A survey of covid-19 in Women Using Solid Biomass Fuel in Rural Nowshera, Pakistan

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Abstract:
Objectives: *To assess the knowledge of health hazards of the dried animal's dung smoke, and the predisposing factors and precautions of Covid-19 among women age range 25-65 years of district Nowshera.*
And to measure the prevalence of Covid-19 in suspected women using and not using the stated biomass for cooking purposes.
Materials and Methods: *A cross-sectional study was conducted from April 2020 to March 2021 by the Department of Community Medicine, Women Medical College (WMC), Abbottabad.*
A total of 400 nonsmoker women (Study group 300 and Control group 100) having no history of diffusing capacity of the lungs for carbon monoxide (DLCO), having symptoms and polymerase chain reaction (PCR) test result of Covid-19 from three villages of district Nowshera were included.
Study populations used biomass at least for 05 years and Control populations did not use biomass for cooking purposes. Information from the participants were collected through a pre-designed/ pre-tested questionnaire. The data were analyzed through basic statistical methods.
Results:*Knowledge regarding adverse health effects of biomass smoke was found in below 20 % and predisposing factors/precautions of Covid-19 in below 11 % women respectively.*
Forty-nine (16.3 %) women in the study group had the infection of Corona virus and 11 (11 %) in the control group (p< 0.05). Besides, the Covid-19 infection was observed to have a positive correlation with the duration of exposure to biomass (r=0.96).
Conclusion: *The know-how of women of rural area of District Nowshera regarding the hazards of Biomass smoke, and Predisposing factors and precautions of Covid-19 was observed in less than 20 % women. Besides, the positive cases of Covid-19 were found more in the women exposed to Biomass smoke as compared to the Control group.*
Key Words: *Exposure to biomass, Covid-19 infection, Women of district Nowshera,*

I.   Introduction:
A large portion of the global population relies on exothermic biological sources for cooking and heating. About half of the world's population and 90% of rural communities in developing countries use biomass fuels to generate energy[1]. The Smoke that comes from the combustion of Biomass is a mixture of complex particles and gases that not only causes indoor air pollution, but is also harmful to human health, especially the lungs.

The stated smoke of biomass comprises a variety of pollutants, including suspendedarticulate matter (PM) and polycyclic organic matter (POM), which includes recognizedCarcinogens such as benzo[a]pyrene, as

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well as gaseous pollutants such as carbon monoxide and formaldehyde[2]. Early research has linked biomass fuel burning to anincrease in respiratory symptoms and lung function impairment in children and adults[3].

Women who cook for their families in rural communities are the most commonly affected; their health is harmed as a result of extended and repetitive exposure to these dangerous chemicals. According to several research studies, biomass smoke promotes respiratory ailments[4-6]. Chronic obstructive pulmonary disease (COPD), asthma, nasopharyngeal and laryngeal carcinoma, and susceptibility to pulmonary tuberculosis are among the major respiratory consequences connected to biomass fuels[7].

Covid-19 is a new pathogenic virus, identified in 2019 in Wuhan, China[8]. It is spread by dust particles and with close unsafe contact among the infected and healthy individuals. When virus-containing aerosols or droplets are breathed or come into direct contact with the mucus membrane of the eyes, nose, or mouth, a person may get infection. As humans have been infected first time with the variant of coronavirus, so there is no natural immunity acquired to it.

The key symptoms of the coronavirus infection are gastrointestinal disorders, dry cough, shortness of breath, and fever[9]. The infection can lead to pneumonia, severe acute respiratory syndrome, and even death in severe cases[9]. Old people, health workers, people with chronic lung disorders, heart disease, cancer, HIV positive, high blood pressure, and diabetes are predisposed and have a greater risk to the virus[9]. Physical distancing, wearing a mask, keeping rooms well aired, avoiding crowds, cleansing hands, and coughing into a bent elbow or tissue can all help to reduce the risk[9].

Yao observed the positive correlation between particulate matter and Covid-19 in the 49 cities of China[10]. Other scientists also described correlations between confirmed covid-19 new cases and air pollution in Milan, Italy[11]. A study documented that Tobacco users (cigarettes, water pipes, cigars, heated tobacco products) are more susceptible to Covid-19, because smoking entails touching contaminated fingers to the lips[12]. Particularly Shisha and hookah is typically an activity that takes place within the groups in public settings and increases the risk of transmission of diseases[12].

This evidence supports the link between smoke/air pollution and Covid-19, suggesting that biomass smoke may predispose to infection with the covid-19 virus[13]. Hence the current epidemiological study was designed to investigate the link between biomass (dry animal's dung) smoke exposure and COVID-19 among rural women of district Nowshera, Pakistan.

II.   Materials and Methods:

This cross-sectional study was conducted by the Department of Community Medicine, Women Medical College, Abbottabad from April 2020 to March 2021. A total of 400 suspected women (Study groups 300 and Control group 100) from three villages of district Nowshera were included in the study. All women were between age limits of 25 to 65 years and permanent residents of the area.

The study group had to have at least 01-hour daily exposure to biomass smoke over the previous 05 years, no past sickness that could alter the DLCO, and no history of self or family smoking. There was no history of biomass smoke exposure, no history of self or family smoking, and no history of a previous disease that could alter the DLCO in the control group. Those women who were not willing to participate in the study and were without symptoms of Covid-19/ the PCR result were excluded from the study.

The local ethical research committee of the WMC, Abbottabad, gave their approval to the project. The study's objectives were disclosed to the participants' family heads, who were assured of confidentiality.

A questionnaire was designed, pre-tested, and filled through trained survey volunteers. The questions asked were about demographic characteristics like age, family income, and education. The participants were also subjected to questions like duration and frequency of usage of biomass, and about hazards of biomass like cold, cough, and difficulty in breathing, asthma, pulmonary tuberculosis, headache, and eye disease.

They were also asked about Covid-19 preventative measures such as physical separation, using a mask, keeping rooms properly ventilated, avoiding crowds, hand washing, and coughing into a bent elbow or tissue and about symptoms of Covid-19 particularly gastrointestinal disorders, dry cough, shortness of breath, and fever and pneumonia. Information was also collected regarding pre-disposing factors i.e., people having more risk of the Covid-19 infection from the participants of the two groups.

The WHO calculator was used to compute the sample size. The calculated sample size was 381, which were rounded up to 400. DLCO was determined by Spirometer and considered normal[14] with forced expiratory volume in one second (FEV1) value greater than 80 %. The period of biomass smoke exposure was measured in years, and the biomass smoke exposure per day was measured in hours.

The completed data was entered into a statistical package for social sciences (SPSS) version 17 for statistical analysis by a skilled computer operator. The level of significance was set at 0.05, and frequency distribution tables were created with numbers and percentages.

III.   Results:

In this investigation, 400 women with suspected Covid-19 symptoms and a recent PCR test result were evaluated. Three hundred women of the Study group were using while 100 women of the Control group were not using the biomass for the cooking purposes. None of the women and their family members had a history of tobacco use.

The distribution of subjects by age is shown in Table-1. We got more suspected cases in the age ranges 45-54 and least in 25-34 age (comparatively young) groups. The duration of subjects using Biomass with the positive PCR cases is described in Table-2. The PCR test for Covid-19 was found positive in 49 (16.3 %) cases among the Study group and 11 (11 %) in the Control group (p< 0.05). A positive correlation (r=0.96) was observed between Covid-19 positive cases with the duration of exposure to biomass smoke.

Table-3 is about the education level, monthly income, symptoms of covid-19, and PCR positive cases of the participants. The educated women were found to have less infection of Covid-19 (r=0.41), while monthly income did not correlate with the infection of the said virus (r= -0.58). The gastrointestinal disorder was observed as the common and pneumonia was the least common symptom of covid-19 in our participants.

Seventy-nine (19.75 %) women were aware and 321 (80.25 %) were not aware of the health hazards of biomass smoke (p< 0.01). Besides, forty-three (10.75 %) women had and 357 (89.25 %) had no knowledge (p< 0.00 1) about the precautions for the prevention and predisposing factors of Covid-19 (Table-4).

Table 1: Distribution of subjects (age wise)

Age (Years)	Study group	Control group	Total
25-34	65 (75.58 %)	21 (24.42 %)	86 (21.50 %)
35-44	76 (74.51 %)	26 (25.49 %)	102 (25.50 %)
45-54	92 (70.77 %)	38 (29.23 %)	130 (32.50%)
55-64	67 (81.71 %)	15 (18.29 %)	82 (20.50 %)
Total	**300 (75 %)**	**100 (25 %)**	**400 (100 %)**

Table-2: Duration of Exposure to biomass smoke and Covid-19 positive cases (Study group)

Biomass use duration (Years)	Subjects (Number (%age) of women)	Infected cases
05-14	92 (30.7 %)	06 (06.5 %)
15-24	81 (27.0 %)	09 (11.1 %)
25-34	74 (24.7 %)	13 (17.6 %)
35+	53 (17.6 %)	21 (39.6 %)
Total	**300** (100 %)	**49 (16.3%)**

Table-3: Socio-demographic characteristics and Covid-19 positive cases

Education of the participants (N=400)	Number of women (% age)	PCR Positive cases
NIL	172 (43.00 %)	29 (16.9 %)
Primary	135 (33.75 %)	21 (15.5 %)
Secondary	64 (16.00 %)	08 (12.5 %)
Graduate	29 (07.25 %)	02 (06.9 %)
Monthly Income (PRK) of participants (N=400)		
5000-10000	194 (48.5 %)	29 (14.9 %)
10000-20000	148 (37.0%)	22 (14.9 %)
21000-30000	33 (08.2 %)	05 (15.1 %)
30000 and above	25 (06.3 %)	04 (16.0 %)
Symptoms of covid-19 and positive cases (N=60)		
Gastro-intestinal disorders	24 (40.0 %)	19 (79.2 %)
Dry cough	21 (35.0 %)	13 (61.9 %)
Shortness of breath	19 (31.7 %)	11 (57.9 %)
Fever	18 (30.0 %)	14 (77.8 %)
Pneumonia	06 (10.0 %)	03 (50.0 %)

Table-4: Knowledge of the Participants

Know-how about	Number of women	Percentage
Health Hazards of Biomass (N=79)		
Dangerous to Health	40	50.6 %
Eyes problem	31	39.2 %
Headache	25	31.6 %
Breathing disorders	22	27.8 %
Cold	20	25.3 %
Cough	16	20.3 %
Precautions of Covid-19 (N=43)		
Distancing	35	81.4 %
Wearing mask	32	74.4 %
Cleaning Hands	29	67.4 %
Avoiding Crowd	21	48.8 %
Coughing in Elbow	06	14.0 %
Predisposing factors of Covid-19 (N=43)		
Old People	20	46.5 %
Diabetes	19	44.2 %
Heart patients	18	41.9 %
Lung Disorders	16	37.2 %
Health workers	13	30.2 %
Hypertension	12	27.9 %

IV.   Discussion:

Many people have been shocked by the recent worldwide Corona virus disease-2019 (Covid-19) outbreak, which has resulted in a pandemic. The participants of our study had almost similar socio-economic status. The stated virus is, however, also terrible for many people in both high- and low-income countries[10]. On the other hand, people in the world's poorest locations, suffer substantial challenges in comparison to the rest of the population[10].

The current study's findings also demonstrated that participants' knowledge of the health risks of biomass usage, as well as precautions and predisposing factors for Covid-19. Because of the lack of knowledge, the populations face more difficulties and are ignorant of how to reduce the risk of infection. Even if someone knows, he/she doesn't have access to soap or running water and hence cannot avoid the things due to poverty and unavailability of the needed facilities.

The suspected cases in the age range 45-54 years were found more common (Table-1). The possible reason might be that at this age group, the women have a more social life and do not care about the precautions as needed in the infective environment. Besides, the elders are more vulnerable to viral infection as also mentioned by 20 women of our study (Table-4) when they were asked about predisposing factors of covid-19.

The women were using biomass from the last 05-14 years were observed comparatively more careful regarding their health and hence were found to have less infection of Covid-19. Similar findings were reported earlier[15]. Moreover, the pattern of the said viral infection as observed was increased with the duration of exposure to biomass smoke in the present study (r=0.96).

In the present attempt, more cases of Covid-19 were observed in the women exposed to biomass smoke as compared to the Control group (p< 0.05). The exact mechanism for the newly diagnosed virus is not clear but the infection rate seems to increase due to particulate matter of biomass smoke[15]. Long-term biomass smoke inhalation is known to generate chronic lung inflammation[16], a state that may encourage Covid-19 infection. Similar findings were found in prior research of people who used solid fuels for cooking and heating in their poorly ventilated houses[16].

According to some researchers, people who live in areas with high levels of pollution are more likely to acquire chronic respiratory diseases and are more sensitive to infectious agents[15]. Oxidative stress, which is created in reaction to air pollutants, is one of the potential pathways identified for the link between air pollution and respiratory illnesses[17]. Besides, in response to exposure to air pollution, the innate immune response may be suppressed, and the permeability of the pulmonary epithelium may be increased [17].

An early study[15] highlighted the link between exposure to smoking and Severe Acute Respiratory Syndrome coronavirus 1 (SARS-CoV-1), Middle East Respiratory Syndrome coronavirus (MERS-CoV), and Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). Infected people living in more polluted areas of China had a two-fold higher mortality rate than those living in less polluted areas[18]. Similarly, COVID-19 has a greater prevalence and fatality rate in Northern Italy, which could be explained in part by exposure to higher levels of air pollution[19].

The limitation of this study was observed in budgeting. This study was not funded by any governmental, private, or non-profit funding bodies. Lack of budget restricted the research to limited samplings and to 03 villages.

Since this is the preliminary data and further large-scale epidemiological studies can be undertaken at different parts of the country regarding the subject. The basic health knowledge of hazards of biomass smoke and precautions for prevention/predisposing factors of Covid-19 needs to be improved among the women. In addition, the women require an alternative source of fuel for cooking and vaccination against Covid-19.

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