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BIOMASS FUEL USERS WOMEN AND CHRONIC OBSTRUCTIVE PULMONARY DISEASES IN WOMEN IN RURAL AREA M. KHOTWADI OF SANGLI DISTRICT.

P.M. Patil
Department of Zoology, Dr. Patangrao Kadam Mahavidyalaya, Sangli
E mail: patilpm16@gmail.com

ABSTRACT:
On a global scale the household use of solid fuels is the most important source of indoor pollution and the exposure to the byproducts of combustion of biomass fuel particularly wood smoke has been related to chronic obstructive pulmonary diseases. In India 95% households use wood as the primary cooking fuel. The smoke released due to incomplete combustion of unprocessed solid biomass fuel contains high volume and number of health damaging air borne pollutants such as PM, CO, NO2, SO2 formaldehyde and other organic compound. Prolong exposure to such air borne pollutants have adverse effect on lung function which causes COPD in which lung functions is reduced. In this study 50 women exposed to biomass fuel were selected form village M.Khotwadi. Information regarding age, height, weight, type of fuel, number of hrs exposed to smoke, no. of yrs., types of kitchen were collected.Spirometry was performed in these women. Spirometric parameter forced expiratory volume per second and forced viral capacity were recorded. In this study we found out of 50 women 24 (48%) were suffered from COPD.

Keywords: COPD, Biomass Fuel, FEV1 (Forced Expiratory Volume per one second), FVC (Forced Vital Capacity)

INTRODUCTION:

On a global scale the household use of solid fuels is the most important source of indoor pollution and the exposure to the byproducts of combustion of biomass fuel particularly wood smoke has been related to chronic obstructive pulmonary diseases. Half of the world population and 75% population of developing countries still depends upon biomass fuel as a primary source of domestic energy for cooking and heating. (Reddy, et al 1990; Desai, et al 2004, Smith, et al.; 2004). Biomass fuel such as wood, plant residues and cow dung especially used for cooking and heating purpose (Nigel Bruce, et al 1988) biomass accounts for more than 80% of domestic energy in India (Holdren et al ;2000).In India 90% household's use wood or animal dung as the primary cooking fuel (IIps). The most important factor in the life of average Indian housewife is the domestic cooking. The typical Indian household life revolves around the cooking area and Indian women spent much of the time there. For daily cooking Indian housewife spent on an average more than 6 hours in the kitchen for cooking food (morning and evening). During her lifetime she is exposed to biomass fuel for 30 to 40 yrs. The type of house, location of kitchen and type of fuel used play a significant role on women health.

The smoke released due to incomplete combustion of unprocessed solid biomass fuel contains high volume and number of health damaging air borne pollutants such as (PM) respirable particulate matter PM10, CO, NO2, SO2, formaldehyde and other organic compounds (Bruce et al., 2000) Prolong exposure to such air born pollutants have adverse effect on the respiratory system of women which causes COPD.COPD is the inflammation and swelling of the lining of the airways that leads to narrowing and obstruction of the airways. In rural areas, most common cause of COPD is air pollution.

MATERIAL & METHODS:

Total 100 women were participated in this study. The biomass fuel users group was represented by 50 women from M.Khotwadi. Another group of LPG users was represented by 50 women from same villages of Sangli district. All women were 25 years of age or older. Biomass fuel users were from low socio-economic status. All women were interviewed and information was collected about age, height, weight type of house, type of Kitchen, no. of years exposure to biomass smoke, no. of hrs/day exposed to smoke. Spirometrywas performed in 100women, 50 biomass fuel users (subjects) and 50 LPG users (control). Force expiratory volume/1 second (FEV1%) and ratio

of force expiratory volume/1second / force vital capacity were recorded. Women having FEV1% <70% were considered as COPD.

Statistical analysis:

Z significance test was used. 'Z' value for control and subject was calculated, using formula based on null hypothesis to show significant difference between control and subject.

$$Cal\ |z| = \left[\frac{\overline{x1} - \overline{x2}}{\sqrt{\frac{\sigma 1^2}{n_1} + \frac{\sigma 2^2}{n_2}}}\right]$$

$\overline{x1}$ Mean of subject $\overline{x2}$ Mean of Control

$\overline{\sigma 1}$ Standard devaation of subject $\overline{\sigma 2}$ Standard devaation of subject

n1 = Number of observations of subjects

n2 = Number of observations of control

H0: There is no significant difference between control and subject women FEV1.

V/s

H1: There is significant difference between control and subject women FEV1.

Cal |Z| = > table Z = 1.96 at 5% level of significance.

∴ Reject H0

∴ There is significance difference between control and subject.

RESULT AND DISCUSSION

Table No.1 represents observations on Age, years of exposure and spirometry (in percentage) of control and Subject women in the village **M.** Khotwadi. The mean values of Age and years of exposure of control women are 42.20 and 20.20. While mean values of Age and year of exposure of subject women are 43.58 and 22.34. The mean values of FEV_1%, FVC%, FEV_1/FVC%, of control women are 99.18, 91.77 and 85.31 respectively, the mean values of FEV_1%, FVC%, FEV_1/FVC% of Subject women are 73.46, 76.67 and 79.00 respectively. These values are shown at the base of each column in the Table No.1.

The calculated Z value of Age and years of exposure and calculated Z value of FEV_1%, FVC%, FEV_1/FVC% based on null hypothesis are at the last of each column in the Table No.1. The calculated Z value of Age and years of exposure are 1.77 and 0.13. The calculated Z values of Age and years of exposure are less than 1.96 hence there is no significant difference in age and year of exposure of control and subject women. While calculated Z values of FEV_1%, FVC% and FEV_1/FVC% are 6.12, 3.98 and 4.41 respectively. The calculated Z values of FEV_1%, FVC%, FEV_1/FVC% are greater than 1.96 hence there is significant difference in FEV_1%, FVC%, FEV_1/FVC% of control and Subject women. The result is significant at 5% level of significance.

In this study we found that out of 50 women using chulla from rural area M. Khoutwadi 24 women were having FEV1% < 70. In M. Khotwadi 24 women were suffered from obstructive type of disorder. Our results are similar with the results of Dennis et al. (1996), Orozco et al. (2006), Caballero et al. (2008). In obstructive type of spirometry pattern there is narrowing of small airways due to chronic inflammation. According to Dennis et al. (1996), Orozco et al. (2006), Caballero et al. (2008) the reduction in FEV1% & FEV1/FVC% may be due to chronic inhalation of toxic substances emitted during biomass combustion leading to inflammatory changes in (bronchi and bronchioles).

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Table No. – 1
Data of Spirometry (FEV_1%, FVC%, FEV_1/FVC%) of Rural Women from M. Khotwadi Exposed to Biomass smoke

Sr. No.	CONTROL					SUBJECT				
	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%
1	39	12	79.00	77.73	79.53	42	23	76.23	71.92	90.91
2	40	23	92.79	91.43	86.16	38	18	99.12	89.06	95.76
3	41	25	101.27	96.37	86.02	36	17	93.80	98.73	82.64
4	42	24	87.58	86.26	88.47	38	14	95.07	91.43	86.16
5	37	20	121.33	114.67	86.26	40	19	68.98	80.66	75.44
6	52	13	121.33	114.67	86.26	45	25	21.56	25.74	69.23
7	46	28	83.04	77.73	83.04	48	29	61.43	76.77	66.15
8	38	21	79.00	77.73	78.95	44	24	21.56	25.74	69.23
9	45	27	121.33	114.67	86.26	45	24	54.46	67.47	69.05
10	40	11	101.27	96.37	86.02	42	21	45.62	58.04	67.93
11	38	21	121.33	114.67	86.26	45	13	98.03	91.30	88.69
12	45	26	121.33	114.67	86.26	43	23	76.23	71.92	90.91

Sr. No.	CONTROL					SUBJECT				
	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%
13	46	29	98.03	91.30	88.69	46	29	58.28	63.45	76.00
14	37	12	83.04	77.73	83.04	40	20	50.00	58.15	70.09
15	40	22	105.18	102.62	86.38	46	22	87.33	89.67	79.39
16	42	24	83.04	61.07	83.04	41	14	40.96	53.36	64.71
17	48	30	87.33	75.00	79.39	48	25	121.33	114.67	86.26
18	39	22	87.33	58.51	79.39	49	27	54.46	67.47	69.05
19	40	13	121.33	114.67	86.26	43	22	101.27	96.37	86.02
20	48	30	80.67	58.51	73.33	48	29	45.62	58.04	67.93
21	39	21	98.03	91.30	88.69	38	28	40.96	53.36	64.71
22	49	33	121.33	114.67	86.26	49	25	96.02	91.43	86.16
23	49	30	101.27	96.37	86.02	49	29	53.37	36.36	80.56
24	45	28	101.27	96.37	86.02	46	27	48.55	75.21	73.63
25	40	13	101.27	96.37	86.02	36	18	71.19	72.70	84.39
26	37	20	87.58	86.26	88.47	46	14	109.82	98.48	92.27
27	39	21	98.03	91.30	88.69	39	21	68.80	73.90	80.10
28	40	22	87.58	86.26	88.47	45	24	83.51	77.58	90.75
29	43	12	101.27	96.37	86.02	47	28	74.64	76.61	78.63
30	42	23	87.33	58.51	79.39	46	27	57.08	61.99	79.17
31	44	27	83.04	77.73	83.04	42	22	66.29	83.33	66.29
32	41	24	98.03	91.30	88.69	49	13	81.44	78.88	89.96
33	39	11	87.58	86.26	88.47	42	22	61.43	77.69	66.15
34	43	23	98.03	91.30	88.69	43	20	87.33	89.67	79.39
35	38	20	121.33	114.67	86.26	45	25	70.94	65.56	91.14
36	46	29	98.03	91.30	88.69	49	28	67.58	66.82	83.67
37	38	12	101.27	96.37	86.02	42	20	73.79	80.49	76.77
38	39	21	121.33	114.67	86.26	55	35	61.43	77.69	66.15
39	41	24	121.33	114.67	86.26	49	29	76.23	71.20	91.82
40	49	30	83.04	61.07	83.04	46	25	66.29	97.22	66.29
41	44	27	83.04	61.07	83.04	43	20	87.33	89.67	79.39
42	43	26	121.33	114.67	86.26	39	17	73.79	80.49	76.77
43	40	22	101.27	96.37	86.02	43	20	166.27	142.11	85.19
44	37	10	101.27	96.37	86.02	44	21	121.33	114.67	86.26
45	45	26	98.03	91.30	88.69	42	22	61.43	77.69	66.15
46	47	28	121.33	114.67	86.26	41	19	109.82	98.48	92.27
47	42	24	87.58	86.26	88.47	38	18	77.08	83.33	77.89
48	44	23	83.04	77.73	83.04	37	20	70.94	65.56	91.14
49	40	22	105.18	102.62	86.38	39	19	76.23	71.92	90.91

Sr. No.	CONTROL					SUBJECT				
	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%
50	44	25	82.56	77.73	83.04	43	23	40.96	53.36	64.71
Mean	**42.20**	**22.20**	**99.18**	**91.77**	**85.31**	**43.58**	**22.34**	**73.46**	**76.67**	**79.00**
Var.	**13.96**	**35.84**	**208.02**	**293.64**	**10.24**	**16.48**	**23.14**	**674.61**	**427.53**	**92.09**
Sqrt	**0.78**	**1.09**	**4.20**	**3.80**	**1.43**					
Z	**1.77**	**0.13**	**6.12**	**3.98**	**4.41**					