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Chronic Obstructive Pulmonary Disease Among the Users of Improved Cooking Stove and Traditional Cooking Stove

Ahmad SA[1], Faruquee MH[1], Yasmin R[1], Sultana S[1], Chowdhury S[2]

[1]Department of Occupational and Environmental Health, Bangladesh University of Health Science (BUHS), Dhaka, Bangladesh; [2]Department of Community Medicine, Bangladesh University of Health Science (BUHS), Dhaka, Bangladesh.

Abstract

Background: Use of Improved Cooking Stove (ICS) is increasing in Bangladesh. It is expected that the use of ICS will decrease the occurrence of respiratory diseases, which remains to be explored.

*Objective:*The current study was an attempt to find out the occurrence of respiratory illnesses, particularly the Chronic Obstructive Pulmonary Disease (COPD) among the ICS users and comparing such illness among Traditional Cooking Stove (TCS) users.

Methods: This was a cross-sectional comparative study carried out among the women who were using ICS and TCS for cooking purposes. Women aged 35 years and above and cooking for more than 3 years were the study population. A total of 674 respondents were selected from a selected rural area, of which 232 were ICS users and 442 were TCS users. The study participants of both groups were age-matched (±2 years). Questionnaire on respiratory illness, COPD Population Screener (CPS) and COPD Assessment Test (CAT) questionnaires were used to collect necessary data from the respondents.

Results: The average age of the respondents was 43.96±7.632 years. Significantly (p=.000) a higher proportion of the TCS users had no formal education (46.4%). None of the respondents had smoking habits, but 16.8% of them had the habits of chewing tobacco. Overall, 85.5% of the respondents used biomass fuel. The average cooking year of the respondents was 26.9±8.59 and the daily average cooking duration was 3.09 hours. Among the TCS users, COPD (23.6%) and other respiratory illnesses (49.5%) were significantly (p=.001 and p=0.014 respectively) higher than those of the ICS users. Logistic regression analysis revealed that biomass fuel had the strongest ability (3.8 times) to predict COPD followed by the ability (1.8 times) of TCS use.

Conclusion: The study revealed that TCS users significantly suffered more from COPD than that of ICS users. Respondents having poor socio-economic conditions, a lower proportion of them were found to use ICS; not affordable was a reason. Along with TCS use, biomass fuel should also be discouraged.

Keywords: Respiratory disease, Biomass, Traditional cooking stove, Improved cooking stove

Introduction

Man learned to use fire as long as 500,000 years ago. Initially, ancient people created the fire for getting warm, for protection against wild animals and to some extent for cooking food. They discovered that food cooked with fire was easy to chew and increased the taste than raw foods.[1,2] Stove use had been started since the beginning of human history.[3,4] However, the clay made stove was first known to use in China from 221-207 BC.[5]

Use of traditional stoves began around thousands of year back. In Bangladesh, traditional cooking stoves (TCS) known as *Chula* is made of clay, commonly used in rural area.[3,6] Biomass is the principal source of fuel of *Chula,* which contributes more than 90% of the total fuel supply of the country. About 30 million households in Bangladesh use biomass fuels for cooking purpose, and of them 24 million households are from rural areas.[2,7-9] The common biomass fuels used for cooking are wood, leaves, cow-dung, straw, paddy husk, jute sticks, bagasse, sawdust etc.[8-11]

TCSs produce heavy smoke due to incomplete combustion and release many pollutants like particulate matters, carbon monoxide, nitrous oxides, sulphur dioxide, formaldehyde and carcinogens.[7-9] Women and children in the household, spend 3 to 7 hours near the stoves while cooking and are exposed to these pollutants every day specially the particulate matter upto 20 times higher than recommended levels of the WHO.[7,8,12] WHO assessed that pollution due to biomass fuel accounts for 1.6 million death and 39

*Correspondence: SK Akhtar Ahmad, Department of Occupational and Environmental Health, Bangladesh University of Health Science (BUHS), 125/1 Darus Salam, Mirpur-1, Dhaka-1216, Bangladesh; e-mail:anonsaahmad@gmail.com; ORCID: 0000-0003-0025-2673

million disability-adjusted life years (DALY) every year,[13] and responsible for 3.7% overall disease burden in developing countries;[14] and contribute to increase the greenhouse gases in the atmosphere.[4,15] Exposure to the pollutants released from the stoves may cause many health effects particularly asthma, acute respiratory infections, pneumonia, chronic obstructive pulmonary diseases (COPD), low birth weight and various cancers.[8,11-14] It was reported that under 5 children who were exposed to smoke of solid fuels, more than 1.8 times likely to develop pneumonia. According to a WHO report, smoke from cooking fuels account for nearly 2 million deaths mostly women and children, more than 99 percent of which occurs in developing countries. Further, it has been estimated that by 2030, over 4,000 people will die prematurely each day due to household air pollution. In developing countries 730 million tons of biomass fuel burned annually for cooking, which increases the greenhouse gases by emitting >1 billion tons of carbon dioxide into the atmosphere.[4, 13,14]

Since 1970s, Bangladesh has worked to popularise the use of improved cook stoves (ICS) with an aim to reduce indoor air pollution. In the 1990s, ICS has been developed to make it more energy-efficient, smoke removal, and user-friendly to cut the fuel consumption, decrease the emission of pollutants and greenhouse gases as well, thus to reduce the health problems particularly the lower respiratory tract infections, COPD and eye problems.[2,4,9,15,16] ICS has been further developed in 2005 and 2010 to make ICS more acceptable and durable.[2,9] Use of ICS has been increasing in Bangladesh, in 2011 about 510,000 ICSs were in use, which was increased from 424,000 ICSs in 2010. Recently over 800,000 ICSs have been installed by GIZ throughout Bangladesh. There is a target that 30 million households in Bangladesh will use ICS by 2030 to meet the goal of 100% clean cooking environment.[9]

It is expected that by using modified ICS, the household condition will be better in-terms of cleanliness and decreased pollutants emission.[2,4,9] Hence, will decrease the exposure to toxic substances, as a result, the occurrence of respiratory problems will be reduced particularly among the women and children. To find out whether the use of ICS could reduce the occurrence of respiratory illnesses particularly the COPD or not, need evidence-based study, but there lacks such study. The current study aimed to explore the occurrence of respiratory illnesses and COPD as well, among the ICS users while comparing the occurrence of such illnesses with TCS users.

Materials and Methods

This was a cross-sectional community based comparative study carried out to assess COPD and other respiratory illnesses among the women who used ICS. For comparison, the women who used TCS were included in the study. The women from a selected rural area where both TCS and ICS users were accessible and who were aged 35 years and above, and had a history of cooking more than three years was the study population. The study population was approached for consent to be a participant of the study and who agreed, was selected as the respondent. Initially, ICS users were selected then age-matched (±2 years) TCS users were selected as the respondents. For each ICS user respondent, two TCS user respondents were selected. Ultimately, a total of 674 respondents were included in the study of which 232 were ICS users and 442 were TCS users. Twenty-two respondents from TCS users could not be included because of their unwillingness to participate or not available during data collection. The respondents were interviewed face to face by using a pretested questionnaire for data collection on socio-demographic characteristics, personal habits and cooking practices. For respiratory illnesses, a questionnaire on respiratory illness based on NHANES 2012 was used. [17] To assess COPD, COPD Population Screener (CPS) and COPD Assessment Test (CAT) questionnaires were used to collect necessary data from the respondents. [18,19]A respondent scored 5 or more in CPS, identified as most likely suffering from COPD. While a respondent scored upto 5 in CAT, identified as normal, healthy, not suffering from COPD. In this study, a participant was identified as suffering from COPD if she scored >4 in CPS and >5 in CAT. Based on CAT score, the COPD was categorised as normal (upto 5), low (<10), medium (10-20) and high (>20) COPD. In this study, spirometry test of the responded could not be done because the study was done at the village level where the women were shy to do spirometry test and even after several orientations on the use of a spirometer, they could not do it properly. However, to ascertain the COPD and other respiratory diseases the study physicians collected necessary information from the respondents.

Data analysis: The data entry and analysis were done using SPSS. Before entry collected data were

checked and verified for any inconsistencies. Initially, descriptive analysis such as frequency, percentage, mean and standard deviation was done. For inferential statistics, student's t-test for quantitative variables and to find associations between the qualitative variables chi-square test was conducted. Finally, a binary logistic regression analysis was done to find the predictors for COPD.

Ethical clearance: Ethical approval of the study was taken from the Ethical Review Committee of Bangladesh University of Health Sciences (BUHS). The participating women were briefed about the purpose of the study and the data collection procedure. The participating women were also informed that their participation would be voluntary and they could withdraw themselves from the study whenever they wanted to do.

Results

Overall, the mean age of the respondents was 43.9±7.8 years. Comparatively, TCS users had a lower mean age (43.5 years). Almost half (47.6%) of the respondents had education up to primary level. Significantly (χ^2=27.149; *p*=.000) a higher proportion of the TCS users had no formal education (46.4%) while 5.2% of the ICS users had education up to HSC and above. Two-thirds (66.9%) of the respondents had family members upto 4 and comparatively ≥5 family members was higher among TCS users. The monthly family income was significantly higher among ICS users (Taka13295±6076) than that of the TCS users. Majority of the respondents lived in *semipucca* house (34.4%) however, significantly (χ^2=39.374; p=.000) a higher proportion of the TCS users lived in *katcha* house (19.0%) (table I).

Table I: Socio-demographic characteristics of participating women distributed by cooking stove

Characteristics		TCS user (%)	ICS user (%)	Total n=674 (%)	Test of Significance
		442 (65.5)	232 (34.5)		
Age (years)	35-44	223 (50.6)	125 (53.6)	348 (51.6)	χ^2=0.71; *p*=.398
	45 and Above	219 (50.5)	107 (46.1)	326 (48.4)	
	Mean±SD	44.19± 7.995	43.53± 7.515	43.96± 7.834	t=1.039; *p*=.299
Education	Non formal	205 (46.4)	61 (25.3)	266 (39.5)	χ^2=27.149;; *p*=.000
	Upto Primary	191 (43.3)	130 (55.8)	321 (47.6)	
	SSC	34 (7.7)	29 (12.4)	63 (9.3)	
	HSC & Above	12 (2.7)	12 (5.2)	24 (3.6)	
Family Size	Upto 4	297 (67.2)	154 (66.4)	451 (66.9)	χ^2=0.04; p=.831
	5 and Above	145 (32.9)	78 (33.5)	223 (33.1)	
Monthly Income	Mean± SD (Tk)	9346± 4832	13295± 607	10705± 5612	t=9.202; *p*=.000
House Type	Katcha	84 (19.0)	20 (8.6)	104 (15.4)	χ^2=39.374; *p*=.000
	Tin	139 (31.5)	59 (25.3)	198 (29.4)	
	Semi pucca	117 (26.5)	115 (49.4)	232 (34.4)	
	Pucca	102 (23.1)	38 (16.4)	140 (20.8)	

Table II: Tobacco consumption and cooking practice by the participating women

Tobacco Use		TCS user n=442 (%)	ICS user n=232 (%)	Total n=674 (%)	Test of Significance
Tobacco Consumed	Yes	87 (19.7)	26 (11.2)	113 (16.8)	χ^2=7.833; *p*=.005
	No	355 (80.4)	206 (68.4)	581 (83.2)	
Type of Tobacco consumption	*Jarda*	44 (73.3)	16 (26.7)	60 (53.1)	χ^2=0.970; *p*=.616
	Tamak	22 (81.5)	05 (18.5)	27 (23.9)	
	Gul	21 (80.8)	05 (19.2)	26 (23.0)	
Second hand Smoking in home	Yes	219 (49.5)	91 (39.4)	310 (46.0)	χ^2=6.528; *p*=.011
	No	223 (50.6)	141 (60.5)	364 (54.0)	
Cooking Practice					
Fuel Types	Biomass	374 (84.6)	202 (87.1)	576 (85.5)	χ^2= .737; *p*=0.391
	Non-biomass	68 (15.4)	30 (12.9)	98 (14.5)	
Length of Cooking	Mean± SD (Yrs)	27.27± 8.775	26.41± 8.211*	26.98±8.589	t=1.234; *p*=.217
	Mean± SD (Hrs)	3.13± 0.675	3.02± 0.597	3.09± 0.650	t=-1.960; *p*=.050

* Total cooking years and cooking years with ICS 7.2± 4.972 years

None of the respondents had the habits of smoking; however, 16.8% of them had the habits of chewing tobacco. The consumption of tobacco was significantly (χ^2=7.833; p=.005) high (19.7%) among TCS users than that of ICS users (11.2%). The chewing tobacco was *Jarda* (53.1%) *tamak* (23.9%) and *gul* (23.0%). Exposure to second-hand smoking (smoking by HH member) was significantly (χ^2=6.528; *p*=.011) high among the

households of TCS users (49.5%) compared to that of ICS users (39.4%). (table II)

Table III: Distribution of respiratory problems and COPD of the participating women

Suffering from Respiratory Disorders		TCS user n=412 (%)	ICS user n=232 (%)	Total n=674 (%)	Test of Significance
Respiratory problems	No	223 (50.6)	140 (60.3)	363 (53.9)	χ^2= 5.991; **p=.014**
	Yes	219 (49.5)	93 (39.9)	311 (46.1)	
COPD*	No	337 (76.4)	201 (86.3)	538 (79.8)	χ^2=10.20; **p=.001**
	Yes	105 (23.6)	31 (13.4)	136 (20.2)	
COPD Categories (CAT Score)	Low (<10)	57 (54.8)	18 (59.4)	75 (55.1)	χ^2=0.150; p=.928
	Medium (10-20)	40 (38.1)	11 (35.5)	51 (37.5)	
	High (>20)	8 (7.8)	2 (6.5)	10 (7.4)	
Respiratory Manifestations (Multiple Responses)	Asthma	117 (53.4)	37 (40.2)	154 (22.8)	χ^2=4.521; p=**.033**
	Dyspnoea	114 (52.3)	35 (38.0)	149 (22.0)	χ^2=5.096; p=**.024**
	Chest Tightness	121 (55.2)	39 (42.4)	160 (23.7)	χ^2=4.289; p=**.038**
	Chronic Cough	76 (34.7)	21 (22.8)	97 (14.4)	χ^2=4.258;**p=.039**
	Cough & Mucus	111 (50.9)	43 (46.2)	154 (22.8)	χ^2=0.571; p=.450
	Nasal block	140 (63.9)	51 (55.4)	191 (28.3)	χ^2=1.972; p=**.160**
	Nasal discharge	137 (62.6)	44 (47.8)	181 (26.92)	χ^2=5.779; p=**.016**

* No= CPS upto 4 & CAT upto 5; Yes= CPS > 4 & CAT >5

Overall, 85.5% of the respondents used biomass fuel and of them, ICS users were 87.1% and TCS users were 84.6%. Respondents had a cooking length of 26.9±8.6 years and TCS users had a little higher length (27.3±8.8 years), and in this cooking length with ICS was7.2±4.972 years. However, the daily cooking hours between TCS (3.13±0.675) and ICS users (3.02±0.59) was significantly (t=-1.960; *p*=.050) different. (table II) The common biomass fuels used for cooking, were wood (78.3%), cow-dung (75.0%) and leaves (26.6%). The reasons for not using ICS as stated, ICS was not suitable (34.0%), would not be comfortable to use (29.1%), not affordable (27.1%), didn't know about ICS (11.2%), need more fuel to use ICS (9.0%), and didn't find any necessity to use ICS (7.6%).

Overall, 46.1% of the respondents were found to suffer from respiratory illnesses (table III) and the occurrence was significantly (χ^2=5991; *p*=.014) higher among TCS users (49.5%) than that of ICS users (39.9%). The manifestations of the respiratory illnesses were nasal block (28.3%), nasal discharge (26.9%), chest tightness (23.7%), asthma (22.8%), cough with mucus (22.8%), dyspnoea (22.0%) and chronic cough (14.4%). However, one-fifth (20.2%) of the total respondents were found to suffer from COPD (table III). Significantly (χ^2=10.204; *p*=.001) a higher proportion of the TCS users (23.6%) were identified as suffering from COPD compared to that of ICS users (13.4%).

Table IV: COPD participating women distributed by socio-demographic characteristics

Characteristics		COPD No n=538 (%)	COPD Yes n=136 (%)	Total n=674 (%)	Test of Significance
Age (Years)	Mean± SD	43.3± 7.575	46.7± 8.263	43.96± 7.834	t=-4.622; *p*=.000
Education	Non formal	196 (36.4)	70 (51.5)	266 (39.5)	χ^2=11.80; *p*=0.008
	Upto Primary	265 (49.3)	56 (41.2)	321 (47.6)	
	SSC	56 (10.4)	07 (5.1)	63 (9.3)	
	HSC & Above	21 (3.9)	3 (2.2)	24 (3.6)	
Family size	Upto 4	358 (66.5)	93 (68.4)	451 (66.9)	χ^2= .166; *p*=0.684
	5 and above	180 (33.5)	43 (31.6)	223 (33.1)	
Monthly Income	Mean± SD	11055 ± 5685	9319± 5103	10705 ± 5612	t=3.245; *p*=.001
House type	*Katcha*	77 (14.3)	27 (19.9)	104 (15.4)	χ^2= 3.566; *p*=0.312
	Semi pucca	160 (29.7)	38 (27.9)	198 (29.4)	
	Tin	187 (34.8)	45 (33.1)	232 (34.4)	
	Pucca	114 (21.2)	26 (19.1)	140 (20.8)	

Based on CAT scores, COPD was categorised as low, medium and high stage, and a majority (55.1%) of the respondents were in low stage and only 7.4 % were in the high stage. The high stage COPD was more common among the TCS users (7.8%) than that of ICS users (6.5%). Respondents suffering from COPD significantly (t=-4.622; *p*=.000) had a higher mean age (46.7±8.263 years), 51.5% had no formal education (χ^2=11.804; p=.008) and had a lower (Taka 9319) monthly income (t=3.245; *p*=.001) (table IV). Moreover,

occurrence of COPD was found significantly higher (22.2%) among the biomass fuel users (χ^2=10.278; *p*=.001), who had a longer length (29.52 ± 9.064 years) of cooking experience (t=-3.911; *p*=.000), and habits (31.0%) of chewing tobacco (χ^2=9.823; *p*=.002) (table V).

Table V: COPD by cooking practice and tobacco use of the respondents

Factors		COPD		Total	Test of Significance
		No n=538 (%)	Yes n=136 (%)	n=674 (%)	
Cooking Practice					
Fuel types	Biomass	448 (77.9)	128 (22.1)	576 (85.5)	χ^2=10.27; ***p*=.001**
	Non-biomass	90 (91.8)	08 (8.2)	98 (14.5)	
Duration of Cooking	Mean± SD Yrs	26.33± 8.350	29.52± 9.064	26.98± 8.589	t=-3.911; ***p*=.000**
	Mean± SD Hrs	3.08± 0.662	3.13± 0.604	3.09± 0.650	t=-.681; *p*=.496
Tobacco Use					
Tobacco consumption	Yes	78 (69.0)	35 (31.0)	113 (16.8)	χ^2=9.823; ***p*=.002**
	No	460 (82.0)	101 (18.0)	561 (83.2)	
Type of Tobacco (n=113)	*Jarda*	39 (34.5)	21 (18.6)	60 (53.1)	χ^2=3.617; *p*=.164
	Tamak	20 (17.7)	7 (6.2)	27 (23.9)	
	Gul	21 (18.6)	5 (4.4)	26 (23.0)	
Second hand Smoking	Yes	243 (78.4)	67 (21.6)	310 (46.0)	χ^2= .734; *p*=.392
	No	295 (81.0)	69 (19.0)	364 (54.0)	

Logistic regression analysis was carried out to see the impact of the factors which were found to have a significant relationship with the occurrence of COPD. As such, age of the respondents, education, monthly income, years of cooking, chewing tobacco, biomass fuel and use of improved stove was controlled for to see the ability to predict the likelihood of occurrence of COPD (table V). Independently age of the respondents *(p*=.032), chewing tobacco *(p*=.029), cooking stove (*p*=0.018) and biomass fuel *(p*=0.001) had the significant ability to predict the likelihood of developing COPD. Use of biomass fuel was the strongest (3.8 times) predictor for COPD followed by the use of TCS (1.8 times). Furthermore, each unit increase of age significantly had 1.01 times ability to predict the development of COPD (table VI). A second logistic analysis was carried out to see the ability of TCS as a predictor for COPD after removing the control for biomass. The analysis revealed that the ability of TCS use to predict the likelihood of developing COPD was reduced after removing the control for biomass. However, in this model, TCS use was the strongest predictor (1.6 times) for COPD while the impact of chewing tobacco became insignificant predictor for COPD (table VI).

Table VI: Logistic regression predicting likelihood of occurrence of COPD among the respondents

Dependent Variables	COPD among the TCS and ICS users women					95% Confidence Interval	
Independent Variables	**B**	**S.E.**	**Wald**	**P**	**Exp (B)**	**Lower**	**Upper**
a. Constant	-5.108	1.050	23.683	.000	.006		
Cooking stove	.576	.243	5.621	**.018**	1.778	1.105	2.862
Biomass fuel	1.345	.403	11.162	**.001**	3.837	1.743	8.446
Tobacco chewing	.571	.262	4.739	**.029**	1.769	1.059	2.957
No education			.894	.827			
Primary education	.240	.662	.132	.716	1.272	.348	4.653
Secondary educ	.287	.653	.192	.661	1.332	.370	4.791
Higher Sec educ	-.095	.755	.016	.899	.909	.207	3.995
Monthly income	.000	.000	1.817	.178	1.000	1.000	1.000
Age in years	.049	.023	4.588	**.032**	1.050	1.004	1.098
Years of cooking	-.004	.022	.034	.853	.996	.955	1.039
b. Constant	-3.647	.932	15.310	.000	.026		
Cooking stove	.482	.240	4.049	**.044**	1.620	1.013	2.591
Tobacco chewing	.370	.252	2.153	.142	1.447	.883	2.372
No education			1.305	.728			
Primary education	.359	.652	.302	.582	1.431	.399	5.141
Secondary education	.309	.644	.229	.632	1.361	.385	4.813
Higher Secondary education	-.109	.746	.021	.884	.897	.208	3.868
Monthly income	.000	.000	3.371	.066	1.000	1.000	1.000
Age in Years	.047	.022	4.376	**.036**	1.048	1.003	1.095
Years of Cooking	-.005	.021	.052	.820	.995	.954	1.038

Overall Chi Square 52.400; *p* =.000 and 37.963; *p* =.000 respectively

Discussion

ICS had been initiated in Bangladesh to cut the biomass fuel use, particularly the consumption of firewood thus, to prevent the occurrence of respiratory illness and other diseases including cancer.[4,6] ICS has been proved to be energy-efficient, reduce fuel consumption and less smoke emission but the main sources of fuel remain the biomass.[2,8] About half of the world population still depends on biomass fuel and more than two billion people use biomass fuels such as dung, wood, crop residues and coal.[8,20,21] In rural Bangladesh biomass is the principal sources of fuel which contributes more than 90% of the total fuel supply.[8,21] In this study, most (85.5%) of the respondents were found to use biomass and the use was higher among the ICS users (87.1%), and the main biomass was wood and cow-dung.

Studies reported that poor socioeconomic conditions of the household had an important negative role in the ICS use.[4,8,22,23] The current study also revealed that a majority of the TCS users belonged to the disadvantageous socioeconomic conditions. They had education up to primary level or no formal education, lower monthly income and lived in *Tin* house. On the contrary, the ICS users comparatively had a higher level of education (SSC and above), higher monthly income and majority lived in s*emi-pucca* houses. ICS is fuel-efficient and takes less time to cook.[2,9] The current study also revealed significantly a less cooking hour among the ICS users, which was on average 3.02 hours, while, overall daily cooking duration was 3.08 hours. Study in Bangladesh reported a higher average cooking hour (3.36) among rural women.[11]

Pollutants in cooking smoke may cause increased risk even more than double for developing various respiratory illnesses, specially the COPD and cancer.[12,24,25] The current study indicated that TCS users might be at the double burden of risk of developing diseases particularly respiratory diseases and cancer because TCS users were being exposed to the pollutants in the smoke daily and significantly a higher proportion of them consumed tobacco like *Jarda, Tamak* and *Gul*. Studies revealed the association of the pollutants released from cooking smoke with the occurrence of respiratory diseases. [2,8.11-15] In the current study, half (49.5%) of the TCS users were found to suffer from respiratory illnesses and almost one-fourth suffered from COPD (23.6%) which was significantly higher than those of ICS users and are reported to be attributable to biomass smoke.[11-14] However, in the studies, the prevalence of COPD among the rural and urban people in Bangladesh was reported to be 13.5% and among the residence of Dhaka city aged ≥40 years was 11.4%.[26,27]

Studies from Bangladesh and elsewhere revealed an inverse relationship of socioeconomic factors and the occurrence of respiratory illnesses as well as COPD. [27-33] The socioeconomic factors of the current study also had an influencing role in the occurrence of COPD. Respondents who had lower monthly income and had education up to primary level or no formal education were found to suffer significantly more from COPD. In addition, this study revealed an increased occurrence of COPD with a higher average year of cooking experience of the respondents. Moreover, logistic regression analysis revealed 1.01 times more risk of developing COPD with one year increased in age.

COPD is considered as a major cause of morbidity and mortality as well as the economic and social burden of a country. WHO estimates that currently, 65 million people worldwide have COPD and by 2030, COPD will be the 3rd main cause of death.[28,30] Further, WHO report shows that biomass smokes is a major environmental risk factor and rank 8th important risk factor for the global burden of diseases and contributes for 2.7% of the burden of disease.[2,13,14] This study revealed a higher occurrence of COPD (22.1%) among the biomass fuel users than that of non-biomass fuel users (8.2%). Moreover, logistic regression analysis revealed that both biomass fuel (3.8times) and TCS (1.8times) had strong ability to predict COPD. However, while the control for biomass fuel was removed from the analysis, the ability of TCS to predict the COPD was decreased. Thus, indicated an increased risk of developing COPD due to the combined effect of biomass fuel and TCS use and biomass had the main role to predict. Therefore, to reduce the risk of developing COPD, ICS use must be increased and the use of biomass fuel should be decreased. To undertake a preventive and control measures a regular community-based screening and monitoring service should be set up and community clinic services may be extended for this purpose so that in Bangladesh COPD would not be a burden by 2030 as estimated by the WHO.

Conclusion

The current study revealed that among the TCS users the occurrence of COPD significantly higher than that of ICS users. Further, this study revealed that the participating women who used biomass

fuel and had the habits of chewing tobacco suffered more from COPD. Comparatively, the respondents who had poor socioeconomic conditions, a lower proportion of them was to be found to use ICS.

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