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**INDOOR AIR POLLUTION: HEALTH HAZARDS AND TECHNIQUES TO REDUCE
THE HAZARDOUS EFFECTS**

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ABSTRACT

Industrial progress and ubiquitous technological adoption are major contributing factors to air pollution in developed countries. Air pollution is equally serious in rural and urban areas of our country. In rural India, majority of women use bio mass fuel (unprocessed fuel) for cooking and heating that causes lots of indoor pollution. Rural women heavily depend on fuel wood and bio mass fuels for cooking activity in which concomitant release of hazardous smoke is a major problem especially in poorly ventilated closed kitchen space. Women and children who spend major part of their time indoors are more prone to be affected by the smoke released by fuel wood burning. To reduce the harmful / hazardous effect of smoke, the intervention of improved technologies like smokeless stoves, domestic biogas plant, processed bio mass fuels (Charring and Briquetting) may be made available to rural parts in India.

Keywords:

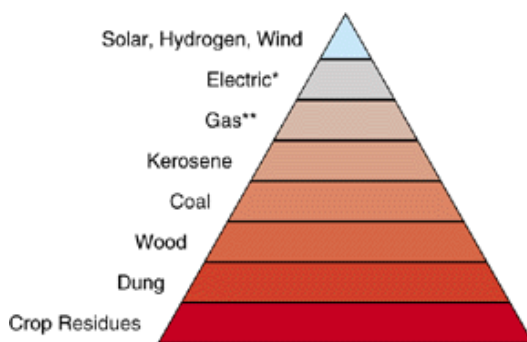
BMF (Bio Mass Fuel), Respiratory & Non respiratory infections / Diseases.

INTRODUCTION

India is fast growing economy in the world with 60% of population is living in rural areas and earning their livelihood from agricultural activities that contribute approximately 13.7% to the GDP. Energy is most essential to meet the industrial, agricultural and domestic needs. Around 40% of global population (approximately 3 million people) (Duncan et al 2008) is depending on BMFs to cater their domestic energy needs. Women population in India is mostly engaged in domestic activities viz. cooking and household chores. For cooking majority of rural women are still depending on un-processed bio mass fuel. Women get severely exposed to smoke emitted by burning bio mass fuel for cooking. So the health of women at the higher risk to getting various diseases by inhaling indoor pollution. 1.5 million Deaths are reported a year due to indoor air pollutions - mostly young children and women. Indoor air pollution results in eye inflammation, allergies, pulmonary disease, cardiovascular problems and various non respiratory ailments. Reducing the indoor air pollution is a national challenge. India is committed to provide clean energy to all in future. Many socioeconomic obstacles and inefficient household energy practices are the key challenges to meet this national goal. Various R&D agencies are involved to develop techniques to reduce the hazardous effects of indoor air pollution on human health.

What is Bio Mass Fuel? Why it is preferred fuel choice among rural women?

Agricultural & forestry wastes, wood, charcoal, cow dung and crop residues are bio mass fuels as it caters to the domestic energy needs in developing countries e.g. cooking, heating in rural parts where clean and modern energy is not available. In rural parts of India unprocessed BMF is very common fuel for domestic activities. Unprocessed BMF release smoke containing harmful pollutants including carbon monoxide, sulphur dioxide, nitrogen oxides etc. These pollutants are adding up the chances for respiratory and non-respiratory infections in poor women as they do not have access to clean energy and depending on dried animal dung, crop residues and agricultural wastes for domestic energy needs. These BMFs are at the bottom of the energy ladder (WHO 2006) also considered less efficient fuels while fuel wood, charcoal and kerosene make the higher level at the energy ladder and considered as more efficient fuels. One among the many factors responsible for household's fuel choice is cost and accessibility of fuel (Masera et. al. 2000). This is major reason among rural masses prefer bio mass fuel for cooking and are more prone to suffer its adverse effects on health.



Source : <http://www.burningissues.org/energy-ladder.htm>

HAZARDOUS EFFECTS OF BMF

Respiratory Infections / Diseases

Indoor pollution is major contributing factor to pulmonary ailments which leads to may fatal diseases. The smoke emission from BMFs contains harmful elements which adversely affects the human health. Women are more vulnerable to suffer pulmonary ailments as the cooking is mostly performed by them. Passive inhalers (children) are also at higher risk of pulmonary diseases. Most common pulmonary diseases among rural dwellers are bronchitis and asthma (Babak Amra 2003; Sram R.J. et al 2005) air pollution increase the chance of these diseases in rural women and children as they are more exposed to smoke emitted while cooking.

International Agency for Research on Cancer (IARC 2010) classified the emission from bio mass fuels specially coal as carcinogenic group I and fuel wood as group II. These carcinogenic constituents present in smoke increase the chance of lung cancer. Studies have found good correlation between indoor air pollution and lung cancer (Behera et al 2005).

Pollutants present in bio mass fuel causing acute respiratory infection in women and children as they are more exposed to indoor pollution. Tuberculosis is widely prevalent in rural population. Indoor pollution enhances the risk of tuberculosis (Babak Amra 2002).

Non Respiratory Infections / Diseases

Non respiratory infections are also caused by indoor pollution. Eyes are very vulnerable to suffer the pollutants present in the smoke. Inflammation and irritation apart the chances of getting cataract also increase with the exposure of smoke (Amod et al 2005). Suspended particles and dust present in the smoke damage the cornea and diminish the vision leading to blindness if not treated timely. Though cataract develops with increasing age but there are evidences of cataract in early age as an outcome of exposure to smoke. (Amod K Pokhrel et al). Women living in households that use biomass cooking fuels, have much higher prevalence of both partial and complete blindness (NFHS Bulletin No. 13-14) than women living in households that use cleaner fuels. Among women age 30 and older, 17% of partial blindness and 20% of complete blindness can be attributed to cooking smoke from biomass fuels.

Among various adverse health effects of BMFs lower birth weight of newly borne babies is also noticed. It is observed the women with regular exposure to smoke during pregnancy delivers the babies with lower weights than the normal birth weights. (Boy et al 2002) But if the fuel wood is used in open space by pregnant women then the babies' weight at the time of birth is average compared with the babies delivered by mothers using clean fuels.

Mal nutrition is very common phenomena in developing countries. Malnutrition may be one of the major reasons of nutritional deficiency. Among various factors nutritional deficiency is directly linked to the quality of food and awareness about its nutritive value. Many studies reported the nutritional deficiency in rural population as they lack the nutritious food and awareness about its nutritive value / importance. Studies have the evidence of chronic anaemia and slower growth among children exposed to bio mass fuel (Mishra et al 2007).

TECHNIQUES TO REDUCE THE SMOKE / HAZARDOUS EFFECTS OF BMF

Improved stove

The improved stove was developed under the Agri. Energy & Power (AEP) Division of CIAE during 982-84. The stove outer body is insulated by glass-wool to minimize heat loss. This stove utilizes briquetted charcoal that emits less smoke.

Smokeless chullah

The smokeless chullah was developed keeping in mind the traditional chullah being used by the rural household. With slight modification of the traditional chullah a chimney was attached that takes the smoke out of the house due to up-draught. Cool air enters the chullah and hot air with smoke goes up out of the house.

Charring and briquetting technology

More than 500 million tonnes of agricultural wastes and stalk materials are available annually that can be converted into charr by a clearing kiln. A portable charring kiln has been developed by CIAE that converts agricultural wastes into charr. The charr is mixed to cow-dung (25%), soil (25%) and water (25%) then converted into briquettes by a manual briquetting machine or commercial briquetting machine. The briquettes produced are suitable for use in the improved stove. About 500 g briquettes are loaded in the stove that burn for about an hour. Less smoke emits from the briquettes.

Bio-gas plant

Domestic and community bio-gas plants can be used in the rural areas for supply of bio-gas for cooking, water heating and running engine. Both floating dome and fixed dome type bio-gas plant designs are now available and government subsidy is also available for installing the plants. By

using bio-gas rural women are relieved of smoke problem. The digested slurry from the plant can be directly used as manure.

Solar cooker

Box type solar cookers with reflectors developed by several organizations including CIAE are now commercially available in the market. Black coated boxes in the cooker absorb solar radiation and temperature rises to about 1000 C and more. Rice, dal, vegetables etc may be cooked easily with solar cooker.

CONCLUSION AND RECOMMENDATIONS

A large population world over is depending on bio mass fuels and prone to suffer the health problems. Introducing the improved cooking technology can control the indoor air pollution to great extent and reduce the hazardous effects of bio mass fuel smoke substantially. Due to poor availability of modern gadgets, fuel and dependable energy source, the farm women in remote villages of the country still struggle to cook food with fuel wood and inhale smoke causing health hazard for self and the children.

The modern and appropriate technology developed by research organizations can reduce the health problems of rural women caused by smoke while cooking and water heating. The technologies described can reduce the problems of rural households as well as reduce the environmental pollution and global warming.

While utilizing the agricultural waste as fuel, efforts should also be made to promote energy plantation around the farm land and household. Efforts are needed from the government to create awareness for using the green energy and save the planet.

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