



## Comparative analysis of indoor air quality in Nabha and Zirakpur Punjab, India

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### ABSTRACT

According to World Health Organization (WHO, 2012) indoor smoke from solid fuels ranked as one of the top ten risk factors for the global burden of disease, accounting for 4.3 million premature deaths each year. So, a study was conducted at Zirakpur and Nabha in Punjab (India). Zirakpur is considered as an urban area while Nabha is a rural place. A comparison was made in terms of awareness, raw materials used for cooking purposes, impact on health etc. For this study a total of 50 respondents were taken and statistically analyzed, which revealed that 96% respondents in rural area used chulah while 100% urban residents used gas cylinders. Rural residents mostly used wood and cow dung as fuel while LPG was used by the urban residents. Rural residents were found to be more susceptible to many diseases in comparison to urban. The investigation revealed that respondents from rural area were less aware about the air pollution as compared to urban residents.

**Key words:** Indoor Air Quality, Air Pollution, Pollution Borne Diseases

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## INTRODUCTION

According to WHO (2010) the quality of air inside houses, public buildings, where residents spend a large part of their life time, is an essential determinant of healthy life and well-being. Globally, almost 3 billion people rely on biomass (wood, charcoal, crop residues and dung) and coal as their primary source of domestic energy.<sup>1</sup> Biomass accounts for more than one-half of the domestic energy requirement in many developing countries.

Exposure to indoor air pollution (IAP) due to combustion of solid fuels is an important cause of morbidity and mortality in developing countries.<sup>2</sup> Globally, indoor air pollution caused by the usage of solid fuel is responsible for 1.6 million deaths due to pneumonia, chronic respiratory disease and lung cancer etc. In developing countries, indoor smoke is responsible for an estimated 3.7% of the overall disease burden, making it the most lethal killer after malnutrition, unsafe sex and lack of safe water and sanitation.<sup>3</sup> In rural areas, unlike urban areas, chullah is mainly used for cooking purposes, which increases the chances of indoor air pollution in the area.

### Rationale of the study

Air pollution, particularly indoor air pollution being a critical issue plays pivotal role in deteriorating health of the people and burning of fossil fuels and biomass adversely affects health of the people. So, considering the importance of the fact, the present study entitled “**Comparative analysis of indoor air quality in Nabha and Zirakpur(Punjab- India)**” was undertaken at *Mohali* district of Punjab with Nabha (rural area) and Zirakpur (urban area) as the study locations.

Main objectives behind the investigation were as follows:

- To know perception of respondents about the air pollution.
- To make a comparison between urban (Zirakpur) and rural (Nabha) areas in terms of Air Quality.

- To find out the difference in the fuels used for cooking purposes by urban and rural residents.
- To study the relation between health of the residents and air pollution.

## MATERIALS AND METHODS

Semi structured interview schedule was employed to gain qualitative insights that endeavored to provide an in-depth holistic understanding about indoor air quality and thereafter to compare the knowledge and awareness about air pollution and its laws among the rural and urban residents. The total sample size considered using purposive sampling technique for study was 50 residents which in turn consisted of 25 rural and 25 urban residents in Punjab with prime focus on women residents.

## RESULTS AND DISCUSSION

### Socio- Economic profile

Majority of the respondents were less than 35 years old in both urban and rural areas and were homemakers. In urban area, there was no respondent from lower income group and 24% were from upper income group. Whereas in rural area 28% respondents were from lower income group but no participation was there from upper income group. Such a response could be due to the fact that residents in urban area have more opportunities of employment as compared to rural area. Even as per NSO (1999-2000) there is a huge gap between urban & rural parts of India in terms of per capita income as for urban it was Rs. 19, 407 in 1999-2000 and for rural it was Rs. 9, 841. In the analysis it was found that more than half of the respondents (68%) were illiterate in rural areas whereas each respondent from urban areas was literate and only 16% of the respondents had been exposed to primary education in the rural area. It was revealed that no respondent was exposed to higher education in rural area, while in urban areas about 80% respondents studied upto higher education.



In urban area (Zirakpur) because of greater advancement and sound financial conditions good facilities and schools were found to be available as compared to the rural area (Nabha). Better employment leads to better financial conditions and greater opportunities for getting educated thus urban residents were found to be more educated. According to 2001, Census of India, only 3.4% rural residents have graduated or above as compared to the 13.2% of the urban residents<sup>4</sup>. In the present study it was found that in urban area 100% residents were literate and living in *pakkahouses* while more than half of the respondents were living in semi-*pakkahouses* in rural area, which may be

due to the poor financial conditions and low availability of job opportunities.

The type of house is also an indicator of the economic development. According to NFHS Survey, houses made from mud, thatch or other low-quality materials are called *kachhahouses*; houses that use partly low-quality and partly high-quality materials are semi-*pakka* houses, and houses made with high quality materials throughout, including the floor, roof and exterior walls are called *Pakka* houses.<sup>5</sup>

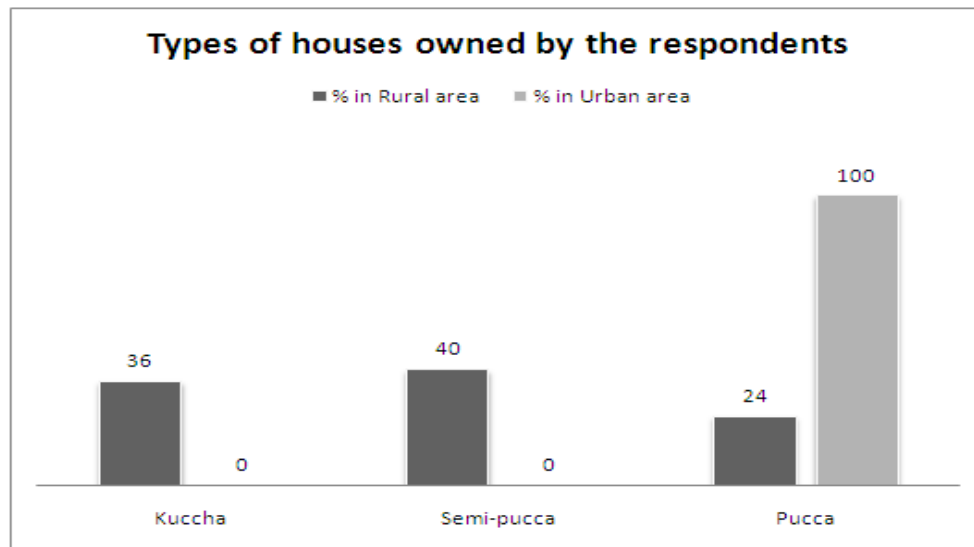


Figure 1. Type of houses owned by respondents

#### Nature of fuels used:

There is clear difference in cooking practices between rural and urban area. Rural dwellers rely more on cow-dung and wood for cooking as compared to the high quality fuel such as charcoal, LPG (Liquefied Petroleum Gas) etc.<sup>6</sup>

In urban area, only gas cylinders (100%) were used by respondents, it may be because of the advancement in technology and better employment facilities & good financial condition available to urban residents. While in

rural areas women cook food on chullahs as it is a cheap and easy medium of cooking which requires wood and cow dung, majority of residents in rural area were using these two materials extensively (shown in table 1) and were reluctant to change to gas cylinders leading to increase in indoor air pollution. In rural area since residents majorly used chullah they have very mild (8%) knowledge regarding the Pipelined Natural Gas (P.N.G.) in comparison to the well aware residents of urban areas (84%). P.N.G. refers to the Pipeline



Natural Gas in which gas is transported through pipes to the areas of natural gas demand.

**Table 1. Raw material of cooking fuel used by the respondents**

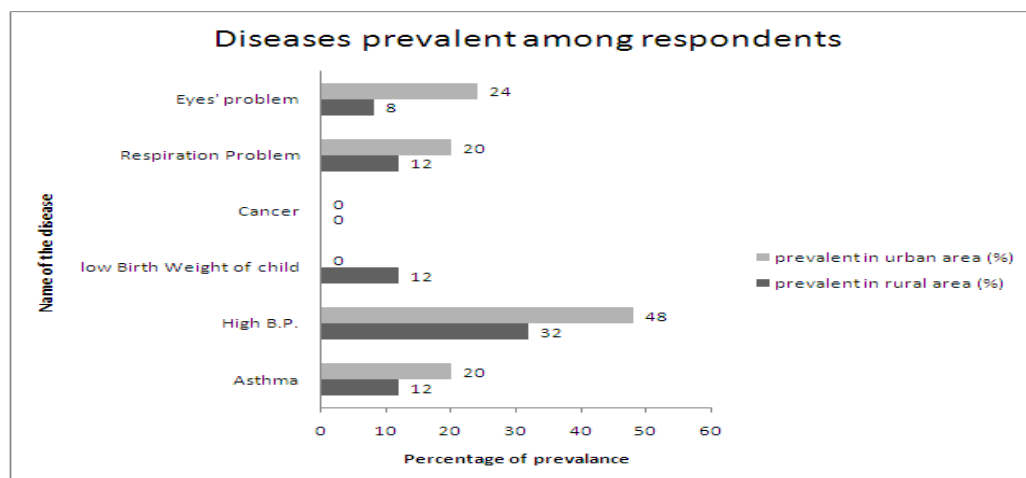
Raw material of cooking fuel used by the respondents		
Percentage of usage by Urban residents	Percentage of usage by Rural residents	Name of the Material
0	92	Wood
0	76	Cow- dung
100	24	Gas Cylinder

Educated residents prefer cleaner fuel for cooking whereas residents with no knowledge in this regard prefer solid fuels and traditional fuel which includes coal/lignite, charcoal, wood, straw/shrubs/grass, agricultural crop waste and dung cakes. In the studied rural area where chullah is mostly used by the residents only 12 % of the studied residents had chimney and the rest 88% residents were cooking food without chimney. In the studied urban area where gas cylinders were extensively used by residents, 64% residents had chimney in their houses. Chimneys help in navigating the gases at higher atmosphere; they are mostly used in urban areas as compared to the rural areas.<sup>6</sup>

### Impact on Health

Both urban and rural areas contribute in polluting air quality in different ways. In rural area (Nabha), chullah was used for cooking which uses biomass fuel. Biomass fuel on combustion releases gases like SO<sub>2</sub>, CO,

NO<sub>2</sub> and other volatile components which on inhalation can cause severe fatal diseases like cancer, acute respiratory infections etc. In the present study it was found that female in rural area (44%) were more susceptible to diseases as compared to the men, as women are most exposed to chullahs while cooking. Rural residents have very low awareness about the harmful effects of chullah as compared to the urban residents (80%). Rural residents are more susceptible to diseases (as seen in figure 2) because of chullah, 12% of the studied residents were found to be suffering from Asthma, 32% from High B.P. and 12% from the low weight of the child. The low birth weight of child occurs due to the inhalation of harmful gases during pregnancy, which may lead to death of the child.





**Figure 2. Disease prevalent among the respondents**

Respiratory infections contribute to 10.9% of the total burden of diseases, which may be due to the both, presence of communicable diseases as well as high air pollution levels.<sup>7</sup> So, it was important to know whether the respondents were well aware or not about this particular problem. The smoke of chullah emits poisonous and harmful gases like sulphur dioxide which causes respiratory problems like asthma etc.

The prevalence of cancer is about 4.1% amongst all the diseases indicating that the effects of air pollutions are visualized on the urban population.<sup>8</sup> It was reported that biomass smoke exposure enhanced the instances of bronchial asthma.<sup>9</sup> Physician-diagnosed asthma was recorded in 6.6% of biomass using women against 4.5% in LPG users. Likewise, medically-diagnosed asthma was present in 6.7% children from biomass using households while 3.9% of children from LPG using families had this problem.

It also revealed that cumulative exposures to biomass smoke were associated with greater prevalence of respiratory symptoms, suggesting underlying respiratory illness.<sup>9</sup> As it is evident from the study that in both the Urban (Zirakpur) and rural (Nabha) areas, woman were found to be more prone to the illness in comparison to men.

In rural area, 44% women were found to be prone to illness, it may be due to the raw materials (wood, Cow-dung) used in chullah. Women and young children, often carried on their mother's back, tend to be most exposed to smoke from solid fuel combustion because of women's nearly universal role as household cook and caregiver.<sup>6</sup> In the studied rural area (16%) residents have low access to doctors because of the poor medical facilities available as compared to the studied urban area (48%), rural residents were found to be dependent

mostly on home remedies (28%) or Vaidya (32%) as compared to the urban residents.

#### **Cognizance about Air pollution:**

It was important to know whether the respondents in rural as well as urban areas were aware of the air quality they live in i.e., indoor as well as outdoor. So this question was put in front of the respondents and was found that rural (Nabha) residents were less aware (12%) about the air pollution as compared to the urban (Zirakpur) residents (60%). The reasons for it may be due to the low literacy rate among rural residents. Thus rural residents were unaware about the major destruction caused by chullah.

The indoor air pollution can be reduced by the use of clean fuels like LPG or P.N.G. (Pipeline Natural Gas). In rural areas residents had low awareness about P.N.G. But interestingly, majority (72%) of them were willing to use it while 28% of the rural residents were unwilling to use P.N.G. The main reason has linked to the belief that use of pipe for transportation of gas is risky and may lead to a fatal accident. Rural and urban both had some knowledge regarding the air pollution laws, but urban residents (20%) were still willing to have some change in air pollution laws as compared to the rural residents. Banning of plastics, use of more solar energy and compulsory use of chimneys by all the factories, use of cycles, carpooling were few suggestions given by the respondents.

The ban on plastics has been initiated on 1<sup>st</sup> May 2011 under the Punjab Plastic Bags Control Act, prohibiting the manufacturing, disposal and usage of polythene of thickness no less than 30 micron and size not less than 8x12 inches and colour other than specific colours.<sup>10</sup> Knowledge regarding laws about air pollution is important in abating the air pollution level. Rural residents as compared to the urban residents were unaware about air pollution and



its laws. Only 20% residents from urban area wanted any modifications in the laws of air pollution.

## CONCLUSION

The results of the study leads to infer that residents in the studied urban (Zirakpur) area got more opportunities of employment, income sources, schooling of their children as compared to the studied rural (Nabha) area. 80% of the urban respondents were found to be literate which is much higher than the % literacy of rural respondents, it explains the economic development also. The availability of economic options and job availability were also found to be linked to nature of dwelling as well. In the current study it was observed that unlike urban area where 100% residents were found to be living in *pakkahouses*, more than half of the respondents in rural area were living in semi-*pakkahouses*. As reported by the studies done in this domain and in this study as well, a clear difference in cooking practices between rural and urban dwellers were found. The rural residents rely more on cow-dung and wood for cooking purposes whereas urban dwellers use only gas cylinders because of the advancement in economic well-being. It was also inferred that in rural areas residents have very little knowledge regarding the Pipelined Natural Gas in comparison to the residents of urban areas. The low level of awareness leads them to cook food on chullahs, as it is a cheap and easy medium of cooking and were reluctant to change to gas cylinders. This behavioral aspect coupled with economic and educational reasons have been found to prevailing increase in indoor air pollution. As consequence it was found that rural residents were found to be more susceptible to diseases caused by indoor air pollution as compared to the urban residents at same time poor medical facilities were available to rural areas as compared to urban areas. It was also observed that the studied rural (Nabha) residents depend mostly on home remedies and Vaidyafor curing medical problems as compared to the studied urban residents. Rural residents were found to

be less aware in comparison the urban residents in regard to air pollution and related laws. It was found that urban residents were willing to have some change in air pollution laws. Banning of plastics, use of more solar energy and compulsory use of chimneys by all the factories, use of cycles, carpooling were few suggestions given by the urban (Zirakpur) respondents.

## REFERENCES

1. World Health organization (WHO).(2010). Indoor Air Pollution and Health. Retrieved 2014, March 29 from <http://www.who.int/mediacentre/factsheets/fs292/en/print.html> 24/.
2. Ezzati, M. and Kammen, M.D. (2002). The health impacts of exposure to indoor air pollution from solid fuels in developing countries: knowledge, gaps, and data needs, Research Gate. Retrieved 2014, March 29 from [http://www.researchgate.net/publication/11049229\\_The\\_health\\_impacts\\_of\\_exposure\\_to\\_indoor\\_air\\_pollution\\_from\\_solid\\_fuels\\_in\\_developing\\_countries\\_knowledge\\_gaps\\_and\\_data\\_needs](http://www.researchgate.net/publication/11049229_The_health_impacts_of_exposure_to_indoor_air_pollution_from_solid_fuels_in_developing_countries_knowledge_gaps_and_data_needs)
3. World health organization (WHO).(2005). Indoor air pollution and health.Fact sheet N°292. Retrieved 2014, March 29 from [http://www.cetesb.sp.gov.br/userfiles/file/laboratorios/fiea/poluicao\\_do\\_ar\\_ingles.pdf](http://www.cetesb.sp.gov.br/userfiles/file/laboratorios/fiea/poluicao_do_ar_ingles.pdf)
4. Government of India.(2001). eCENSUSIndia.GoI, Ministry of Home Affairs, 2001:1. Retrieved 2014, March 29 from [http://censusindia.gov.in/Census\\_Data\\_2001/Census\\_Newsletters/Newsletter\\_Links/News\\_Issue\\_no\\_1.htm](http://censusindia.gov.in/Census_Data_2001/Census_Newsletters/Newsletter_Links/News_Issue_no_1.htm)
5. National Family Health Survey-3 (NFHS). (2006). MCH and Family Planning: India 2006. International Institute for Population Sciences, Mumbai
6. Smith, K.R. and Bruce, N. G. (2011). Solid fuel use: health effect. *Encyclopedia of Environmental Health*, 5: 150-161. Retrieved 2014, March 29 from <http://www.ehs.sph.berkeley.edu/krs>



- mith/publications/2011/SoldFuel Health  
EncycEH.pdf
7. Central Pollution Control Board (CPCB). (2000). 'Polluting industries'. *Pariveshnewsletter*, Delhi
  8. World Bank. (1993). *World Development report: investing in health*. Washington, DC: The World Bank, Oxford University Press. 329 pp. Retrieved 2014, March 29 from [http://envfor.nic.in/soer/2001/ind\\_air.pdf](http://envfor.nic.in/soer/2001/ind_air.pdf)
  9. Lahiri, T., Roy, S., Basu, C., Ganguly, S., Ray, M.R. and Lahiri, P. (2000). Air pollution in Calcutta elicits adverse pulmonary reaction in children. *Ind J Med Res*, 112: 21-26
  10. .The Financial Express. (2014). Punjab bans on plastic bags from May 1. *The Financial Express: e- paper*, 2014, May 4. Retrieved 2014, March 29 from <http://www.financialexpress.com/news/punjab-bans-on-plastic-bags-from-may-1/776827>
  11. World health organization (WHO).(2012). Household air pollution and health.Fact sheet N°292. Retrieved 2014, March 29 from <http://www.who.int/mediacentre/factsheet/fs292/en/>