

STUDY THE PUBLIC HEALTH IMPACT OF ZERO EMISSION ECO FRIENDLY INTEGRATED BIOMASS STOVE DEVELOPED FOR RURAL WOMEN –A RECENT SURVEY REPORT

Diana Padhi
Department of Public Health,
Sree Chitra Tirunal Institute for Medical Sciences & Technology,
Thiruvananthapuram, India 695011,
Email: dianapadhi@gmail.com

Debashree Padhi,
Department of Mechanical Engineering,
Konark Institute of Science & Technology,
Bhubaneswar, India 756150
Email: debashreepadhi@gmail.com

Payodhar Padhi
Department of Mechanical Engineering,
Konark Institute of Science & Technology,
Bhubaneswar, India 756150
E Mail: payodharpadhi@gmail.com

ABSTRACT

Combustion is the most common way of polluting our health and environment. In recent survey, we found that indoor pollution activities are polluting more compared to outdoor pollution. Indoor air pollution can also be considered as important risk factor for public health, report showing that the people spend more than 60% of their time indoors. Fifty percent of the world population and approximately 90% of the rural population in developing countries are using biomass as energy source. Besides this, women are getting affected from several chronic and heart diseases. Also their ageing process becomes earlier, problems like tanning and poor eyesight caused due to solid and harmful particles entering into their eyes. Due to unburnt particles, their lungs organ are getting affected. Further dark circles and wrinkles come at very early stage. Keeping in view these, a zero emission biomass stove for cooking especially for rural women was developed and have taken on trial for a period of six months in a village. Further a survey has been done to study its health impacts after and before the use of zero smoke biomass stove. Significant health improvements have been observed.

Key words: Combustion, Health, survey, zero emission

1. Introduction

Around 3 billion people worldwide rely on wood, wood stick, dung and leaves for cooking fuel. Burning biomass fuels on open atmosphere and in inefficient stoves, releases many harmful pollutants [1]. Household air pollution, due to cooking process using solid fuels, is the third leading risk factor for morbidity and mortality globally. As per public health report in 2010, 3.5 million deaths and 4.3% of global disability observed to household air pollution [2]. Pollutants coming out from inefficient cooking stoves due to incomplete combustion of solid fuels contribute to global climate change [3]. Solid biomass stoves currently remain the only widely available and affordable option in many regions of the world after gas and electric stoves. Recent observations of the negative impact of household air pollution on public health suggests that it is time to go for a critical and intensive surveys to inform decision-making on improved cook stoves. Correct and consistent use of improved cook stoves and proper arrangement of fuels in the cooking stove have the potential to improve public health, reduce deforestation, mitigate climate change and improve livelihoods. To obtain the information it is required to go for a standard survey. The Multiple Indicator Cluster Survey (MICS) and the Demographic and Health Survey (DHS) are two nationally-representative household surveys that have been widely used to collect data on health risks and outcomes since 1984 and 1995, respectively [7]. To date, surveys of this type have been conducted in nearly 190 countries. In this paper we have taken a short survey in one remote village where 35 families are residing. The survey was conducted before and after the use of zero emission cooking stoves. The zero smoke biomass stove was developed and patented by the authors. The stoves were distributed to the each family members in the village since more than six months. They were advised to do all the cooking activities using zero smoke biomass stove. The time difference of survey was estimated nearly 6 months. Then after six months the public health data was collected from each family and analyzed in this paper. Sample size of five families and the one woman from each family involved in cooking activities was taken in the survey.

Methods

2.1. Setting and Study population

The study was based in a village_Baigani of Odisha, India 359 inhabitants. It is a small village having 35 families situated near to Banki, a subdivision head quarter of Odisha. It is essentially a rural area; almost all population estimated is using biomass as a main cooking fuel. There is a mix of lower and middle socio-economic class families living within the community. The target population for our study was women as they have primary responsibility for cooking in the household. The Figure 1 shows the different health problems of some women dealing with traditional biomass cooking stoves.

Figure 1. Women involved in cooking with traditional biomass stove suffering from different diseases



(a) Eye infection



(b) Swollen glands



© Suffering from Cataract



(d) Breathing problem

Figure 2 (a) Traditional Biomass Coking Stove (b) Improved ie zero emission biomass cooking stoves Model I & II (c) Smokeless Biomass cooking stove Model III



(a) Traditional biomass stove



(b) Zero smoke biomass stove Model I & II



(c) Zero smoke biomass stove model III

1.2. Sampling

Women were identified from individual household. For our pilot study, a target sample of twenty women, five in each group, was set. Rural households were sampled from Biagani villages 3 km from Banki, a subdivision head quarter. All rural households were situated adjacent to each other. These houses were built out of mud and wood and did not have electricity or access to piped water. All participants in these villages were from subsistence farming households, representing the majority of the households in Odisha.

A questionnaire was designed specifically for the purpose of this study. Questions were divided into four sections; household circumstances, general health, awareness of cooking smoke causing illness and willingness to change cooking practices. These questions related to the size of the house, type of fuel most commonly used, profession of the husband or total house income.

In terms of reported health, we asked closed questions first to establish whether women linked indoor air pollution and disease. We then asked women to elaborate using open-ended questions. Preliminary questions were asked about general health before focusing on respiratory health. The open-ended questions were designed to allow women to describe their health problems in their own terms. Also we have taken the cost involved with the treatment. We assessed awareness of the problems caused by indoor cooking fume by asking whether the interviewees thought cooking smoke was detrimental to their health. They were then asked to elaborate, again using open-ended questions.

1. Results and Discussions:

Figure 1 shows the medical problems of some women who have already involved in cooking with traditional stoves using biomass more than 15 years. Table 1 shows the medical history of 5 women in five families involved in cooking continuously. The Table 1 also shows the diseases they are suffering and average expenses yearly. This includes transport cost, doctor fees and medicine cost. Figure 2 shows the traditional and zero emission biomass cooking stoves (patented) developed by authors and tested for zero emissions. The stoves are in market since more than one year. Table 2 gives the report after six months from the start of zero emission cooking stoves. It shows little bit improvements as the

time period is very less. More time is required to study intensively the impact of public health impact. Though time period is very less still there is a drastically reduction of doctor consultation. The more important is no eye etching since the starting of zero emission of stove.

Table 1. Survey Report of Medical History of five families' exposure to Traditional biomass cook stove (of five families).

Name of the Village-Baigani, Address- Panchayat—Anuary, P/s—Banki, Post Office—Barampura, District—Cuttack-754008, Odisha, India.			
House Number	Year of exposure to biomass smoke	Disease type	Yearly average Medical expanses (Doctor fees transportation cost Medicine cost)in rupees
11-21	30 years	Breathing problem Tumor	19,500.00
11-3	20 years	Pulmonary disease Gastric	10,000.00
11-28	10 years	Eye problem Breathing problem	4,600.00
12-13/2	12 years	COPD, Stroke Lungs problem	23,000,00
11-23/1	18 years	Eye problem T.B Lungs problem	9,700.00

Given the significant burden of disease and environmental impacts associated with cooking with traditional stoves and bio mass fuels, we have given more effort to identify indicators that will accelerate progress. Because adoption of zero emission cooking technologies is currently the primary requirements for large sectors of the population for which indicators are needed to effectively track changes in the ownership and use of select cooking technologies. More indicators on biomass fuel practices collection practices are essential to understand potentially damaging effects on public health improvement and the environment.

Table 2.Survey report of Medical history using Zero smoke bio mass stove after 6 month

House Number	6 months exposure of zero smoke biomass	Doctor consultation frequency	Medical expanses after six months In rupees
11-21	06	Two Times	600.00
11-3	06	Three Times	750.00
11-28	06	Once	250.00
12-13/2	06	Two Times	560.00
11-23/1	06	Four Times	890.00

The benefits and costs of any proposed indicator will need for careful consideration. We have not assessed the detailed survey needed for designing significant changes to national surveys, which may cause in changes to sampling schemes and the workload of interviewers. We recognize that economic constraints is major hindrance data collection and research would be needed to understand the time and resources required.

4 Conclusions

We have taken a pilot study as an important step in seeking to assess awareness of the affects of cooking fuel on health and willingness to change among women in Baigani village. Our recent development of zero smoke stove has a significance health-effects of indoor biomass cooking smoke which is the first step in India in implementing a programme to reduce exposure. Our findings have direct relevance for policy and practice, supporting implementation of a programme to increase accessibility and use of improved stoves in the area. Further research would help ensure an evidence-based approach and post-implementation evaluation of health and awareness would be vital.

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