Perspectives on Women’s Health in the Purview of Delhi’s Air Pollution

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Introduction

The couplet (Varma, 2008)¹ written by the nineteenth century Urdu poet Mirza Ghalib (1797-1869) is a figurative expression of his helplessness about how he had to work in Delhi (the capital city of India) under an oppressive British Raj.

‘My struggle is the same, as do captive birds engage,
Collecting twigs to build a nest, even in their cage’.

Reflecting upon these lines here is not a mere coincidence. They resonate even today, wherein people of Delhi are still captivated. The difference, this time, is only that we have created an enemy for ourselves. The enemy is the toxic air of the city in which millions of people breathe and sustain their livelihoods. The five elements of the cosmos-the air, earth, fire, sky and water were readily available for our disposal. However, we humans have misused it for millions of years. Today, in countries like China and Japan, we can see advertisements saying ‘Oxygen for Sale’. We have not only polluted the air but have also started to trade it. Our tryst with the abysmal air of Delhi began in the 1990s and still persists. Ecofeminists like Vandana Shiva (Shiva, 1988)² and Carolyn Merchant (Merchant, 1996)³ in their work have explained that traditionally women were associated with nature. Symbols like rivers, earth, trees were associated with feminine qualities whereas men were associated with culture. The tussle between culture and nature is nothing but societal norms created due to patriarchy. Their argument establishes the closer relationship shared by women with the pollution in the environment. In developing countries like India, Indonesia, Jordan, Egypt, among others, women are oppressed based on their caste, class, colour and gender.

Integrated exposure to indoor and outdoor air pollution has emerged as a major cause of premature deaths in India, making women dually exposed to air pollutants. To mitigate indoor air pollution in particular, the Central Government came up with a welfare scheme called the Pradhan Mantri Ujjwala Yojana (PMUY). The primary objective is to provide gas connections to Below Poverty Line (BPL) families that will ensure universal coverage of clean cooking gas. Only an adult woman belonging to a poor household would be an eligible beneficiary under the scheme. For verification, documents like permanent address proof, Aadhar card number, Jan Dhan/ bank account number, utility bills, etc. are required.

A number of studies over the years have reported the prevalence of acute respiratory diseases, asthma in vulnerable age groups, cardiovascular morbidity due to exposure to Particulate Matter (PM) and other pollutants in Indian metropolitan cities (Special Report 21, 2018)⁴. Dr. Praveen Agarwal, a Chest Expert from the Department of Emergency Medicine, All India Institute of Medical Sciences (AIIMS), Delhi raises concerns about neonates facing complications like low birth weight, immature or reduced lung function, premature delivery, etc., due to air pollution.

Despite that Delhi’s pollution levels are in the moderate (101-200) to severe (>401) category, the sources of air pollution stand significant in fueling the city's economy. While at the same time, as high pollution levels persist in the period from 2015 to present, it is taking shape as a central public health issue with repercussions on the quality of life and economy (CEH, 2017)⁵.

Dr. Agarwal observed an approximately 10 percent increase in cases of respiratory diseases directly attributable to air pollution, mostly during the winter season. Dr. Garima Kachhawah, a gynaecologist believes...
that, ‘living in Delhi is almost like living in a gas chamber’. The native people of Delhi have now accustomed themselves to this lifestyle.

India bears an estimated one million deaths and approximately 9.8 hundred thousand premature births each year due to air pollution (Greenpeace Southeast Asia, 2020)\(^6\). Furthermore, it is a fact that years of life lost (YLLs) in a developing country can be owed to a number of causes. By 2016, the accounted percentage of total YLLs (Cropper, et al, 1994)\(^7\) due to premature mortality had a predominance of cardiovascular diseases, chest infections, neonatal disorders and birth complications besides other causes. Child and maternal malnutrition (12.9 percent) and air pollution (7 percent) ranked among the top five risk factors of Disability-Adjusted Life Years (DALYs) in Delhi (IHME, 2017)\(^8\). The data suggests malnutrition and air pollution as independent risk factors. However, the interdependence of these risk factors would become a challenge to the enormous developmental efforts in public health that ensued in the preceding years. Therefore, it is inevitable that an epidemiological transition in the disease burden profile for the city would shift in favour of air pollution, as a central cause of disease and death burden over the coming years.

‘Beat the Air Pollution’ was the theme for the 2019 World Environment Day organised by the UNO. ‘My message to governments is clear: tax pollution; end fossil fuel subsidies; and stop building new coal plants. We need a green economy not a grey economy,’ a statement made by António Guterres, the UNSG. In the same year, the Delhi Declaration of UNCCD was conducted and one of the primary objectives was to ensure gender balance, engagement of youth and securing of land rights. This reflects that pollution has crossed geo-political boundaries and each one of us need to stand in solidarity to resolve this issue.

Relevance of the Study

A key relevance of the study lies in bringing forth the perspectives of women. Relative human cognitive progress is emphasised instead of focusing merely on standardised quantitative data. Sandra Harding in her book 'Feminism and Methodology: Social Science Issues' published in 1988, argues for the importance of women's experiences while refuting the false supposition that using women's experiences rather than men's as an empirical and theoretical resource espouses relativism.

Generally, it is seen that invisible work (household work) performed by women is taken for granted and often comes at the cost of their health (like women using chulha for cooking as a daily chore), as compared to the visible work (paid work) done by women. They face mental and physical abuse when at times, they fail to fulfill their duties. ‘Overburdened with unhealthfulness’ correctly explains these unfortunate circumstances. Our study here becomes crucial in that women’s narratives are documented, which often go unnoticed.

The empirical and qualitative study would act as evidence for policymakers to plan a sustainable course of action that would be sensitive to women’s health vis-à-vis environmental pollution. There is an importance of maintaining proper records of data by the health centres for the purpose of conducting research studies on health complications arising from the pollution. Without the availability of scientific studies regarding the impact of air pollution on women’s health, the impediments to women empowerment through improvement of their health would be difficult to address.

The case study of Beijing has demonstrated that grassroots mobilisation with women’s inclusion can be effective similarly for Delhi, considering the demographic similarities. This research would suggest relevant practices and remedies that would enhance the engagement of individuals in responding to this life threatening enemy.

Our research strengthens and voices the ideas of those feminists who have dedicated their lives in bringing these issues to the forefront.
Research Methodology

This is an observational study which brought to light a decline in the air quality since 2015. An empirical and cross-sectional study was conducted from October 2019 to February 2020. Detailed mapping of authorised colonies and (un)authorised slums was conducted for selection of samples for preliminary survey in Badarpur and Jor Bagh. The areas were selected based on their poor air quality and their respective demographic profiles.

Pre-testing took place on 19 December 2019. It was done among seven unauthorised and four authorised households which helped researchers to get acquainted with life in slums and come up with the relevant research questions. The first phase field visit commenced on 25 December 2019 with a semi-structured questionnaire prepared in Hindi and English. The fieldwork was conducted in the select authorised colonies of Phase-1 and unauthorised areas of Phase-2 of Gautampuri in Molarband-Badarpur. In the second phase, the field was revisited on 04 January 2020 to see the scenario during extreme cold. More urban residents were interviewed from across different districts and their narratives were taken in the next phase. In the following phase, an extensive field survey was undertaken in slum clusters consisting both an authorised and unauthorised squatter in Jor Bagh on 06 January 2020. We also visited AIIMS and Lady Hardinge Hospital in the first week of January. In the fifth phase, we interacted with key-informants like Pradhan (village head), Accredited Social Health Activists (ASHAs), long term residents, welfare workers, academicians and recorded the comments and relevant information. In the last phase (11-28 February 2020) the two colonies (Bihari Camp, Phase 2) were visited again to monitor presence of cross ventilation in households, availability of licensed gas agencies, nearby plant-nurseries and cleanliness. The purpose was to make people aware about the impact of firewood burning activities on health and mobilise them to use indoor plants at home and workplace. Plant saplings were also distributed.

In-depth semi-structured interviews were conducted with pregnant and non-pregnant females of different income brackets, local residents, gynaecologist, chest specialist, ASHA workers and a dietitian. A welfare worker of the area accompanied and introduced us to the respondents and also facilitated in building rapport with the females’ in-laws and husbands. Before beginning the interview, we shared a brief overview of our study, stated our purpose and obtained consent from each respondent. It took us 15-20 minutes to interview each individual respondent.

We performed an analysis of a relevant government welfare policy PMUY, qualitatively and through field visits to obtain the ground report and prepare policy feedback and assessments.

In addition, a comparative analysis of Beijing with Delhi was done with the aim of deriving valuable lessons.

Qualitative analysis involves review of primary sources (such as eligible reports) and uses secondary data to understand people's opinions and beliefs about the issue. It includes analysis of peer-reviewed journal articles, books and online sources.

Review of Literature

Delhi is a culturally and geographically diverse cosmopolitan city. It will overtake Tokyo as the most densely populated major city by 2028, and the world could have 43 megacities, most of them located in developing nations, by 2030. (WEF, 2018). A rise in industrialisation, increase in the use of synthetic chemicals and repeated exposure to hazardous compounds adversely affects health. In some cases, women are at a greater risk than men, especially with the rise in environmental synthetic estrogens which affects hormones and disturbs the body's metabolism. Of the components of air pollution, PM seems to be the most harmful to human health (Krewski and Rainham, 2007). The size and the elemental composition of PM is directly linked to adverse health effects (Dreher et al., 1997). Environmental pollution was shown to affect reproductive functions; in particular, adverse effects on pregnancy outcomes, fertility, and foetal health were reported (Glinianaia et al., 2004). We have evaluated 25 studies that demonstrate the potential effect of air pollutants on female reproduction. Siddharth Singh in his recent book has mentioned that pregnant women are vulnerable as pollution has been known to cause foetal growth
problems, low birth weight and increased mortality. CO can enter the body of pregnant women and prevent adequate oxygen from reaching the foetus (Singh, 2018).

In her work ‘Gender and Green Governance: The political economy of women’s presence within and beyond community forestry’, Bina Agarwal makes some excellent observations about the condition of rural women in the Indian context (Agarwal, 2010). Her analysis begins with mentioning about rural women as the ‘main gatherers of firewood for cooking and heating’; she then asserts that rural women’s dependence on community resources is greater than men’s because they have lesser access to private resources.

The State of Global Air, India 2019 report estimated 1.2 million human deaths due to air pollution in India. Neonates are considered as highly susceptible due to an immature immune system and greater rate of respiration. By inhaling toxic air, through the placenta, foetus can develop a mutational effect. Furthermore, the book ‘The Air Pollution and Health Effects’ examines the placenta which has been exposed to toxic air, and the results confirm morphological changes (Nadadur & Hollingsworth et al., 2015).

It was observed in Taiwan that postmenopausal women living near high vehicle-traffic areas are more prone to develop breast cancer. Individuals who resided in municipalities with higher PM2.5 levels were at a significantly increased risk of death from cancers of mouth, lung, breast, liver, bladder, kidney, prostate and ovary. From 2012 to 2016, the worst air quality was noted in areas such as Yunlin and Chiayi counties with Tainan and Kaohsiung cities in the south, Taichung City in mid-western part and New Taipei City in Northern Taiwan.

In the USA, according to the State of the Air Report 2019, California is the most affected area by air pollution followed by Oregon and Washington.

Studies conducted in the Netherlands using ultrasound measurements, observed that PM10 and NO2 concentration was inversely related to foetal femur length (in second and third trimester of pregnancy), head circumference (in third trimester) and overall growth. Other than that increased blood pressure, stillbirths and systemic cancers are caused by toxic air (Hooven et al, 2012).

The notion of women’s biological processes having a close relationship with nature was introduced by Sherry Ortner. Other ecofeminists such as Ynestra King and Carolyn Merchant subscribe to the view that women are ideologically constructed as closer to nature because of their biology. Merchant explores various aspects of myth and religion like Goddess Gaia, where there is a direct relation between nature and gender. Her book ‘Earthcare: women and the environment’ unlike other titles is not about cleaning or taking care of the environment, but how humans- especially women- are related to it. Environmentalists further argue that women and the environment share a history of oppression by patriarchal institutions (Leach, 2007).

In 2018, a report published by the Environment Pollution Prevention and Control Authority (EPCA) for Delhi and Centre for Science and Environment (CSE) highlighted stubble burning in the states of Haryana and Punjab as a major polluter. Further, hot mix plants, thermal power plants and industrial emissions from Delhi’s suburban areas (like Okhla, Jhilmil, Mundaka, among other areas) and National Capital Region add to the poor air quality in the city.

Environmentalist Sunita Narain writes in her book ‘Why I should be tolerant?’ about how toxic air pollution is choking Delhi and the city has run out of clean air to breathe. She further mentions leapfrog options to curb the escalating air pollution to secure health and life. The author measured different costs applied to the price of each vehicle viz., construction and maintenance of roads, policing, powering traffic lights, jam on roads and parking spaces. The quality of the air we breathe depends on a combination of both technology and lifestyle choices we make every day (Narain, 2016). Dr. Nidhi Sawhney, dietitian at ‘Nutri ADVICE’, correlates hormonal imbalances like Polycystic Ovarian Disease (PCOD), delayed-painful menstrual cycles and skin problems (such as acne and rashes), with the changing lifestyle trends. Long-term exposure to pollutants can damage the intestinal lining, hindering nutrient absorption. For this, she suggested intake of non-processed foods (Satvik or organic) which detoxify the body and make it immune towards the pollutants.

Vandana Shiva, a prominent Indian ecofeminist sorts out the relation between ecology and women. Scientific development, as she quotes Sandra Harding, is a ‘western, bourgeois, masculine project’. For Shiva, it
is the de-mothering of nature. She gives importance to prakriti (nature) and shakti (power) (Shiva, 1988). Destruction of prakriti will harm shakti which is a feminine principle of cosmos.

However Bina Agrawal24 in opposition advocates for an alternative formulation to ecofeminism in developing countries, termed as ‘Feminist and Environmentalism’. She attempts to replace the notion of ‘women as victims’ with one that perceives ‘women as active agents’, in the context of India specifically and the third world countries in general. Carrying this view forward in our paper, we propose a revised relationship between nature and women, where women’s role is central in fighting air pollution.

Comparative study of Beijing and Delhi

Economic development often comes at the cost of the environment. Air quality started deteriorating in Beijing from the late 1990s due to the rapid industrial and urban development. The Beijing authorities launched comprehensive air pollution control programmes, in phases, since 1998. However, the intensive air quality improvements took off in the city with the Beijing Clean Air Action Plan 2013-17. The major sources have been coal combustion, fugitive dust, vehicular and industrial emissions.

Complete legislation and enforcement mechanism with systematic planning; powerful local standards, high public environmental awareness, economic incentives and a sophisticated air quality monitoring system were instrumental in the last phase. (UNEP, 2018)25

Specific inspection, automatic online monitoring and hotspot grid supervision with the help of an environmental police team was strengthened. This promoted environmental governance among the corporates. Suspected environmental crimes have a provision of joint law enforcement between the environmental protection and public security departments to deter further crimes.

Economic support included subsidisation of clean energy renovation of coal-fired boilers (industries) and for coal-to-electrical heating transition (households). Incentives were also provided to vehicle owners who scrapped old cars, retrofitted heavy-duty diesel vehicles and bought new energy vehicles. Differentiated fees are charged according to the concentration of waste gas emissions for high polluting enterprises that stayed in production. Latest technologies like remote sensing with high spatial and temporal resolution, laser radar vertical network, high-precision meteorological observation and smart air quality sensors, with greater analytical capacity using big data technology were put to use.

For generating environmental awareness, it featured interaction between traditional and new media, including newspapers, television and online platforms like WeChat and Weibo. They fostered online and offline activities with public participation such as the Beijing Environmental Culture Week and environmental education programmes. Environmental ambassadors were appointed in 2013 who act as a model to adopt eco-sensitive values. The Beijing awareness programmes in the suburban areas aimed at women-centric volunteer activities which encouraged and supported women in the surrounding villages and communities to participate in the local level environmental activities like publicity of policies and regular inspections to find and solve problems.

Beijing and Delhi share certain similarities to qualify for a comparative analysis. Both the political capitals with similar demographics aspire to be economic giants to support their high population, alongwith sustainable development. As centres of urbanisation, they attract migration from the neighbouring regions. Geographical and meteorological factors that are seen to be affecting the concentration of pollutants, like topography, temperature, wind velocity, distance from the sea or a major water body, etc. have been found to be similar. The sources of pollutants as mentioned above stand similar with respect to both the cities. Hence, Beijing’s air quality improvement measures can be considered exemplary for Delhi.

The 2013 legislation of Beijing had a specific implementation plan for all enforcement bodies. For instance, in 2017, Beijing had put to exercise an environmental police team. Delhi would have to do away with the indistinct distribution of responsibilities regarding the environmental law enforcement. Further, a bottom-up approach needs to be adopted, wherein the role of the general people and local government needs to be increased. An example of a successful local-level action in the form of installation of an anti-smog tower in Lajpat Nagar took place in 2019.
Delhi has its major sources of road dust as kicked up by vehicles and from the unchecked construction boom. Despite the prevalence of Environment (Protection) Amendment Rules, 2018, implementation of these existing rules is deficient. Therefore, effective enforcement through improved e-governance measures like real-time video monitoring systems, satellite information, remote sensing with big data analysis should be put into the public domain. This air quality data made available to the public would bring transparency and accountability. SAFAR-Delhi observational network has deployed Air Quality Monitoring Stations (AQMS) only in 11 locations. There is a need to increase the number of monitoring stations, especially in the high-pollution areas. It was observed that in Badarpur, an industrial area which produces massive pollution has no monitoring station in its vicinity.

Delhi can provide financial incentives as soon as scrapping is taken up, rather than on a precondition of buying another vehicle. Setting a monthly quota for new license plates for passenger cars can be done with a simultaneous strengthening of public transport. Pollution-emitting industrial areas of Delhi can be targeted for subsidy provisions to initiate environment-friendly technological renovations. Further, to make these measures more inclusive, women’s participation should be increased.

**Voices from the Field**

There is a lack of reflection of the women’s perspectives in research with respect to pollution. We covered households across Delhi who gave an account of their day to day struggles with the poor air quality and its adverse health impacts. What comes through these narratives is that their socio-economic status-low income levels, lack of cleaner cooking fuel and poor access to health facilities especially with regard to gendered division of labour-is a determining factor in shaping their defense against the unhealthy environment. These factors hold true for the slum areas of Badarpur and Jor Bagh as well. It is clear that these respondents imagined a better urban life. The interviews in these areas highlight the importance of the government scheme PMUY as a means to alleviate indoor air pollution.

On the day of Christmas in Badarpur (a severely congested squatter), we met Kavita who was busy cooking on an earthen chulha, with her daughter sitting in a Santa cap. It was difficult to interview her while being surrounded by smoke coming from the chulha. Kavita (35) explained that she totally relied upon chulha for cooking, boiling water and warming hands in winters. Upon asking, she replied that LPG is expensive and her family could not afford it. Along with cooking in the unhealthful conditions, she was doubly burdened with the task of collecting wood stacks for fuel. Some of the health effects Kavita suffered from were coughing, headaches, and eye irritation. She expressed, ‘Chulha is my destiny’. Her family tried, but could not enroll in the PMUY. Her daughter, Komal (11) reported that her school remained closed during the poor air quality days. It disturbed her education and daily routine. She also suffered from health problems as her mother.

A case of serious health conditions in women in the area came to light with Amrita (22), who was suffering from severe asthma and was mostly bedridden. She experienced extreme chest pain and headaches. Her condition had further deteriorated due to pollution. Although financially weak, the family used LPG (availed independently of PMUY) for cooking which they had to get refilled once or twice in a week, as Amrita’s bad health would have been further affected if they had continued the use of chulha.

Amrita’s neighbour, Sanjana (18) had an office housekeeping job. She suffered from ailments like headache, fever and bodily weakness which she attributed to air pollution. According to her, major causes of air pollution were industrial fumes and vehicular emissions. She also described the life of vendors in the area, whose work suffered due to extreme winter smog. ‘The chulha contributes to indoor pollution and must be tackled by resorting to LPG’, she elaborated. People find it difficult to continue LPG usage due to inability to bear the costs and hence, revert to the use of chulha. Unable to produce the residence-identity proofs and utility bills, which are prerequisite to registration in the scheme, she could not avail the benefits.

Further, we met two middle-aged women, Sanjeeda (50) and Umrvati (40). Both had LPG connections. Yet, they used chulhas occasionally, due to certain psychological and traditional attachments. Sanjeeda believed that seasonal food cooked on the chulha tasted better, whereas Umrvati held onto a myth associated with LPG-
cooked food,— that it caused stomach acidity. Sanjeeda explained that dust in the environment had caused her suffocation and dizziness, and irregular menstrual cycles among her daughters. This had compelled them to opt for an LPG connection. Umravati cited similar health problems as her reason to switch to LPG. However, her daughter-in-law (Pooja), was refused a connection under the PMUY, due to lack of documents. Pooja, who had recently moved to Delhi, found air quality better in her native place Chapra (Bihar). Unaware of the scheme and without proper documents, another respondent Tulsi (17) could not get herself registered. She used a small cylinder purchased independently. Tulsi, who had recently delivered a child in the month of September, recounted that she experienced headache and fever due to declining air quality. Moreover her husband, a sweeper, suffered as his work was affected due to low visibility.

However, Badarpur residents were not totally bereft of PMUY benefits. Kamala Devi’s (35) narrative is a success story, depicting socio-economic transformation and financial relief that PMUY can bring about. Kamla had been living in the area for the past two decades with her husband, a security guard in the golf course. Reduced visibility at the road due to increased air pollution in winters affected the latter's work, as the golf course remains closed during times of extreme dust. Earlier Kamla used to cook food on a small LPG cylinder and refilling was a cumbersome process. She mentioned illicit LPG trade in the area. In March 2019, she came to know about PMUY through a ‘government campaign’ in her neighbourhood. The scheme provided the household with a cylinder, a double-burner gas stove, a lighter and a safety hose. They could get the cylinder refilled using a toll-free mobile number. Feeling satisfied and content, the couple acknowledged the importance of the scheme and thanked the government for assisting poor people. She described, ‘PMUY scheme as a means for women empowerment and tackling indoor air pollution’.

Avtaar Singh (42), Pradhan of Gautampuri, was mutually elected in the year 2013. However, his position was ceremonial in nature since no funds were allocated to furnish his functions. He was mainly involved in conveying people’s grievances to the respective state departments and the municipal corporation. He denied the presence of any governmental schemes aimed at mitigating pollution and was unaware of both the PMUY and its beneficiaries in his area. The pradhan admitted that most households possessed both LPG cylinders and earthen chulha, and that the latter was used when the households ran out of gas.

Sangeeta (37) and Safeena Begum (36) were the ASHAs incharge of 400 households each, in their respective localities. Their work consisted of awareness and immunisation programmes related to reproductive health and child care. They acknowledged the severity of air pollution and its impacts such as irritation in eyes and various cardio-vascular and pulmonary ailments. Sangeeta came across a case of deformity in a child which she believed, may or may not be attributed to air pollution. Safeena discouraged the use of earthen chulha and burning other fuelwood that caused air pollution. Sangeeta noticed that the primary earners of the allocated households were daily wage labourers, yet they managed to have LPG for cooking. During the peak pollution days, both the ASHAs were directed to distribute anti-pollution masks and organise campaigns.

It must be noted that the specialists we interviewed—Dr. Agarwal and Dr. Kachhawah— were quite apprehensive of the use of masks and air purifiers. They had informed us that masks bring only a psychological relief to the wearer (barring the oft expensive N-95 masks) and the air purifiers disrupt the humidity.

Kiran Devi (45), another ASHA, covered an area with 1100 residents. She indicated that a majority of the households are poverty stricken and can barely afford medications. She further explained that the medicines she distributed for tuberculosis, asthma and other respiratory diseases were in high demand. Three people had died in her area post the Hindu festival of Diwali due to respiratory problems. Further, she informed us that more than half of the households used chulhas. She admitted observing coughing and breathing problems in chulha-using women. Thus, during pregnancy, she advised them to transfer the task of cooking to other family members. She recently dealt with a case wherein the foetus had a cyst in its head. She believed that it could be caused due to air pollution.

It was ironic to find an urban slum in a posh vicinity of Jor Bagh, South Delhi. We conducted an FGD with Sunita (34) and Tara Devi (45), housewives, who were negligent about their own health and were more concerned about their husbands’ and sons’ problems. This denotes that the value of one's work and health are interrelated. Whereas household work, for many, is 'invisible'. Even though unaware of the air purifying benefits of plants, they had made an attempt to plant banana saplings.
We went on to cover some comparatively higher income households in the urban areas of Delhi. Harsha Arora Agarwal (30), a teacher at a private coaching institute, was seven months pregnant with her first child. She said that she had been stressed ever since her gynaecologist had informed her that the foetus’ brain development is definitely affected by air pollution. The latter had merely suggested use of air purifiers and had warned Harsha about the pollution levels in November. She then resorted to the advice offered by several foreign websites like ‘Mummy and child’, which suggested yoga and many other useful remedies. The respondent did not have any health problems prior to the pregnancy. Due to pollution, she suffered from headache, eye itching, cold, running nose and breathlessness at times which required artificial pumping. Therefore, she tried not to go out when it was too foggy or too congested on the roads.

Anakha S. (20), a resident of Lajpat Nagar, was born and brought up in Delhi. In 2017, she had developed Lymph node TB, for which she took medication. She believed that TB and other such diseases would not have been so widespread if the pollution was not so severe. Being a fine arts student, Anakha felt that her concentration and creativity got hampered as well. To mitigate this problem, she had practiced terrace farming and maintained indoor plants.

Correlation between reproductive stages (Nulliparous/ Pregnant in 2019-20/ Primipara-Multipara before 2019), work profile (Visible work/ Invisible work/ Student) and health problems attributable to air pollution.

We evaluated the following data representations and derived the major findings:

Headache has been observed as the most recurring health issue among women in the visible work category, followed by women of the invisible and student category respectively. This has been observed in the visible work women as persisting throughout their reproductive life stages. Nulliparous visible and student categories have shown a similar trend of headache during air pollution. Headache is reflected in almost all reproductive stages, being most intensive in the postpartum period, suggesting a relation between increased family and child care responsibilities and greater mental stress.

Throughout our narratives, eye irritation and watery eyes is pertinent in all the categories, be it due to indoor or outdoor air pollution. The source of both the kinds of pollution would have to be eliminated to decrease its effects on women’s eyes and to lower the potential of early loss of visibility. Similar eye problems have been observed in nulliparous earlier than in pregnant or primipara/ multipara. This indicates greater susceptibility of nulliparous to the deteriorating air quality therefore, in the long run it can lead to severe issues of decreasing visibility level, resulting in lower efficiency in later stages of life. Use of biomass fuel for cooking and heating contributes to indoor air pollution and leads not only in eye irritation but also blindness among women. Increased urbanisation, as in Delhi, results in high concentration of pollutants that causes dry eye syndrome, conjunctivitis and can make the eyes sensitive to bright light. (Gupta and Muthukumar, 2018)
Graph 1: Correlation between Reproductive Stages, Work Profile and Health Problems attributable to Air Pollution.

In the respiratory problems category, the trend shown suggests that women in the student and visible work category are reporting low-level respiratory diseases whereas, invisible sector women report mostly medium-high level problems. As the age increases, an escalation to intensive health ailments like chest pain, increase in asthmatic attacks and suffocation was noticed in some respondents, amongst the visible and invisible work categories. The visible category women may be able to access dispensaries and primary healthcare centres more frequently than homemakers. This indicates a possible negligence, hence late identification of diseases, on the part of the homemakers when it comes to their health.
The invisible work category women using chulha (solid fuel for cooking) in Badarpur and Jor Bagh have a high exposure to health damaging pollutants including small soot particles that penetrate deep into the lungs. In poorly ventilated dwellings, indoor smoke can be 100 times higher than acceptable levels for fine particles. These pollutants have been projected to cause pneumonia, stroke, ischaemic heart disease, chronic obstructive pulmonary disease and lung cancer. Women, in general suffer from higher risk of noncommunicable diseases related to pollution exposure and it also states that household is the major contributor to indoor pollution and affects most women and children. It has reduced the life expectancy of an individual by 20 months. (WHO, 2019)

Dr. Sawhney, the dietician had correlated issues such as acne and rashes on the body to the persistent air pollution in Delhi. However, only a few of our respondents noted the above relationship. This indicates ignorance among people regarding the widespread health effects of pollution. Whether women worked outside or inside their homes, reproductive problems were encountered by both the categories in the form of irregular menstrual cycles, an observation made by the dietician as well. Fatigue attributable to atmospheric pollution, emerges as a widespread issue faced by all categories. Miscellaneous health problems such as fever, mood swings, snoring, increase in sugar levels was noticed among the visible/invisible work performing women during the high pollution days of winter months.

Only the women performing invisible work have shown negligence (not recognised health problem) while narratives engaging female students, visible work women had some realisation for their health being affected by air pollution. Women’s exposure to the public sphere (as student/visible work performing) may have had some impact on them to realise the importance of their personal health.

Correlation between educational qualifications of the respondents and mitigation measures taken on air pollution

As we compare the A and D education categories, there is a similarity in the degree of mitigation. Ideally, higher levels of education should result in a higher level of mitigation measures.

Graph 3: Educational Qualifications vs Mitigation Measures taken on Air Pollution

Women of category A have performed well in all the three degrees of mitigation level, despite the low level of education. This indicates that they have general awareness about the issue and therefore if they are given adequate knowledge of high level mitigation measures, their personal level air pollution mitigation outcomes can improve (reach a higher level). Further, socioeconomic factors also hinder mitigation action among respondents.
with lower levels of education. Consciousness and technical knowledge on air pollution among the D categories is likely to be higher. However, willingness to take high level (3rd level) mitigation measures is significantly weaker as compared to their education qualification and capacity to take action. We noticed a predominant presence of first degree mitigation in the B category. The respondents perceive that micro level mitigation can be done at a personal/household level. However, macro-level air pollution is something which can only be dealt with by the state machinery.

Research Findings

Our research findings bring out the difference in various income brackets and their views on air pollution. Moreover it has been found that local citizens are not aware of the serious consequences of air pollution yet, and are not equipped adequately to protect themselves.

Key finding of the paper suggests that the visible category women are more equipped to fight air pollution since they are more aware of the health problems in the early stages of life due to a better sense of their personal health. Their actions in order to protect themselves, is also quick because they share an equal platform in contributing to the family's income. Negligence for personal health betterment is noticed mainly amongst the women engaged in the invisible work. Students have predominantly faced the most direct health impacts of air pollution in the form of eye and respiratory problems which can be aggravated if there is longevity in exposure to pollutants.

The knowledge-action relationship, amongst citizens, is analysed through the respondents’ education qualifications, awareness of air pollution and the degree of mitigation measures taken to reduce air pollution. The outcomes suggest that there is not a direct relationship between education and mitigation measures taken. Educational qualifications complement general awareness to materialise high degree mitigation, provided that willingness is also present.

With respect to the analysis of PMUY, the objectives of the scheme are to empower women to be in good health and to enable them to pursue their socio-economic aspirations. However, these were found to be hindered by the presence of extreme poverty, black marketing, lack of awareness, informal labour, migration along with the persistence of invisible work. The field visits have indicated that these factors have distanced the respondents from acquiring proofs of identity/residence. It was observed that mainly due to financial constraints and behavioural tendencies, the transition from chulha to LPG was not fully achieved. Women’s health must become a concern for the governments and policy makers to direct women to become agents of socio-economic transformation rather than as mere beneficiaries. This indicates that any uplifting effort for women has to be supplemented by gender sensitive environmental governance for their holistic health improvement.
Suggestions

Based on our extensive field work, following are some of our key suggestions:

1. Agricultural extension services in India can play a significant role in educating farmers about handling agricultural waste. Stubble or agricultural waste burning adds to the deteriorating air quality in Delhi’s winters. Agricultural waste- a type of biomass- collection and management can take the form of micro enterprises at the local level with active engagement of women Self Help Groups (SHGs) and NGOs. Biomass can contribute to the production of in-demand renewable products like briquettes.

2. Indoor plants have been effective in decreasing the amount of pollutants in the surrounding air. They present a sustainable method to restore ecological aesthetics in urban areas. We recommend few indoor plants that residents of Delhi can maintain, to detoxify some part of their surrounding air, based on their purchasing capacity: For lower, middle and higher income groups respectively, following plants are suggested: money plant or pothos (Epipremnum aureum), snake plant (Sansevieria trifasciata), aloe vera (Aloe vera or A. barbadensis), spider plant (Chlorophytum comosum); lady palm (Rhapis excelsa), Chinese evergreen (Aglaonema); areca palms (Chrysalidocarpus lutescens), rubber plant (Ficus elastica), bamboo palm (Chrysalidocarpus lutescens) (Chamaedorea seifrizii), Boston fern (Nephrolepis exaltata Bostoniensis).

3. Proper cross-ventilation is required with careful monitoring of the pollution outside to maintain good quality air within the houses. Therefore, checking the air quality with the help of mobile applications like SAFAR is highly suggested. Monitoring, here, is with respect to the density of pollutants in the air, which is high during morning and evening.

4. Civil societies, SHGs, Resident Welfare Associations (RWA) and government agencies need to optimise the use of mass media and communications to highlight practices that can be adopted at an individual or a household scale. Animated videos, advertisements, awareness camps and other means need to substantiate what a common person can take up to mitigate air pollution.

5. ASHAs act as a medium between the government health agencies and the local community, regarding the grassroots health rights and planning. Hence, their training should also include a capacity building programme regarding pollution- related health impacts. In this manner, ASHAs can act as the 'ambassadors of awareness' for policies like PMUY. Considering the social value of work they do, their salaries should be made more remunerative. Similarly, a performance-based assessment should be done to make their role more effective.

6. Digital air quality monitor screens need to be spread out equitably across Delhi. Higher visibility of air quality indicators on such monitor screens is likely to produce a more proactive action on part of the citizens.

7. DMRC should take the initiative to exhibit art like posters, murals, wall paintings on the exteriors of the metro infrastructure to arouse the conscience of daily commuters, towards environmental sustainability.

Conclusion

Post-colonial feminist Gayatri Spivak talks about the paradox of representation, where women are not exercising their agency or, in other words, are ‘voiceless’. Yashasvi Mehlawat, an aspiring poet pens down in her poem ‘As I Gasp for Fresh Air’,

Where the toxicity still persists,
Looking at myself swirling in the dust,
Choking, gasping for air as if I’m muffled.

It is important for any woman to initiate conversations with other fellow women regarding health issues for their emancipation. The motive should be ‘She for Herself’. By asserting the need for gender equality, they can break down barriers and spread awareness. Efforts to bring a gender perspective in the development research and policies will be successful only when different disciplines work together. Cooperation and dialogue across academic disciplines can be enhanced through curriculum reform that encourages the taking up of gender sensitive research across several disciplines. Policies and strategies for socio-economic development can be constructed to the benefit of women in the society to reduce the gender unequal development trajectory. Recognising the burden that environmental challenges impose on them, women have a key role to play when it comes to air pollution mitigation. They are vital agents of change and their needs and contributions can be a part of the solution. Their
roles and perspectives must be acknowledged, valued, and incorporated into the development of feminist oriented policies and studies.

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