

## The effects of Poverty on Lung Health

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Nigeria was declared the world's poverty capital in 2018 in a report by Brookings Institution, knocking off India from the position<sup>1</sup>. It was stated that Nigeria has about 87 million people in extreme poverty compared to India's 73 million<sup>1</sup>. It was further stated that extreme poverty is growing by six people every minute while poverty in India continues to fall<sup>1</sup>. The World "poverty clock", a tool used to track poverty progress worldwide, reported that Nigeria has 71 million extremely poor people<sup>2</sup>. It further stated that 133 million Nigerians are multidimensionally poor.<sup>2</sup> Worldwide, about 828 million people will wake up every day having no idea when or where their next meal will come from, and many will go to bed the same day without eating anything. According to 2022 report<sup>3</sup>, Nigeria ranks 37 out of 72 countries. The poverty situation is competing with population increase. Nigeria's hunger level ranks 103 out of 121 countries.

A close look at the current situation in the country will actually support a worsening statistics and this has stimulated the writing of this paper.

### THE LUNG AND ITS DEVELOPMENT- IN BRIEF

The Lung occupies the upper 2/3 of the bony thorax and weights between 900 to 1000 grams in life<sup>4</sup>. Forty to fifty percent of the weight is blood. It's main function is to extract oxygen from the environment and dispose of waste gases principally CO<sub>2</sub>. Ten thousand litres of air are inhaled daily<sup>4</sup> to ensure that this function, which can be hampered by dust, gases and infective agents, are maintained. Particulate matter, less than ten microns may pass through its protective barriers. The cross sectional area of the lungs increase 10 folds from the nose to the respiratory bronchioles. The surface area of the gas exchanging bronchioles and alveoli is about 85 m<sup>2</sup>. This is tucked into a volume of 4 litres through its numerous folds<sup>4</sup>. The diffusion surface, which is 0.1microns thick is closely matched with capillaries to allow for gas transfers.

The primary lung buds from anterior fore gut on the 28<sup>th</sup> day<sup>5</sup>. Retinoic acid plays a major role in these developments. Types 1 and 2 pneumocytes develop from the 24<sup>th</sup> to the 28<sup>th</sup> weeks from endoderm<sup>4</sup>. The air/blood barrier form at this stage.

Capillaries remodel and become applied to type 1 cells. There is a rapid alveolarization and microvascular maturation after birth. There is a twenty fold multiplication of the surface area<sup>5</sup>. The alveoli increase from 50 million at birth to 300 million at full maturation.

### Poverty

Poverty has been defined in various ways. It is the lack of means to satisfy basic needs. It is the lack of minimum food and shelter necessary for maintaining life. It is the state of one who lacks a usual or socially acceptable amount of money or material possession (encyclopaedia Britannica). The World Bank defines it as a condition in which a person, family or community lacks the essentials necessary for material wellbeing. The World Bank further classifies it into:

- a. Extreme poverty where the person's income is less than \$2.15 a day (2022 figure)
- b. Moderate poverty where the persons income is less than \$3.65 a day (2022 figure).<sup>1</sup>

The persistence of poverty in individuals or groups leads to the adoption of a poverty culture in which the individual or group shows particular patterns of life:

- Resign to their state of poverty
- Think nothing can be done to change their economic outcome
- Pass the poverty from generation to generation
- Feel powerless to affect their future.
- Feel negative, inferior, passive, hopeless, powerless
- Lack education necessary for obtaining a better paying job that will lift them from their current status.

### STATISTICS ON WORLD POVERTY

According to the World Bank, about 9.2% of the World, or 719 million people, live on less than \$2.15 dollars a day. In the USA 11.6% or 37.9 million people lived in poverty in 2021<sup>1</sup> The above figures are calculated based on income and a person's ability to meet basic needs. However, when looking beyond income to people experiencing deprivations in health, education and living standard, 1.2 billion people in 111 developing countries are multidimensionally poor according to UN Development Programme report. This accounts for 19% of the World population. The report further stated that extreme poverty is largely concentrated in sub-Saharan Africa. Children and the youths account for 2/3 of the World's poor and women represent a majority in most regions.

In 2002, now casted estimates show 333 million children living in extreme poverty, 829 million children living below \$3.65, 1.43 billion children living below \$6.83 dollars<sup>6</sup>.

### Multidimensional Poverty

This encompasses the various deprivations experienced by poor people in their daily lives. This includes poor health, lack of education, inadequate<sup>3</sup> living standards, disempowerment, poor quality of work, the threat of violence, and living in areas that are environmentally hazardous among others. Sixty three (63%) percent of persons living within Nigeria (133 million people) are multidimensionally poor<sup>7</sup>. The national multidimensional poverty index is 0.257 indicating that poor people experience just over one quarter of all possible deprivations<sup>3</sup>. Sixty five percent of the

poor (86 million people) live in the North, while 35% (nearly 47 million) live in the South. Incidence of multidimensional poverty vary from state to state; from as low as 27% in Ondo state to 91% in Sokoto<sup>3</sup>. The multidimensional poverty index measures the percentage of households in a country deprived along three dimensions – monetary poverty, education and basic infrastructures service – to capture a more complete picture of poverty.

To expatiate further, they lack:

1. Food, both in quantity and quality. Their BMI tends to be less than 17. They are exposed to many health hazard due to poor nutrition and other factors.
2. Safe Drinking water. Some spend at least 30 minutes to collect water from source which most of the time is surface water. A lot of health hazards are associate with this.
3. Sanitation facilities:- Toilet are lacking and many of them defecate openly and are open to some health hazards.
4. Access to good health care- prenatal care may be poor. Post natal care including immunization and nutrition may not be available. They may also lack the funds to treat diseases of all kinds at early stages before complications set in.
5. Shelter: they tend to live in overcrowded places. 4 kids to a room among kids, 3 people to a room among adults. Both adults and children live in places with no floors or floors on stilts built on shallow, dirty water. Their houses are located in places with high crime rates and so their windows and doors are perpetually closed. Ventilation is definitely poor.
6. Education: some have no past or current history of schooling in children. When they go to school at all, it is to poorly staffed schools in very unhealthy environments. The adults among them may not have attended school and so cannot read or write.
7. Information: there may have limited access to any types of media, radio, television and computer.
8. Access to service: they may be limited access to school health, piped water, electricity, fire service etc.
9. Job opportunities; they have limited access to good jobs and so are most likely to take up unspecialized and high risk jobs in textile industries, automobile industries and maintenance, steel jobs, cement factories etc.

#### **Adverse Health Effects**

Because of lack, which affects all aspects of their life and living, the exposure to diseases are higher and reaction to diseases are abnormal. Lack of education and relevant information keep them and their progeny in poor health status even in the prenatal periods. Ideal lung growth and development may not be achievable.

Maternal malnutrition will lead on to fetal malnutrition. Vit. A deficiency may result in blunt ended trachea. Lung agenesis and hypogenesis have been observed in rats<sup>6</sup>. Surfactant gene expression are adversely affected. It is a common cause of blindness particularly night blindness (nyctalopia) in countries with high rate of food insecurity<sup>8</sup>. It is associated with impaired humoral and cellular immune function, keratinization of respiratory epithelium and decreased mucus secretion. There is

associated risk of respiratory diseases like pneumonia, COPD, pulmonary fibrosis and lung cancer<sup>8</sup>. Vitamin D deficiency is also associated with similar effects<sup>9</sup>.

Anaemia in pregnancy is associated with intra-uterine growth retardation and premature birth. There is associated double risk of wheezing and triple risk of asthma<sup>10</sup>. Lack of Vitamin D is associated with loss of protection against asthma and atopy<sup>9</sup>.

Increased psychosocial pressures on pregnant mothers is linked with small for age babies which in turn has adverse effects on lung development<sup>11</sup>. They disrupt the interaction in uterus of the immune, neural and endocrine system and alter the course of lung morphogenesis and maturation, resulting in long term changes in the respiratory system<sup>11,12</sup>.

Parental smoking decreases lung function and increases lung morbidity in infants through different modalities. A child may be born with a chronic defect and/ or disease. The chronic disease may prepare him for poverty- a vicious cycle.

Particulate matter pollution level in urban slums constitute another source of respiratory morbidity in sub-saharan Africa. This comes from the means of transportation (buses, tricycles and motorcycles) in their different stages of disrepair<sup>13</sup>. The household use of biomass for cooking etc is common<sup>13,14</sup>. Rural areas are not spared. These biomass fuels come in different forms; wood charcoal, dried animal dung, agricultural residues such as straws and sticks. These are materials with low combustion efficiency. Smokes are discharged from fire and particulate matter is released into the environment including kitchen, living room and

bedrooms in poorly ventilated houses<sup>14,15,16</sup>. Biomass serves as the major fuel source for more than 50% of the World's population and 75% of those are in the developing world.<sup>17</sup>

Many of such people develop Domestically Acquired Particulate Lung Disease (DAPLD) or hut lung<sup>18</sup>. This is a pneumocomosis caused by exposure to smoke derived from biomass fuels used in cooking in poorly ventilated huts<sup>18</sup>. It leads to chronic bronchitis among non smokers in rural countries and account for upto 50% of the total disease burden among the rural poor<sup>19,20</sup>. WHO report estimated that 3.2 million deaths per year in 2020, including over 237,000 deaths of children under 5 resulted from it<sup>21</sup>. The combined effect of ambient air pollution and household air pollution are associated with 6.7 million deaths annually<sup>21,22</sup>. These pollution exposures lead to non communicable disease including stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer<sup>21</sup>.

Because most poor people have poor education, they are in the fore front of the dusty occupation. They constitute the majority of street sweeps. They are involved in stone quarrying, cement works, cotton works, welding, carpentry, smoking of fish and meat (suya). They are the motorcycle and tricycle operators, petrol pump attendants etc. All the above may lead to obstructive and restrictive lung disease. Combined with the habitation in overcrowded environments in poorly ventilated houses, the risk of respiratory infections are increased.

#### **The way forward**

The toxic combination of bad policies, bad economic planning and politics ensures

that optimal health needs are not met. Palliatives, purportedly meant to help the masses out of their poverty, end up enriching the already rich politicians.

The European Respiratory Society, in June 2012, hosted a conference to discuss the growing problem of health inequalities in Europe. They noted that significant differences in health between populations are more common for diseases of the respiratory system. They also noted that (i) The lowest social group are up to 14 times more likely to have respiratory disease than the highest.

(ii) Life expectancy difference in the two groups was

- 10 years in men
- 6 year in women <sup>23</sup>

At the end of the summit, Professor Klaus Rabe, president of ERS concluded by saying

- "low socioeconomic status is a preventable risk factor in developing

respiratory diseases and other health condition and we must act now to improve the current situation.

- Wise political decisions and advocacy can lead to results and it is upto the scientific community to ensure that we are providing policy makers with evidence based solutions for tackling the problem efficiently and effectively.
- We must also address the social and environmental determinants of health and this is done through a whole of government and a whole of society approach that includes not only health professionals and health ministers but finance ministers and prime minister <sup>23</sup>.
- ERS did this in Europe. ATS, American thoracic society, does similar things in the United States of America. The Nigerian thoracic Society should do well to take a cue! Advocacy is the imperative for a better health practice.

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