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INVERSE RELATIONSHIP BETWEEN COPD WOMEN AND AND BODY MASS INDEX IN WOMEN FROM RURAL AREA OF KAKADWADI OF SANGLI DISTRICT.

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ABSTRACT:
In majority of rural areas biomass fuel such as wood, cow dung and crop residue is easily available. Poor families use these biomass fuels for cooking and heating purposes. Majority of poor families lives in Kutcha type of houses. In kutcha type of houses kitchens are not properly ventilated. Incomplete combustion of biomass fuel release smoke which contains high volume and number of air pollutants such as respirable particulate matter PM_{10}, CO, NO_2, SO_2, formaldehyde and other organic compounds. Prolonged exposure to such air born pollutants, have adverse effect on the respiratory system of women which causes reduced lung function.
There is strong relation between reduced lung function and Body Mass Index. To study relation between reduced lung function and Body Mass Index, total 100 women were selected from rural area of Sangli District Kakadwadi. Out of 100 women 50 women using chulla and 50 women using LPG were selected. Women using chulla were considered as Subject and women using LPG were considered as Control. All women were underwent spirometery to detect COPD. Spirometric parameter, FEV_1%, FVC%, FEV_1%/FVC% were recorded. Body Mass Index of all women was calculated. Body Mass Index was categoried in four groups (Underweight <20kg/m^2, Normal Weight 20.0-25.0kg/m^2, Overweight 25.0-30.0kg/m^2, Obese >30.0 kg/m^2) In this study we found that out of 50 women who were exposed to biomass fuel smoke 19 women were suffering from Obstructive type COPD (FEV_1%<70%). In subject women Body Mass Index in underweightcategory, normal weight category, overweight category and obese category was lower than control group.
Keywords: *COPD, Body Mass Index, FEV_1% (Forced Expiratory Volume per one second), Forced Expiratory Volume per one second / forced vital capacity, COPD.*

INTRODUCTION:

In India, Majority of women from rural area still uses biomass fuel such as wood, cow dung and crop residue for cooking and heating purpose. (Smith *et al*, 1996). In rural area most common cause of chronic obstructive disease is the indoor air pollution. For rural women biomass fuel such as wood, cow dung and crop residues are easily available. Rural women from low socio economic status live in kutcha type of houses where kitchens are not properly ventilated. Incomplete combustion of biomass fuel releases smoke, which contains high volume and number of air pollutants. Such as PM_{10}, CO, NO_2, SO_2, formaldehyde and other organic compounds prolonged exposure to such air causes COPD.

COPD is the inflammation and swelling of the linings of the air way that leads to narrowing and obstruction of airways.
Combustion of biomass produces a large amount of smoke that spreads into the environment as air pollutants. Exposure to such biomass smoke causes adverse effect on respiratory system. Biomass fuel smoke is the most important risk factor for COPD where indoor ventilation is inefficient (Albalak *et al.;* 1997, De Koning*et al.*; 1985).

There is strong relation between COPD and Body Mass Index women with COPD develop chronic cough, dyspnea shortness of breath, weight loss occur in some women with COPD is due to low intake of food and also because of additional energy required for breathing. (Brinnel*et al*, 2006) In COPD there is loss of body weight, which has a negative impact on quality of life (Brinnel*et al*, 2006) reduced lung function has effect on the body mass index.

MATERIAL AND METHODS:

Survey of women working in the field (Subject) using chulla in rural area Kakadwadi was done. Information regarding age, type of fuel, year of exposure, hours of exposure was collected.50 women above 35 years of the age using chulla for more than 15 years (Subject) and 50 women

not using LPG (Control) were selected. Spirometry was done in 100 women, (50 subject women and 50 control women).Forced expiratory volume per one second (FEV_1%). Forced Vital Capacity (FVC%). FEV_1%/FVC% was recorded. If FEV_1%<70% then there is obstructive type of COPD.

ANTHROPOMETRY: (Ancel*et al*, 1972)

- In total 100 women Body mass index was calculated by using the formula BMI (Kg/m^2) = Mass (Kg) / Height $(m)^2$E). (Ancel*et al*, 1972)
- BMI was categorized into four groups (World Health Organization, 2000) in total 100 women. Underweight (<20 kg/m^2), Normal weight (20.0 -25.0 kg/m^2), Overweight (25.0-30.0kg/m^2), Obese (>30.0kg/m^2)

STATISTICAL ANALYSIS: Calculated Z test based on null hypothesis: (Gupta and Kappor, 1983)

$$Cal\ |z| = \left[\frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{\sigma 1^2}{n_1} + \frac{\sigma 2^2}{n_2}}}\right]$$

H_0: There is no significant difference between control and subject women FEV_1%.

Vs

H_1: There is significant difference between control and subject women FEV_1%.

Cal |Z| = > table Z = 1.96 at 5% level of significance. If Z value is greater than table value 1.96 then

∴ Reject H_0

∴ There is significance difference between control and subject FEV_1%.

RESULTS AND DISCUSSION:

Body mass index of rural women exposed to biomass fuel smoke in Kakadwadi

Table No. 2 represents the mean values of Age, Weight, Height, BMI of control women are 42.66 Yrs, 56.38 Kg, 150.36 cms and 24.90 Kg/m^2 respectively, while mean values of Age, Weight, Height, BMI of Subject women are 44.34 Yrs, 47.88 Kg, 155.56 cms and 19.89 Kg/m^2 respectively. These values are shown at the base of each column in the Table No.2.The calculated Z values of Age, Weight, Height, BMI based on null hypothesis are at the end of each column in the Table No. 2. The calculated Z values of Weight, Height and BMI are respectively 10.80 Kg, 5.06 cms and 11.22 Kg/m^2. These values are greater than the table values 1.96. So there is significant difference between Z values of Weight, Height, BMI of control and subject. The calculated Z value of Age is 1.89 Yrs this value is less than table value 1.96. So there is no significant difference between Z value of Age of control and subject.

CONCLUSION:

On the basis of the study results, it is concluded that in view of the climatic changes, farming techniques, vector population control process, use of pesticides, fertilizers and seed quality have seen major changes. In view of the study results, it is concluded that there is noticeable change in damages caused by diseases to crop yield, crop yield has gone down noticeably as a function of climatic changes.

In this study when we compared the results of spirometry of subject and control we found that there is reduction in lung function parameter FEV_1% and FEV_1/FVC% in subject women than control. In Kakadwadi19 women were having FEV_1% < 70%. 19 women had Obstructive type of COPD.

Koksal*et al.* (2013), Berlin *et al.* (2014), Arora*et al.* (2014) in their study they reported that the lung function parameter FEV_1% and FEV_1/FVC% were significantly lower in women exposed to biomass fuel smoke than control. The reduction in FEV_1% and FEV_1/FVC% may be due to chronic inhalation of toxic substances emitted during biomass combustion leading to inflammatory changes in the bronchi and bronchioles. Our results are similar with study of Koksal*et al.* (2013), Berlin *et al.* (2014), Arora*et al.* (2014).

In the present study when we compared BMI of subject group with that of control group. We found that in subject group BMI is less than control group. The percentages of underweight and normal weight categories in subject were higher as compared to control while the percentages of overweight and obese categories were lower in subject as compared to control.

According to Sajal (2012), Maryam *et al.* (2012) in their study they found that BMI in the LPG group was significantly higher than in the group of women using biomass. The subjects using biomass fuel are vulnerable to oxidative stress. Low BMI is the major risk factor in the development of COPD. Weight loss occurs in some women with COPD is due to the low intake of food and also because of additional energy required for breathing, similarly in our investigation we found that, low BMI in subject group as compared to control.

REFERENCE:

Smith, K.R. (1996): Indoor air pollution in India. ANati Med J India. 9:103-104.

Albalak, R. (1997): Cultural practices and exposure to particulate pollution from indoor biomass cooking: effect on respiratory health and nutritional status among the Aymara Indians of the Bolivian Highlands. Unpublished Doctoral Dissertation, University of Michigan.

De Koning, H.W., Smith, K.R., Last, J.M. (1985): Biomass fuel combustion and health. Bull World Health Organ. 63:11–26.

Brinnel, Caszo., George, A.D. (2006) : COPD and Nutrition. Lung India. 23:78-81.

Ancel, Keys.,Flaminio, Fidanza., Martti, J., Karvonen., Noboru, Kimura. (1972): Indices of relative weight and obesity. J. Chron Dis. 25:329-343.

Gupta, C., and Kapoor, K. (1983): Fundamentals of mathematics statistics. (8).

Koksal, Hulya., Attila , Saygi., Nesrin, Sariman., Emel, Ahci., Sirin, Yurtlu., Huri, Yilmaz., Yeliz, Duzgun. (2013): Evaluation of clinical and functional parameters in female subjects with Biomass smoke exposure. Respir care. 58(3):424-430.

Berlin, Jeneth., Raj, T. (2014) : Altered lung function test in asymptomatic women using biomass fuel for cooking. Journal of clinical and diagnostic research. 10:BC01–BC03.

Arora, Priya., Gupta, Rajesh., Chopra, Rahul., Gupta, Anupama., Mishra, Neena., Sood, Sushma. (2014): Effect of chronic exposure to biomass fuel smoke on pulmonary function test parameters. Int. J. Res. Med. Sci. 2(4):1488-1494.

Sajal, De. (2012): Body Mass Index Among Patients With Chronic Obstructive Pulmonary Disease. Indian J PhysiolPharmacol. 56(4) :353-8.

Maryam, B. Akor-Dewu., Joseph, O. Ayo., Andrew, R. Collins., M.M. Mabrouk., Alexander, B. Adelaiye., Fatima, L. Ciroma. (2012): Comparative study of haematological and cardiorespiratory parameters in women exposed to biomass or mixed fuels. AIJOCR. 2(8) : 257-263.

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Table No. – 1

Data of Spirometry (FEV_1%, FVC%, FEV_1/FVC%) of Rural Women from Kakadwadi 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	38	12	82.56	61.07	83.04	38	20	57.27	60.82	79.75
2	40	20	98.03	91.30	88.69	45	21	98.03	125.37	88.69
3	38	21	95.54	91.43	86.16	58	38	77.82	74.82	92.79
4	39	20	82.56	61.07	83.04	38	20	73.94	75.78	82.25
5	46	27	121.33	114.67	86.26	45	27	21.56	25.74	69.23
6	43	13	98.03	91.30	88.69	42	14	67.02	63.68	88.73
7	37	18	79.00	61.07	79.53	52	32	21.56	25.74	69.23
8	45	26	98.03	91.30	88.69	49	30	54.46	67.47	69.05
9	40	20	98.03	91.30	88.69	50	31	61.43	77.69	66.15
10	48	14	121.33	114.67	86.26	45	26	61.43	77.69	66.15
11	47	28	101.27	96.37	86.02	45	27	76.23	71.92	90.91
12	42	23	68.00	114.67	48.34	50	30	58.28	63.45	76.00
13	36	20	101.27	96.37	86.02	47	26	50.00	58.15	70.09
14	38	21	92.79	91.43	86.16	49	30	21.56	25.74	69.23
15	42	11	121.33	114.67	86.26	40	14	54.46	67.47	69.05
16	38	20	101.27	96.37	86.02	45	26	61.43	77.69	66.15
17	41	22	98.03	91.30	88.69	41	24	53.37	36.36	80.56
18	43	23	87.58	86.26	88.47	55	37	51.54	53.22	73.63

Sr. No.	CONTROL					SUBJECT				
	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%	Age	Years	FEV_1%	FVC%	FEV_1/ FVC%
19	41	24	87.33	58.93	79.39	45	25	54.46	67.47	69.05
20	39	12	121.33	114.67	86.26	45	14	71.19	72.44	84.39
21	42	22	98.03	91.30	88.69	43	26	30.43	27.49	89.36
22	45	26	101.27	96.37	86.02	45	22	98.03	135.48	88.69
23	40	20	92.79	91.43	86.16	40	19	52.21	74.35	83.04
24	43	23	82.56	61.07	83.04	45	13	101.27	96.37	86.02
25	42	23	87.58	86.26	88.47	50	30	95.54	91.43	86.16
26	40	21	121.33	114.67	86.26	39	21	68.80	73.90	80.10
27	38	12	87.58	86.26	88.47	38	18	121.33	114.67	86.26
28	39	20	98.03	91.30	88.69	40	19	63.11	71.25	83.04
29	43	26	87.58	86.26	88.47	38	17	92.79	91.43	86.16
30	45	27	121.33	114.67	86.26	46	25	121.33	114.67	86.26
31	48	29	101.27	96.37	86.02	38	22	76.23	71.92	90.91
32	41	23	82.56	61.07	83.04	36	19	49.22	63.45	76.00
33	49	12	98.03	91.30	88.69	45	25	21.56	25.74	69.23
34	40	20	82.56	39.29	129.09	41	20	87.58	86.26	88.47
35	49	30	98.03	91.30	88.69	48	30	87.33	58.72	79.39
36	46	29	87.58	86.26	88.47	40	20	87.58	86.26	88.47
37	43	27	98.03	91.30	88.69	45	23	98.03	91.30	88.69
38	49	14	121.33	114.67	86.26	40	20	98.03	91.30	88.69
39	47	29	101.27	96.37	86.02	48	27	52.59	61.07	83.04
40	40	21	101.27	96.37	86.02	40	20	101.27	96.37	86.02
41	48	30	121.33	114.67	86.26	50	30	95.54	91.43	86.16
42	42	24	121.33	114.67	86.26	55	14	50.00	58.15	70.09
43	40	23	98.03	91.30	88.69	43	21	94.67	114.67	67.30
44	44	27	87.58	86.26	88.47	45	27	53.37	54.82	80.56
45	42	24	87.33	90.66	79.39	41	23	54.46	67.47	69.05
46	54	36	73.79	80.49	76.77	42	23	48.55	53.22	73.63
47	44	24	101.27	96.37	86.02	48	30	21.56	25.74	69.23
48	38	20	92.79	91.43	86.16	45	14	82.00	71.85	83.04
49	49	30	87.58	86.26	88.47	38	20	30.43	27.49	89.36
50	42	24	92.79	91.43	86.16	41	21	92.79	91.43	86.16
Mean	42.66	22.22	97.37	91.15	86.30	44.34	23.42	67.49	70.97	79.79
Var.	15.26	30.57	182.13	285.72	72.86	24.22	34.16	676.74	686.05	71.35
Sqrt	0.89	1.14	4.14	4.41	1.70					
Z	1.89	1.05	7.21	4.58	3.83					

Table No.2

Body Mass Index of Rural Women exposed to biomass fuel smoke Kakadwadi

SR. NO.	Control					Subject				
	Name	Age (Yrs)	Weight (Kg)	Height (cms)	BMI Kg/m²	Name	Age (Yrs)	Weight (Kg)	Height (cms)	BMI Kg/m²
1	SEM	38	58	147	26.84	LSP	38	47	161	18.13
2	CVS	40	60	158	24.03	BTP	45	49	154	20.66
3	SRM	38	54	149	24.32	SPP	58	49	162	18.67
4	RRK	39	57	158	22.83	PSP	38	48	160	18.75
5	AAM	46	50	154	21.08	MSP	45	47	169	16.46
6	MRG	43	60	152	25.97	BVP	42	47	158	18.83
7	RPG	37	55	155	22.89	SGP	52	45	164	16.73
8	SDH	45	52	145	24.73	MMP	49	43	162	16.38
9	RMJ	40	66	155	27.47	PMK	50	47	160	18.36
10	MMA	48	59	154	24.88	AAK	45	43	159	17.01
11	LND	47	58	152	25.10	NSK	45	47	158	18.83
12	AGS	42	54	150	24.00	ASP	50	49	161	18.90
13	SSK	36	56	143	27.39	AUP	47	48	160	18.75
14	SVP	38	58	150	25.78	SGP	49	45	164	16.73
15	SSD	42	60	152	25.97	IBP	40	42	152	18.18
16	NAH	38	56	154	23.61	ADK	45	46	158	18.43
17	PNP	41	59	154	24.88	KNP	41	50	160	19.53
18	KJS	43	54	152	23.37	MAP	55	47	162	17.91
19	SSS	41	58	159	22.94	KDP	45	50	159	19.78
20	AMA	39	51	154	21.50	VBP	45	45	153	19.22
21	JKK	42	62	153	26.49	LRP	43	52	145	24.73
22	SVK	45	57	155	23.73	CSP	45	50	152	21.64
23	SBG	40	63	150	28.00	SSP	40	49	154	20.66
24	ABD	43	50	152	21.64	LDP	45	51	148	23.28
25	KVB	42	59	148	26.94	SBP	50	43	150	19.11
26	UBK	40	54	149	24.32	LSP	39	48	144	23.15
27	URP	38	51	150	22.67	PBK	38	50	146	23.46
28	SPP	39	50	145	23.78	TPK	40	54	151	23.68
29	SAP	43	62	151	27.19	UGK	38	53	152	22.94
30	KSP	45	51	154	21.50	NBK	46	45	153	19.22
31	VSP	48	68	154	28.67	SPP	38	48	155	19.98
32	CKT	41	57	150	25.33	SAP	36	45	158	18.03
33	MAR	49	51	151	22.37	ARP	45	49	148	22.37
34	SAW	40	53	150	23.56	SDP	41	49	156	20.13
35	BNS	49	55	140	28.06	RAP	48	50	158	20.03
36	UPJ	46	52	150	23.11	SDP	40	51	159	20.17
37	SAB	43	59	149	26.58	CVP	45	52	150	23.11
38	GAS	49	51	140	26.02	VSP	40	49	152	21.21

SR. NO.	Control					Subject				
	Name	**Age (Yrs)**	**Weight (Kg)**	**Height (cms)**	**BMI Kg/m²**	**Name**	**Age (Yrs)**	**Weight (Kg)**	**Height (cms)**	**BMI Kg/m²**
39	MAS	47	65	146	30.49	PSE	48	51	145	24.26
40	HSJ	40	63	152	27.27	KJP	40	46	145	21.88
41	HDD	48	60	151	26.31	SAP	50	43	158	17.22
42	SSS	42	66	145	31.39	MRP	55	49	148	22.37
43	SUP	40	50	148	22.83	NKP	43	45	156	18.49
44	KNM	44	50	145	23.78	AAP	45	43	155	17.90
45	RYM	42	58	150	25.78	BNP	41	48	160	18.75
46	BLN	54	58	151	25.44	RSB	42	46	161	17.75
47	SBP	44	52	152	22.51	GMC	48	51	152	22.07
48	SPG	38	51	148	23.28	AKP	45	48	159	18.99
49	PSP	49	52	152	22.51	BHM	38	50	154	21.08
50	SNP	42	54	150	24.00	DNM	41	52	158	20.83
	Mean	**42.66**	**56.38**	**150.56**	**24.90**		**44.34**	**47.88**	**155.56**	**19.89**
	Var.	**15.26**	**22.80**	**16.29**	**5.16**		**24.22**	**8.19**	**32.45**	**4.80**
	Sqrt	**0.89**	**0.79**	**0.99**	**0.45**					
	Z	**1.89**	**10.80**	**5.06**	**11.22**					

Weight Category wise Body Mass Index in Control and Subject women Kakadwadi.

Village	Control				Subject			
	<20 Kg/m²	**>20.1 and <24.99 Kg/m²**	**>25 and <29.99 Kg/m²**	**>30 Kg/m²**	**<20 Kg/m²**	**>20.1 and <24.99 Kg/m²**	**>25 and <29.99 Kg/m²**	**>30 Kg/m²**
Kakadwadi	0	28	20	2	29	21	0	0