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COMMENTARY

NEGLECTED VOICES: UNCOVERING THE HIDDEN CONSEQUENCES OF AIR POLLUTION ON RURAL SCHOOLCHILDREN'S HEALTH IN NORTHERN THAILAND

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ABSTRACT

Air pollution is a pressing global concern, with its consequences disproportionately impacting individuals in developing nations. This disparity in impact is especially pronounced among vulnerable groups, including women, children, and the elderly. This paper's primary objective is to illuminate the often-neglected ramifications of air pollution on the well-being of rural schoolchildren in Northern Thailand. Despite their heightened susceptibility, this demographic remains marginalized in discussions concerning air quality. The study aims to underscore the significance of recognizing the schoolchildren's heightened vulnerability to the adverse health effects stemming from air pollution, which is exacerbated by their critical developmental stage. The ensuing discussion comprehensively delves into the detrimental effects of pollution on the overall welfare and health of schoolchildren, thus accentuating the compounded socioeconomic disparities. By acknowledging and addressing the specific vulnerabilities of this demographic, policymakers and stakeholders can devise targeted interventions to safeguard their health and foster sustainable development.

KEYWORDS

air pollution, child health, environmental pollution, inhalation exposure, schools, Thailand

INTRODUCTION

Air pollution constitutes a significant and urgent global environmental threat to public health, contributing to an estimated seven million premature deaths annually. This issue represents a crisis of unparalleled significance in the realm of global health, accounting for nearly one in every nine global fatalities. Exposure to PM2.5, a category encompassing fine airborne particulate matter, resulted in an approximate reduction of one year in the average global life expectancy during the year 2019. In that same year, nearly the entire global population (99%) resided in areas where the stringent air-quality standards established by the World Health Organization (WHO) for 2021 were not met. These harmful particulates, primarily originating from human activities such as fossil fuel combustion, transportation, and agriculture, play a substantial role in the generation of air pollution [1]. Throughout 2022, nations in Southeast Asia exhibited diligent efforts to decrease PM2.5 concentrations in alignment with the WHO guidelines. However, Thailand stood out prominently by dominating the list of the 15 most heavily polluted cities. Impressively, Thailand achieved significant progress in its air quality

during 2022, marking a 10.4% decrease in the annual mean PM2.5 concentration, reaching 18.1 micrograms per cubic meter (μg/m³), a notable improvement from the levels recorded in 2021. Air pollution patterns in Thailand exhibit discernible seasonal variations, characterized by elevated PM2.5 levels during the dry season from November to February. This is followed by the summer season, commencing in March, which witnesses prevalent agricultural burning as farmers clear their lands. A noteworthy inclusion in the 2022 World Air Quality Report was data from 157 urban centers regarding PM2.5 concentrations. Strikingly, none of these urban centers adhered to the WHO's recommended guideline limit of 5 μg/m³ [2]. This underscores the persistent challenges associated in achieving and maintaining clean air standards on a global scale. Therefore, this article is intended for readers such as researchers, policymakers, and organizations across various sectors, emphasizing the importance of addressing the health effects of pollution on children, particularly school-age children in rural areas who are impacted by air pollution issues.

IMPACT OF AIR POLLUTION ON SCHOOLCHILDREN IN NORTHERN THAILAND

While a significant body of research has addressed urban-air quality and its associated health implications, the impact of air pollution on schoolchildren in remote regions has not received adequate attention. Within these populations, Northern Thai schoolchildren emerge as a particularly vulnerable demographic when it comes to the adverse health effects stemming from air pollution. Of noteworthy concern is the sharp increase in PM2.5 levels, which escalated by an astonishing 400% during forest fires in March and April, surpassing the established WHO guidelines. The exacerbation of air pollution is further compounded by transboundary haze, unauthorized crop burning, and illicit teak wood trade, all of which significantly contribute to the deterioration of air quality [2,3]. A variety of sources collectively contribute to the challenge of air pollution in Thailand, including vehicle emissions, industrial discharges, crop incineration, transboundary haze, and power generation. This multifaceted challenge is worsened by inadequate air-quality monitoring mechanisms, limited public awareness about the health consequences of crop burning, and weak enforcement of anti-crop burning regulations. Of particular concern is agricultural burning, a common practice in Thailand, which can elevate PM2.5 levels two to three times beyond WHO limits [4]. Furthermore, the daily averages of the hazard quotient (HQ), which is the basis in the assessment of the potential health risk of PM2.5, indicate a value exceeding 1 between January and April. The yearly mean HQ for children is calculated at 2.81 ± 3.97, surpassing the threshold of 1. This outcome signifies an unacceptable level of risk to human health throughout the entire year [5].

IMPACT OF AIR POLLUTION ON SCHOOLCHILDREN'S HEALTH

The health of schoolchildren bears a substantial burden due to diseases stemming from air pollution. Even minimal exposure to pollutants during pivotal developmental phases, such as in infancy, can lead to adverse outcomes that persist from childhood into adulthood [1,6]. Beyond respiratory issues, pollutants are demonstrably associated with central nervous system disorders, including childhood autism [1,7]. Compelling evidence also connects air pollution to health problems such as low birth weight, tuberculosis, cataracts, and nasopharyngeal/laryngeal cancers. It's noteworthy that air pollution is classified as a carcinogen [8]. Emerging data further associates air pollution with new cases of type 2 diabetes, obesity, inflammation, aging, and neurodegenerative conditions such as Alzheimer's and dementia [9]. Given these findings, it becomes abundantly clear that the impact of air pollution encompasses a wide spectrum of health concerns. These findings underscore the imperative need for effective mitigation strategies to safeguard lifelong well-being. From the author's perspective, there is a prevailing lack of awareness or recognition among the population and related organizations regarding the impact of air pollution on the occurrence of various diseases in school-age children. This lack of awareness persists due to the gradual development of certain health effects associated with air pollution, which often takes a considerable amount of time to manifest as specific diseases.

EFFECTS OF AIR POLLUTION DISPARITIES ON SCHOOLCHILDREN IN NORTHERN THAILAND

The significant and concerning consequences of air pollution on the health and well-being of rural schoolchildren, compounded by socioeconomic disparities, evoke a deep sense of concern. Urgent attention and steadfast commitment to rectify these injustices are imperative. Equity must serve as a guiding principle, especially as economically disadvantaged

children often bear the brunt of health impacts related to pollution. As pollution levels continue to rise, vulnerable individuals lack the resources to shield themselves, leading to pronounced disparities in both health and education. Policies ensuring equitable access to clean air and conducive learning environments take on paramount significance. Equitable distribution of resources, including essentials like N95 air filters, plays a pivotal role in mitigating health risks posed by pollution. The perpetuation of access disparities further entrenches cycles of disadvantage, compromising children's fundamental rights to health and education. Swift intervention is essential for rural schoolchildren facing respiratory infections and developmental hurdles due to air pollution's adverse impact on their developing respiratory systems. Resolving these complex issues holds the potential in empowering children for a healthier future and enables them to realize their full potential.

ADVANCING AIR POLLUTION AWARENESS AMONG SCHOOLCHILDREN

The application of these principles can be guided by The Lancet Commission on pollution and health recommendations [6]. Prioritizing the prevention of the impact of air pollution on schoolchildren is crucial on both national and global agendas. Integration of planning processes into countries and cities is essential. In addition, securing funding and international technical assistance is of critical importance. Consequently, adequate resources must be allocated for urban, national, and global pollution management. Establishing comprehensive monitoring systems for air pollution and its health impacts is of paramount importance. This is because national and local data collection is indispensable in quantifying pollution, identifying sources, evaluating interventions, enforcing actions, raising public awareness, and tracking progress. Moreover, a collaborative approach across sectors is strongly advocated. Partnerships between the public and private sectors, as well as government entities, can accelerate the adoption of clean energy and technology, addressing the root causes of pollution. Integrating pollution mitigation into noncommunicable disease planning is highly recommended. Lastly, emphasis on air pollution research is vital. Research underpins understanding and effective management as it uncovers links between pollution and diseases, identifies the evolving health impacts of pollutants, and accurately maps exposure, particularly within school environments.

CONCLUSION

The study sheds light on the often-overlooked consequences of air pollution on rural schoolchildren's well-being in Northern Thailand. It emphasizes the heightened vulnerability of this demographic, particularly due to socioeconomic disparities, and underscores the urgent need for targeted interventions. By comprehensively addressing the adverse health effects of air pollution on schoolchildren and advocating for equitable access to clean air and resources, policymakers can pave the way for improved health, education, and sustainable development among these young individuals.

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