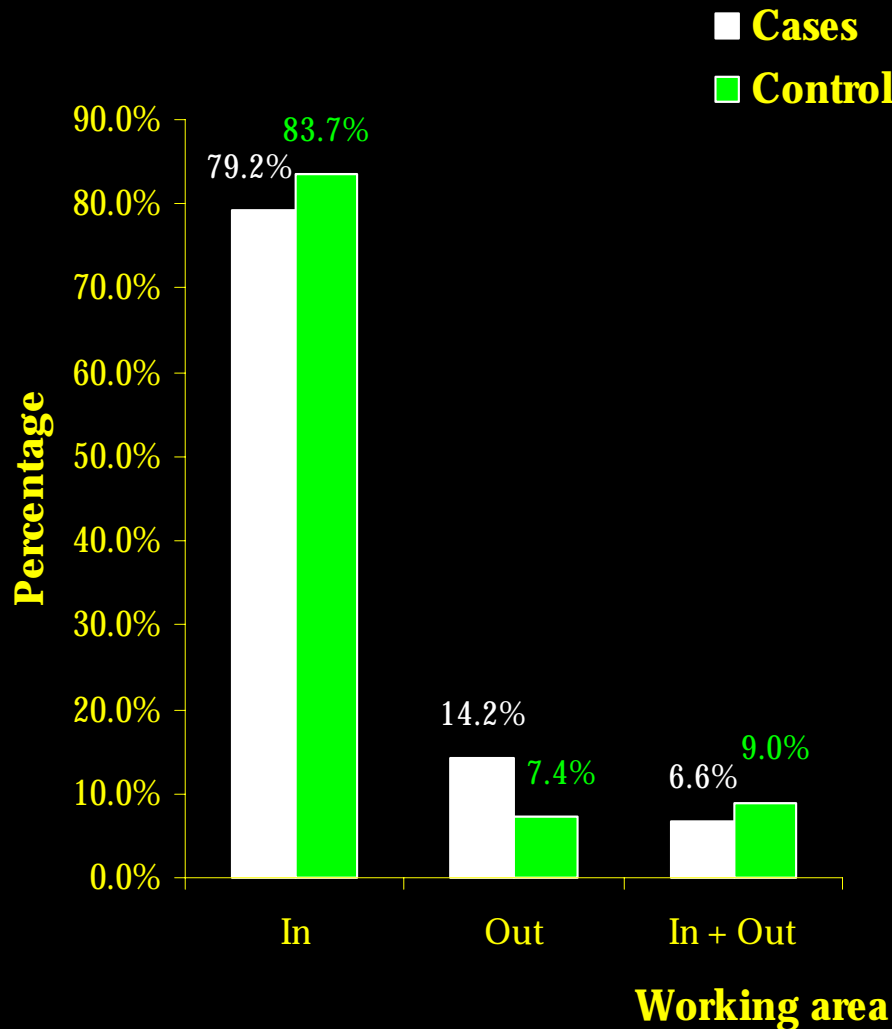


- A very small group, only a 3%, was less than 40yrs old.

- Majority of patients belongs to 56 – 70 yrs age group

- Significant amount of cataract patients were older than 70yrs.

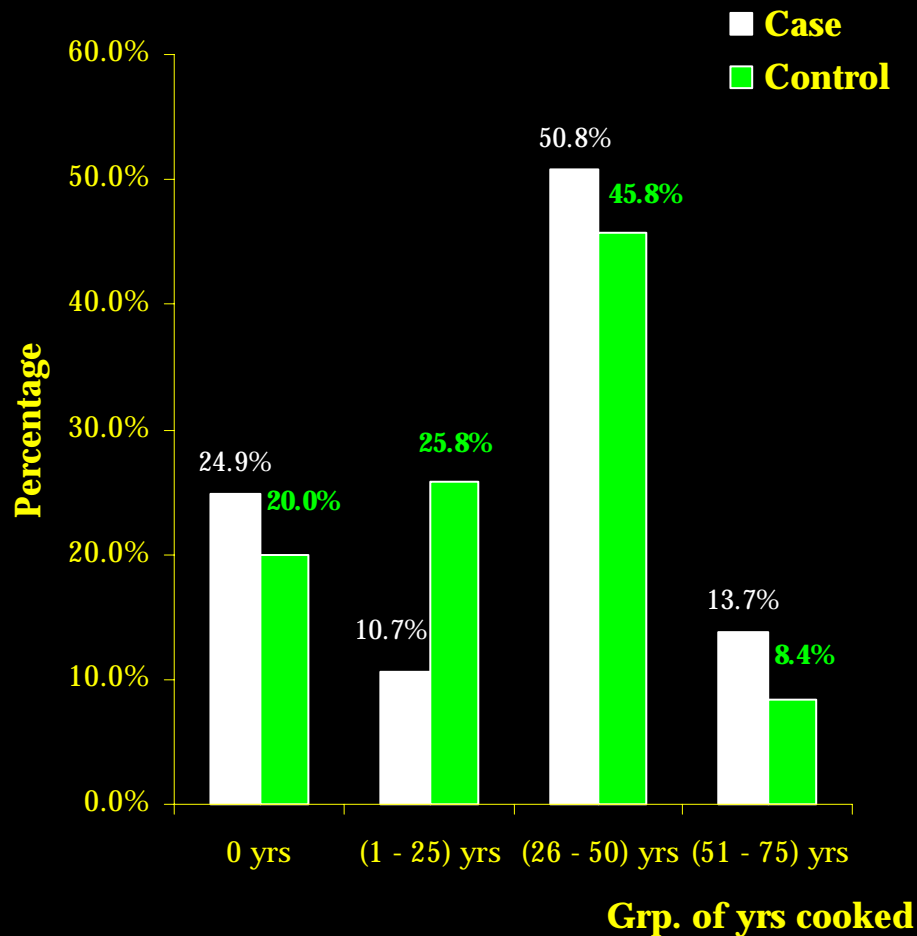
➤ *Variation in the Respondents with their Working area*



• Majority of the patients had confined to indoor working area, including housewives.

• For out door working area case group had represented a high percentage, where they had exposed to UV.

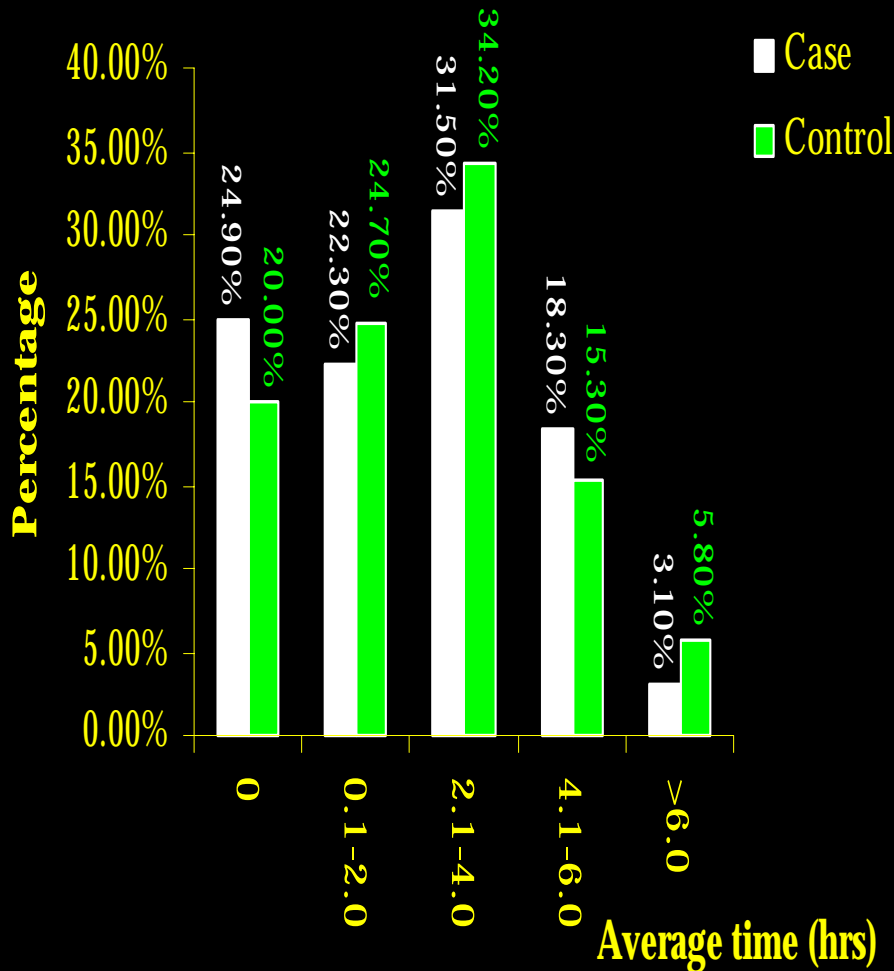
➤ *Variation in the Respondents with Duration of cooking*



- The total 22% zero years cooked tally with the male population of the study.

- As the no. of years exposed for cooking increases the case group had reported a higher percentage.

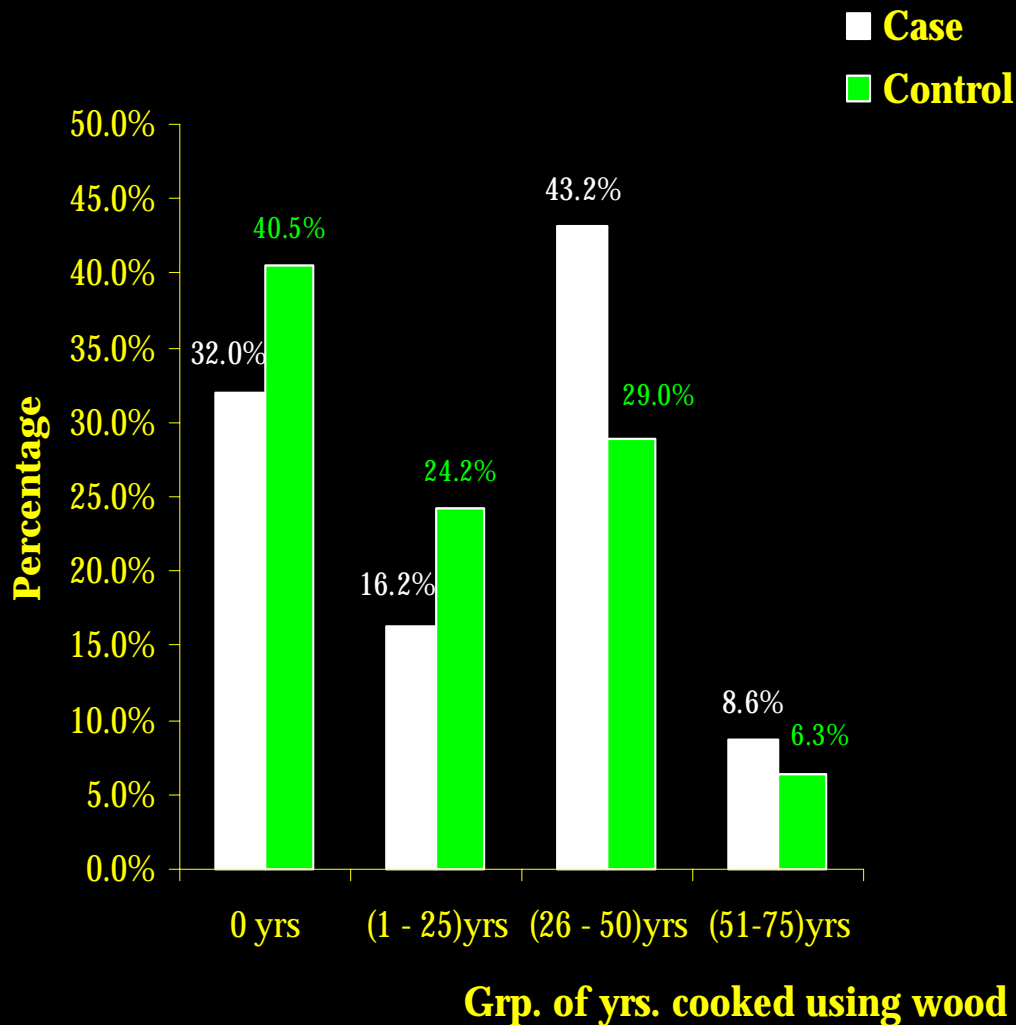
➤ *Variations in the respondents with the exposure hrs. in cooking smoke per day*



•Control had slightly higher percentage for exposure hrs. (0.1-2.0) and (2.1-4.0).

•Case reported having slightly high percentage for exposure hrs.(4.1-6.0)

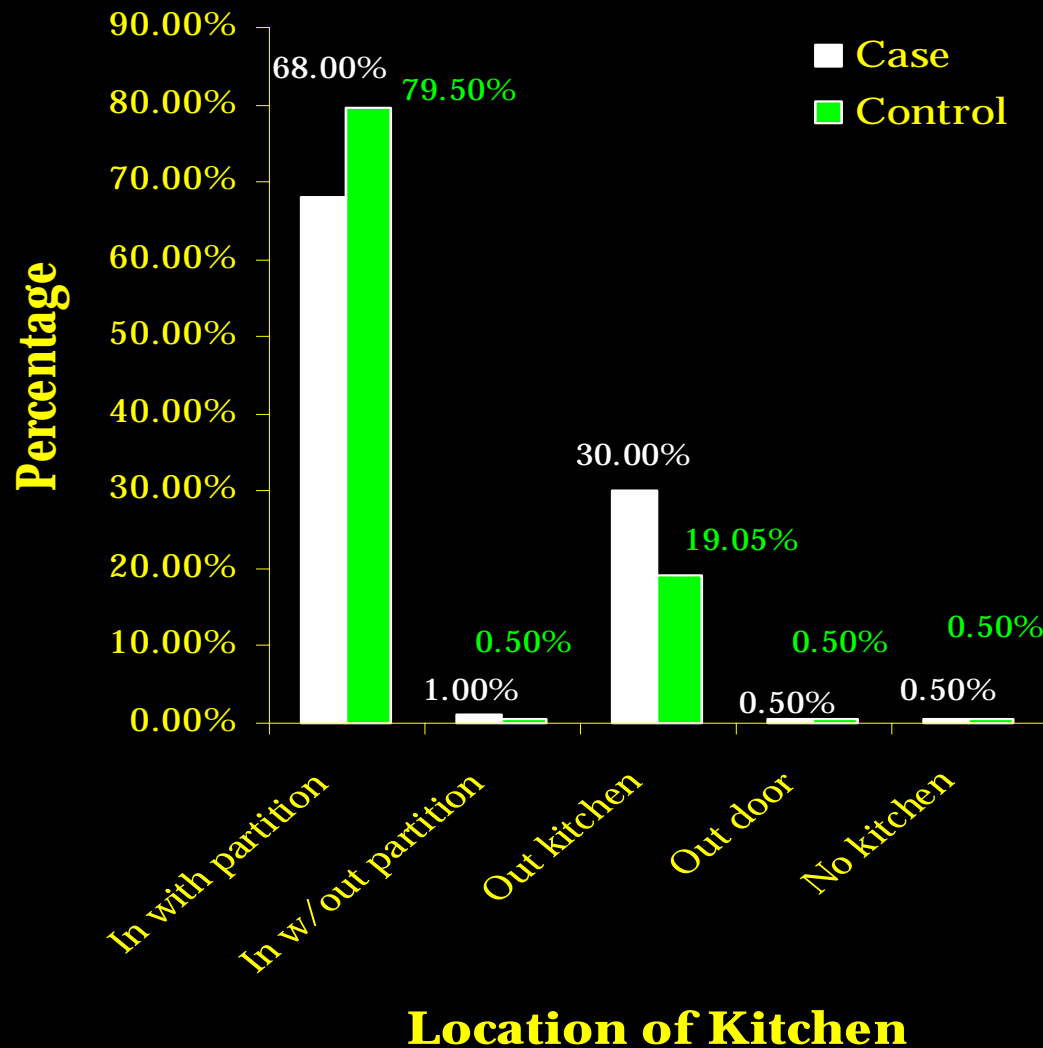
➤ *Variation in the respondents with the no. of yrs. cooked using firewood*



• Lesser percentage of Cases (32%) had not been used firewood for their cooking than the controls (40%).

• As the no. of years used fire wood for cooking increases, a higher percentage of cataract patients had reported.

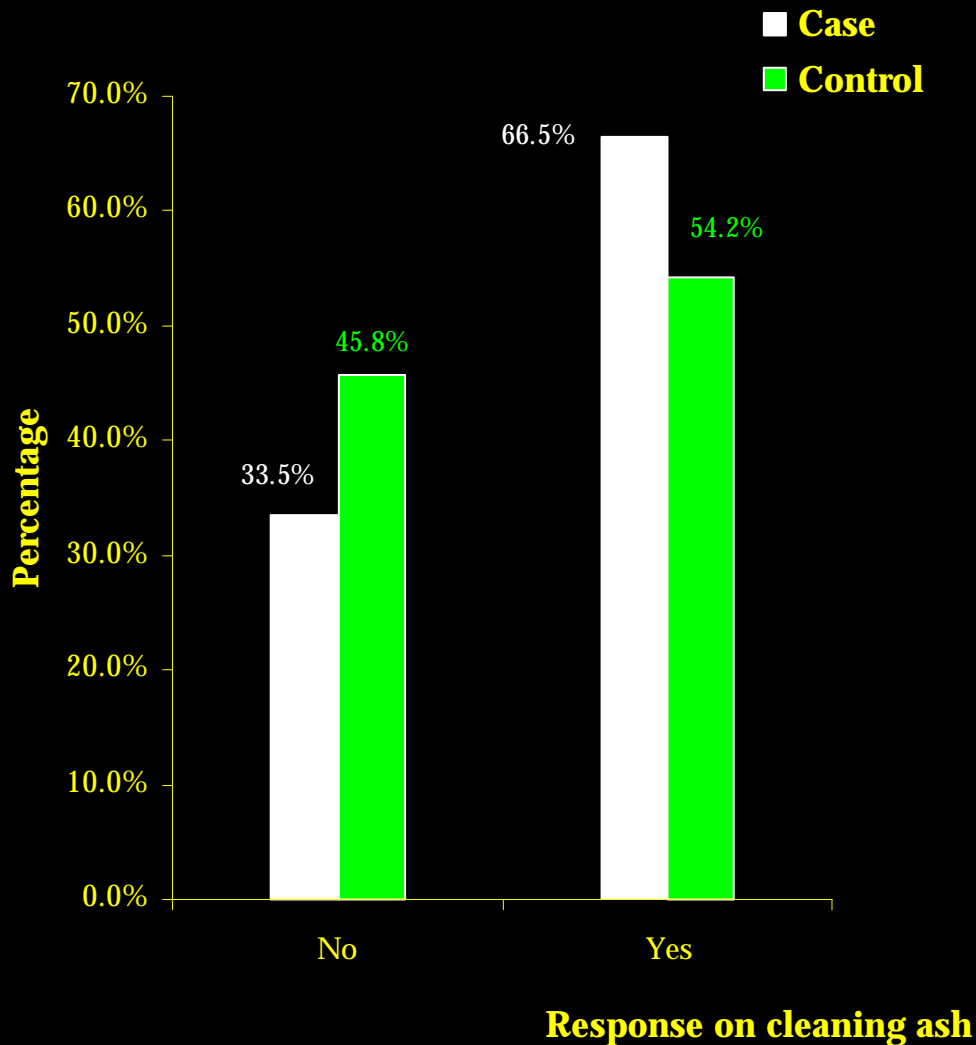
➤ *Variation in the respondents with the location of their kitchen*



• Most of the respondents had cooked indoor with partitioned.

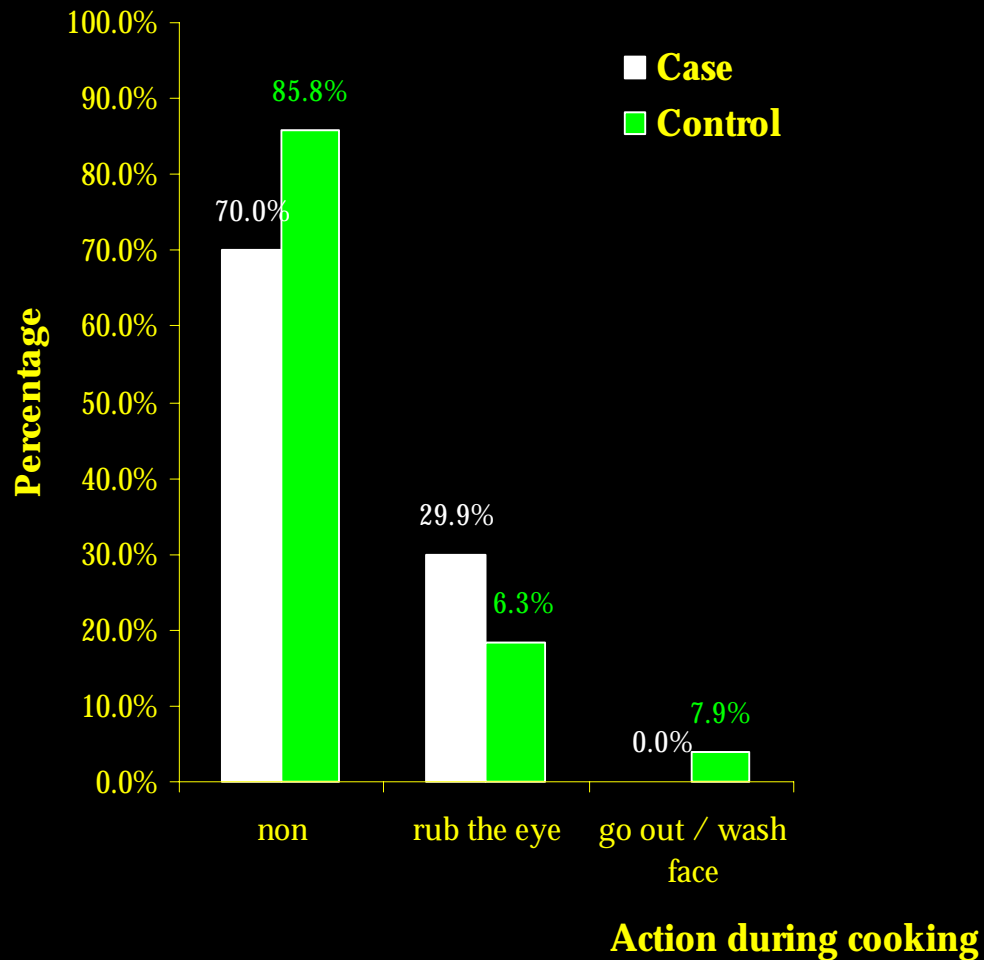
• Less than 10% (total) had their kitchen outside the house, and the cataract patients had more outdoor kitchens than the controls.

➤ *Variation in the Respondents with the Responsibility in cleaning ash*



- More of the cataract patients were responsible in removing ash compared to the controls.

➤ *Variation in the Respondents with the Action during cooking*

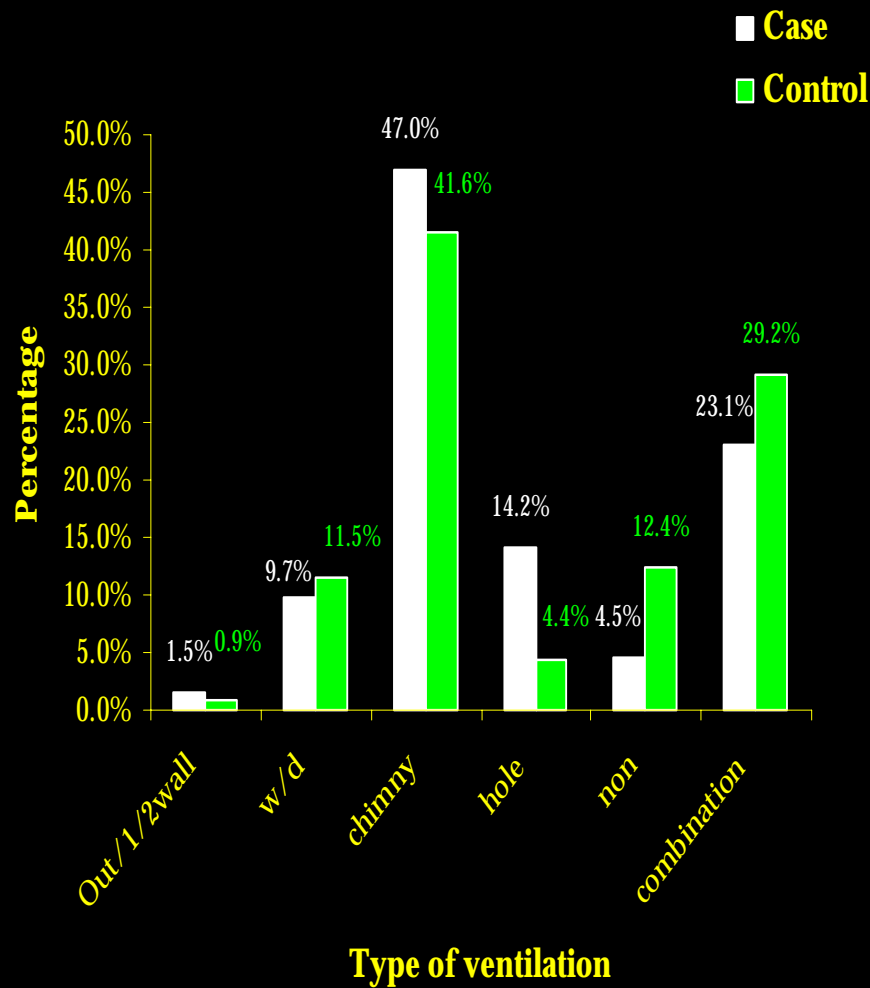


- Most of them had no responses implying the level of discomfort may be low.

- Nearly one third of the cases had a habit of rubbing their eyes, which may contribute to aggravate the eye problems

- For the controls fewer percentage of 8% had left the premises/washed their eyes to alleviate the discomfort but non of the cases had done.

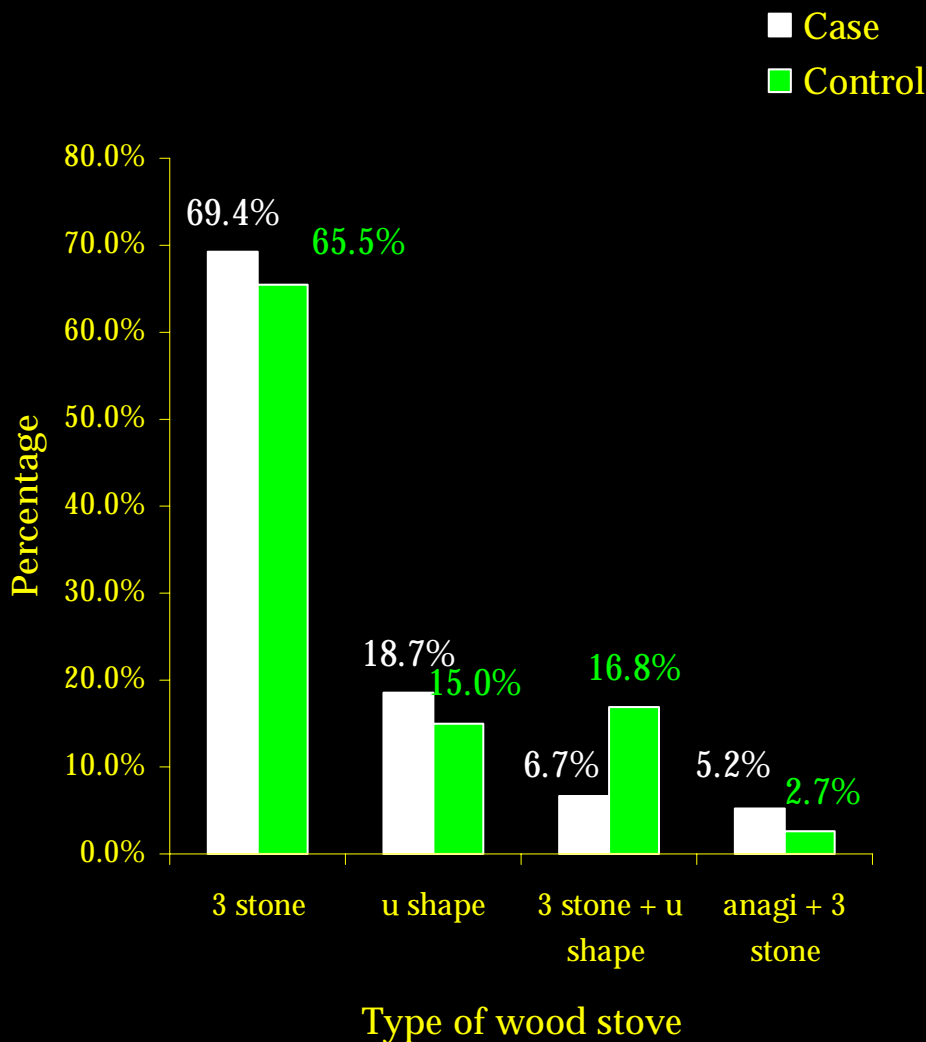
➤ *Variation in the Respondents with the Type of Ventilation near the Woodstove*



•When there was poor ventilation like holes(vents) near the wood stove case group reported a higher percentage.

•Most of the respondents had chimneys in their houses which could disperse the pollutants at a higher level reducing the exposure.

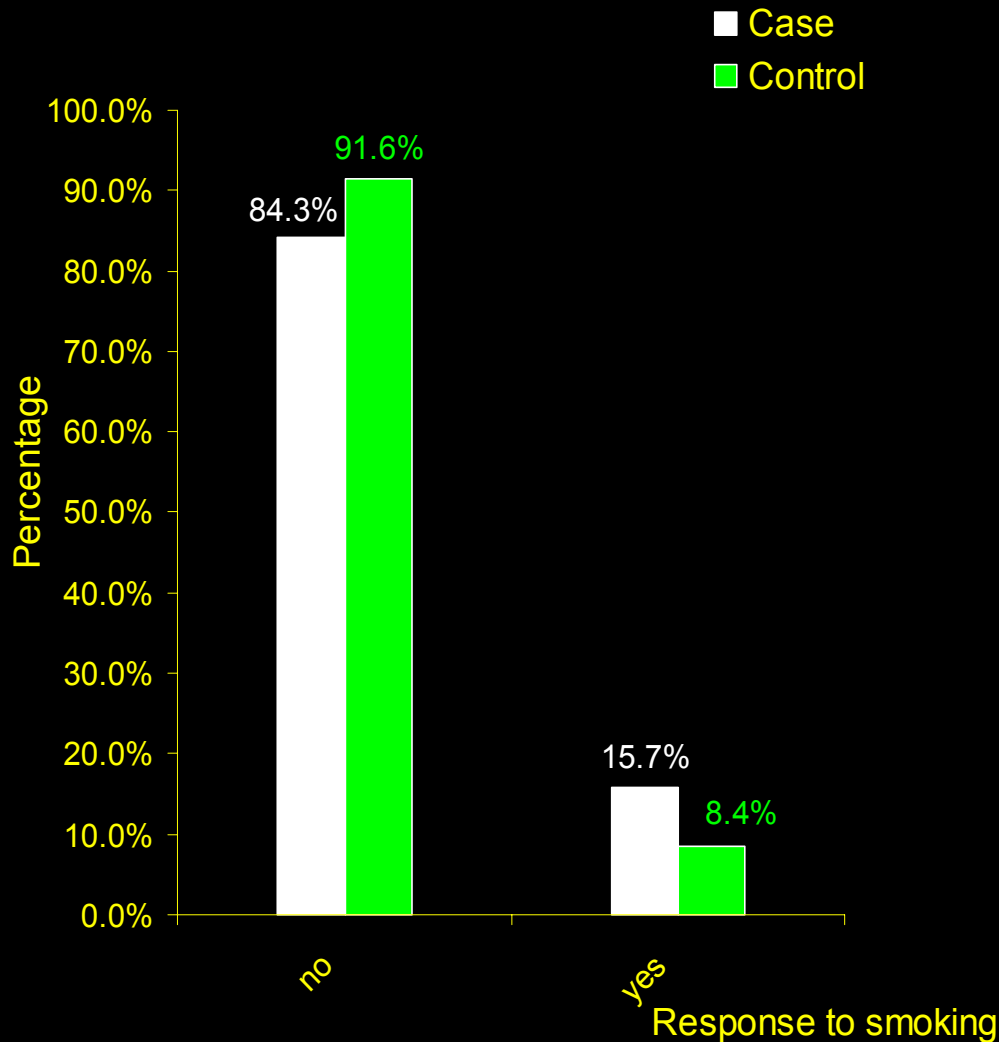
➤ *Effect of the Type of the Wood stove on the Variation of the Respondents*



• Two thirds of the wood stoves were traditional 3 stone type which was very common in the rural areas.

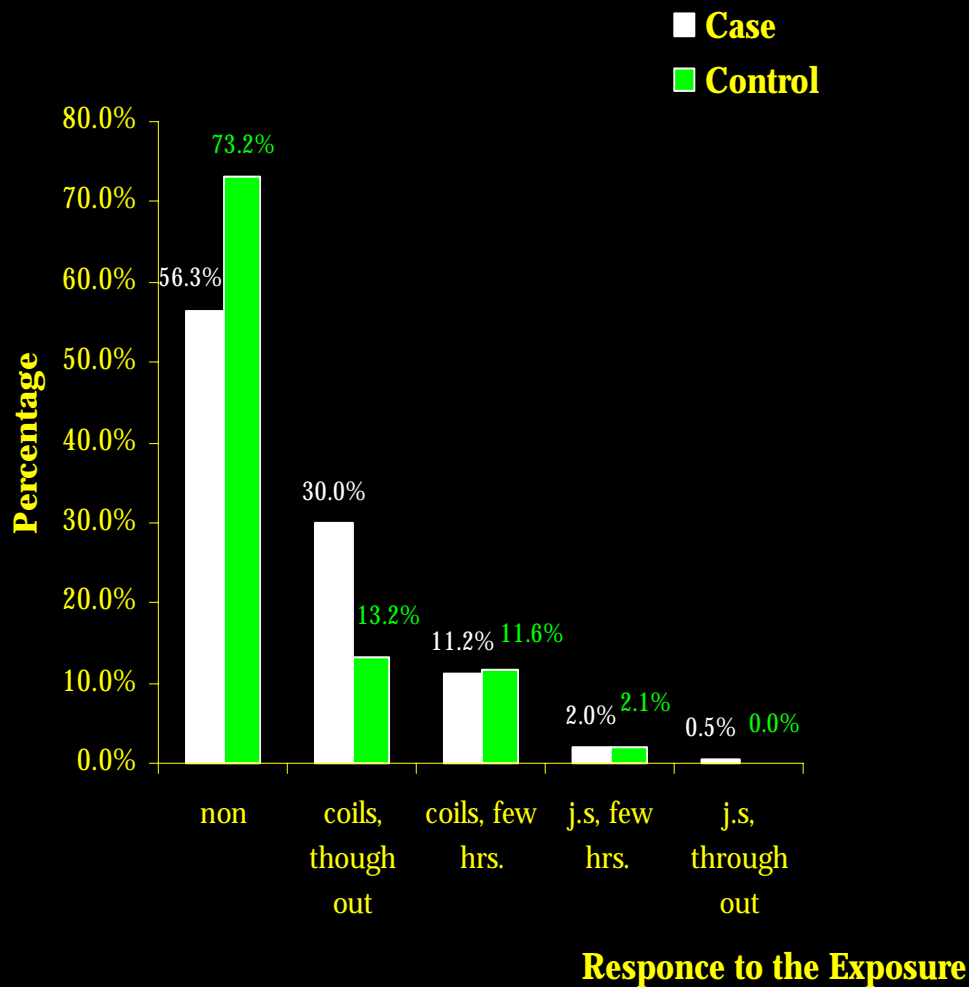
• Lesser no. of the U shape and anagi stoves implied that they were less popular among the study group.

➤ *Variation of the Respondents with their Smoking Habits*



- Almost 90% of the study group was classified as nonsmokers with a higher contribution from the females of the study.

➤ *Variation in the Respondents with the Different types of Indoor smoke exposure*



- Surprisingly, high percentage of the study group claimed that there was no other combustion sources such as burning mosquito coils or joss sticks in their houses.
- Only 22% of the both case & controls had used overnight burning mosquito coils.

Respondents History

Category	Case (N=197)	Control N=190)	Total (N=387)
Having Hypertension			
No	150(76.1%)	162 (85.3%)	312 (80.6%)
Yes	47 (23.9%)	28 (14.7%)	75 (19.4%)
Having Glaucoma			
No	188(95.4%)	187 (98.4%)	375 (96.9%)
Yes	9 (4.6%)	3 (1.6%)	12 (3.1%)
Having Diabetics			
No	149(75.6%)	155 (81.6%)	304 (78.6%)
Yes	48 (24.4%)	35 (18.4%)	83 (21.5%)
Undergone any Physical injury			
No	177(89.9%)	183(96.3%)	360(93.0%)
Yes	20 (10.2%)	7 (3.9%)	27 (7.0%)
Type of the drug taking			
None	160(81.2%)	179 (94.2%)	339 (87.6%)
Steroid	27 (13.7%)	11 (5.8%)	38 (9.8%)
Aspirin	9 (4.6%)	0 (0.0%)	9 (2.3%)
Tamoxifen	1 (0.5%)	0 (0.0%)	1 (0.3%)

- Majority of both case & control had claimed that they are not being treated for the health problems such as hypertension, glaucoma, diabetics, physical injuries to their eye and they were not using prescribed drugs daily.

- All these factors had been known associating with the cataract problem.

- In general, the responses of “yes” to the above categories were always greater for the case than control counter parts.

➤ *History of Cataract diagnosis*

Category	Case (with cataract) (N=197)
How long has the cataract been diagnosed?	
< 1 yr	22 (11.2%)
1 – 5 yrs	154 (78.2%)
5 – 10 yrs	18 (9.1%)
>10 yrs	3 (1.5%)

- Most of cataract patients, their condition was diagnosed about 10 years ago or less.
- Majority of them, almost 78% of the total cataract patients had diagnosed their eye problem within 1 – 5 yrs. of period.

➤ ***Respondents with other members of household reporting cataract condition***

Category	Case (N=197)	Control (N=190)	Total (N=387)
Does any other household member has/had cataract?			
No	181(91.9%)	166 (87.4%)	347 (89.7%)
Yes	16 (8.1%)	24 (12.6%)	40 (10.3%)

- About 90% of the total respondents had no cataract patients at their household.

➤ *Summary of variables correlated with cases*

Variables	p value	Significant level
Age	0.000	95%
Duration exposed to cooking	0.001	95%
No of years cooked using firewood	0.011	95%
Responsible in cleaning ash	0.013	95%
Action during cooking	0.000	95%
Smoking practice	0.028	95%
Having Hypertension	0.023	95%
Consumption of drugs	0.000*	95%
Physical injury on eye	0.013	95%
Exposure to other indoor smoke	0.000*	95%
Ventilation near the wood stove	0.021*	95%
Type of the wood stove	0.003*	95%

**p value calculated using Fisher's Exact test*

- Data analysis shown that the cases were statistically correlated with the
 - _ *Characteristics of cooking such as*
 - * *duration exposed to cooking*
 - * *no. of yrs. cooked using firewood*
 - * *exposure to ash*
 - * *type of the wood stove*
 - * *ventilation near the wood stove*
 - * *action during cooking*
 - _ *Smoking practice*
 - _ *Age*
 - _ *Health condition such as*
 - * *Hypertension*
 - * *Medications*
 - _ *Physical injuries had gone on the eye such as a blow, a cut, a puncture*
 - _ *Exposure to other indoor smoke such as mosquito coils & joss sticks*

❖ *In future , based on statistical relations , we are modeling the data in order to establish the regression coefficients.*

CONCLUSIONS

➤ This preliminary survey concludes that formation of cataract of the tested patients eye is statistically significant with

- * cooking
- * some characteristics of cooking
- * some other variables

➤ Even though researchers had found that factors such as exposure to sunlight, diabetics, glaucoma has an effect on cataract development, but in this survey could not obtain a statistical relations ($p < 0.05$ at 95% significant level), this may be due to small size in the sample.

➤ Also concludes that wood stoves such as 3 stone and u shape mud stove have low efficiency in the combustion process, thereby it correlates.

➤ Chimney is the most popular ventilation method and is the best among other methods available. But in Sri Lanka most of the people are having selves to get the food dried by the heat coming from the stove, this directs the smoke to the face rather than expel out of the chimney.

THANK YOU