Rawalpindi Medical University

Journal of Climate Change

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EDITORIAL

Smog in Lahore, Pakistan: A Serious Public Health Risk

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Abstract

Lahore, Pakistan's second-largest and most polluted city, has lately been blanketed in a thick layer of pollution. Urbanization and industry have both contributed to the city's deteriorating air quality. Smog is dangerous to health and is causing a fast spread of a variety of health issues, while also raising worries about the long-term detrimental consequences on public health. The present scenario is projected to deteriorate further as a result of the government's lack of an aggressive response plan and the inability of responsible authorities to recognize the gravity of the issue. As a result of previously published articles, we want to raise awareness of this critical problem, alerting relevant authorities to the devastating effects smog may have on public health and urging them to take prompt action to avert future damage.

Keywords: Air pollution, Lahore, public health, smog.

Editorial

Pakistan is the most urbanised nation in South Asia, and Lahore, the country's second biggest city, is increasing at a pace of 4% yearly and is recognized as Pakistan's most polluted metropolis. In Asia, urban areas are regularly afflicted by pollution, and Lahore is no exception. As was the case last year, Lahore has been covered once again by an alarmingly dense blanket of haze, shrouding the whole city and wreaking havoc on people's lives. Automobile sales have skyrocketed, unregulated deforestation, rapid urbanisation, and uninterrupted industrial expansion have all contributed to this dangerous scenario over the years.[1]

Smog is responsible for the quick spread of severe health conditions, such as worsening of asthma, allergies, eye infections, respiratory tract infections, and heart diseases that result in early death.[2] Sughis et al. revealed a disturbing discovery in this regard, noting substantially higher systolic and diastolic blood pressure values in Lahore schoolchildren exposed to high levels of air pollution. This alarming discovery serves to emphasise the long-term detrimental impact on the public's health.[3]

Pakistan's air pollution is monitored by the Pakistan Environmental Protection Agency (Pak-EPA) and provincial EPAs. In 2010, the Pak-EPA produced the National Ambient Air Quality Standard (NEQS). The planned annual mean levels of ambient particulate matter, PM2.5 and PM10, were, however, greater than the more stringent World Health Organization (WHO) limits of 10 g/m3 and 20 g/m3, respectively. According to research, ambient particulate matter levels in Lahore substantially surpass both WHO and NEQS recommendations. A research done in Lahore over a five-year period with the goal of comparing fine particle levels to the aforementioned criteria showed that the annual average PM2.5 level in the regions analysed was 136.5 34.1 g/m3, almost 14 times the WHO limits. Additionally, this research notes that this amount of particle matter was equivalent to that of one of the world's most polluted megacities, Delhi, at 143.0 17.8 g/m3. This demonstrates the city of Lahore's deteriorating air quality.[4]

Additionally, the fact that just around 1% of industrial businesses in the nation disclose their emissions raises alarming worries about the city's ignored air quality and its influence on public health. Children are more vulnerable to these negative impacts. According to a research on the long-term consequences of the 1952 Great London Pollution, exposure to smog during the first year of life elevated the chance of childhood asthma by 1987 percent.[5] Given the harm that smog may do, it is essential that cautious efforts to enhance air quality be implemented. Due to a lack of specialized equipment, defined methods, qualified employees, and funding, the majority of environmental regulatory bodies lag behind. The government should begin by investing sufficient finances for monitoring and eliminating hazardous emissions, countrywide afforestation efforts, and the transition to renewable energy sources. Given the grim prospect presented by the current scenario, the urgent requirement is to adopt a tight action plan to avert negative consequences for public health and to alleviate the fiscal load on the country's health system.

Finally, but certainly not least, the public should be made aware of the potential health hazards associated with this environmental danger and taught on how to protect themselves and avoid exacerbations of pre-existing medical disorders. Public service announcements on television, radio, and the Internet, as well as the distribution of instructional booklets and brochures, may all help to accomplish this.

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REVIEW ARTICLE

Preventing And Managing Climate Change-Related Health Hazards

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Abstract

Global environmental changes, a result of human activity and population expansion, are affecting our world in ways that already pose hazards to human health, with the extent of these concerns predicted to expand in the future decades unless extra, proactive measures are taken. Climate change, marine pollution, ozone layer depletion, soil degradation, and urbanisation are all examples of global phenomena that are unprecedented on geographic and temporal scales. Climate change is the most well researched issue. Climate change's health concerns will grow more acute as it impacts the amount and quality of food and water, increases air pollution, modifies the distribution of vectors/pathogens and disease transmission dynamics, and diminishes eco-physical buffering against severe weather and climate events. Health systems urgently need improvement in order to handle these rising concerns effectively. This article summarises the health impacts of climate change and covers mitigation and adaptation strategies for mitigating and avoiding health hazards.

Keywords: Climate change, health hazards,

Introduction

Through the combustion of fossil fuels, urbanisation, deforestation, agriculture, and industrial activities, humans are altering the planet Earth. Since the Industrial Revolution, greenhouse gas (GHG) concentrations in the atmosphere have grown dramatically, notably over the last five decades. Carbon dioxide (CO2), the primary GHG, is now 411 parts per million (ppm) greater than at any point in the last 800,000 years.[1] Global mean surface temperature is presently around 1.0 degree Celsius above pre-industrial levels, with adverse repercussions for human and ecological systems, including health and livelihoods. Global warming is anticipated to reach 1.5 degrees Celsius between 2030 and 2052 if greenhouse gas emissions continue at their current pace. Additionally, climatic change intensified in the 1970s. For instance, the average global temperature from 2006 to 2015 was 0.87 degrees Celsius over the pre-industrial level. For comparison, the average rise in temperature over the same baseline for the last decade, 2009–2018, was 0.93 0.07 °C, while the average over the last five years, 2014–2018, was 1.04 0.09 °C.[2] The Intergovernmental Panel on Climate Change (IPCC) found in its fifth assessment report (AR5) that human-

produced greenhouse gases such as carbon dioxide, methane, and nitrous oxide were responsible for the majority of the observed rise in Earth's temperature during the last 50 years. Each extra unit of heat is expected to enhance the dangers associated with climate change for almost all natural and human systems. These hazards are mostly determined by the pattern and rate of climate change, geographical location, socioeconomic development, resilience, and susceptibility, as well as the adoption of adaptation and mitigation measures. Within a global context, '1.5 degrees Celsius warming' may result in significantly different temperatures in different regions due to variations in the magnitude and rate of warming in specific locations; these variations will interact with society's exposure and vulnerability to climate-related risks. At 1.5 degrees Celsius of warming, temperatures in certain locations will be much higher than the global average, with some regional extremes reaching potentially disastrous levels for ecosystems and society. This study advocates for actions that are compatible with the Paris Agreement's objective of limiting global warming to far below 2 degrees Celsius. Climate-related concerns are having an increasingly negative impact on population health and health systems. Climate, social, and environmental circumstances, and human health are inextricably linked.[3] Climate change, for example, impacts the amount and quality of food and water; increases air pollution; modifies the distribution of vectors/pathogens and disease transmission dynamics; and diminishes eco-physical buffering against severe weather and climate events. Climate change is predicted to affect the patterns of a variety of ambient exposures and catastrophes in the future decades, including excessive temperatures, heat waves, wildfires, droughts, and floods, with potentially dire effects for a number of people. These exposures, in turn, may influence the likelihood of developing a number of climate-related health problems in humans. To safeguard human health, it has become critical to handle these hazards effectively, particularly in light of fast climate change and development decisions that influence health. We analyse the health concerns associated with climate change on a global scale and explore how these risks might be mitigated and avoided via adaptation to and mitigation of climate change. Additionally, we emphasise that minimising the magnitude of change is possibly just as essential as minimising its amount. Health hazards vary significantly across geographical and temporal scales. We examine important adaptation techniques for preparing for and managing the effects of climate change.[4]

Health Risks: Increased Recognition By Policy Makers

Climate change is rapidly being recognised as a serious threat to human health and well-being by policymakers. Over the last two decades, policymakers and scientists have taken into account the threats of climate change to energy, water, and food security, agriculture, industry, economic activity, physical infrastructure, and biodiversity. These analyses contributed to a better understanding of the broad range of dangers that climate change poses to human and environmental systems. Increased awareness of hazards to human health and well-being aided in the alignment of scientific inquiry with public concern and policy debate.[5] From a sustainable development viewpoint, the health impacts of severe weather events (e.g., heatwaves, bushfires, droughts, and floods), vector-borne diseases, and malnutrition are expected to result in the largest disease loads related with climate change (Fig. 1).

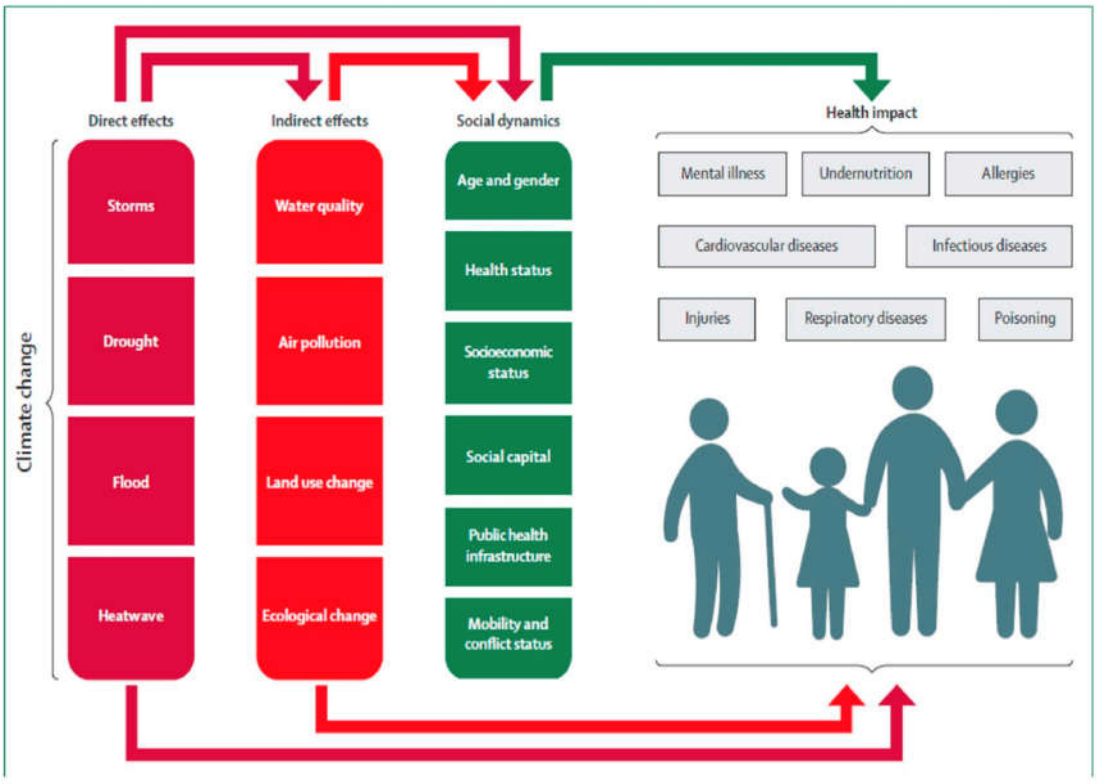

Fig-1: Climate change-related health hazards

At the interface of climate and health, there has been growing realisation that the pace of climate change may be just as significant as the quantity of change in the near term; in some circumstances, it may be even more significant. For example, the accelerating consequences of more frequent and intense extreme weather and climate events are raising public awareness of the dangers of climate change, as evidenced by 2017 flooding in the United

States caused by hurricanes, 2018 California bushfires, 2018 European floods, and 2019 Queensland heatwaves. Additionally, the burden of unfavourable climate-related health consequences is influenced by regional diversity in the pace and degree of climate change. These concerns significantly complicate the process by which local governments design and implement effective mitigation and adaptation plans. Not only are health authorities responsible for promoting physical and mental health, preventing disease, injury, and disability, and enhancing health care systems, but they are also responsible for developing and implementing adaptive strategies to mitigate the health risks associated with climate change.[6] Adaptive interventions in public health may be classified into three categories: primary, secondary, and tertiary prevention. Primary prevention tries to limit exposure to climate change-related risk factors; secondary prevention aims to delay the beginning or development of climate change-related health consequences; and tertiary prevention strives to treat and manage already-occurring health problems. For example, with increased climate change, the frequency, severity, duration, and geographic spread of heatwaves are anticipated to rise. As a consequence, if no further efforts are done, linked health risks are expected to significantly grow. Primary prevention may help limit people's 'exposure' to heat stress. Climate change mitigation is an important component of primary prevention. Primary prevention is advising communities and individuals on the most effective methods for minimising or avoiding exposure to heat in order to maintain core body temperature. Secondary prevention would identify those who are particularly susceptible to heat exposure, such as older adults, children, pregnant women, and individuals with underlying cardiorespiratory illnesses, and provide them with information on effective strategies for increasing their resilience during heatwaves. Tertiary prevention would include post-event care, treatment, and management aimed at mitigating health impacts (e.g., morbidity and death) associated with and after a heatwave. Due to the breadth of climate-related dangers and possible mitigation measures, health-protective efforts should be performed not just by health systems, but also by other relevant sectors of government and business, as well as by people and communities. To plan and execute these activities, an interdisciplinary, comprehensive approach is necessary.[7]

Casual Pathways To Health Risks

Extreme weather events may pose direct threats to human health and society; they are linked to avoidable fatalities and hospitalizations. These incidents may also result in stress and mental disease, posing a significant strain on the community. Furthermore, climate change has the potential to influence human health practises. For example, evidence suggests that rising temperatures have a nonlinear effect on health-promoting bicycle ridership, with increases in bicycling in New York City by the mid-century. This trend could reverse itself if temperatures continue to rise. Indirect concerns include changes in the pattern of transmission of climate-sensitive infectious illnesses, interactions between air pollution and meteorological conditions, and losses in the quality and quantity of food and freshwater. Climate change has the potential to modify the distribution of vectors and infections, as well as human behaviour. All of these variables may lead to variations in infectious disease patterns. Additionally, changes in weather conditions (e.g., temperature, rainfall, and humidity) can have an effect on the atmospheric concentrations

of toxic air pollutants (e.g., particulates, ozone, and nitrogen dioxide) and aeroallergens (e.g., pollens and spores) that are detrimental to population health. Climate change may also wreak havoc on ecosystems, such as coral reefs and coastal mangroves, on a huge scale and in an irreversible manner. For example, coral reefs are anticipated to deteriorate by another 70–90 percent at 1.5 degrees Celsius warming (high confidence), with much greater losses (> 99 percent) by 2 degrees Celsius warming (very high confidence). Such a loss would jeopardise the food security and lives of coastal populations impacted. With increasing warming, particularly over 2 degrees Celsius, the probability of permanent loss of many marine and coastal ecosystems grows. Although more difficult to estimate, significant contributions to the future illness burden of climate change might come from the diffuse and delayed effects of social, economic, and demographic changes. For instance, increased migration of vulnerable people (e.g., low-lying island nations) and loss of livelihoods and life stocks (e.g., Sub-Saharan Africa) may have a wide variety of negative health repercussions — mental, physical, nutritional, and emotional.[8,9]

Vulnerability And Inequity

Low-income individuals, those with little resources, and those who live in physically isolated areas are often more sensitive to climate-related dangers. Populations in low- and middle-income nations are often more vulnerable than those in high-income countries, owing to the former's fewer financial and health system resources. Additionally, inhabitants in higher (or lower) income nations are more vulnerable than those in lower (or higher) income countries. For example, in the United States of America, the risks of severe disease and mortality linked with the 1995 Chicago heatwave, Hurricane Katrina in 2005, and the 2017–18 California forest/bush fires varied significantly among socioeconomic and ethnic subpopulations. Inequality between subpopulations may result in unequal vulnerability within a community. The vulnerability of a population or subpopulation is determined by the following factors: (i) the nature and magnitude of the hazards posed by climate change; (ii) the extent of exposure to these hazards; (iii) the sensitivity and resilience of exposed populations; and (iv) the community capacity to respond to and manage health risks.[10]

It is critical to identify and prioritise the most vulnerable groups and subpopulations, since tackling health inequalities will strengthen policies and programmes aimed at mitigating and preventing climate-related hazards. Taking differential vulnerability into account has major implications for the design and implementation of intervention strategies. How should we prioritise actions to climate change-related health risks? It is vital to prioritise those who are most impacted while also making things safer for everyone. Occasionally, a successful public health intervention may target especially susceptible subpopulations (e.g., relocating persons with chronic conditions to a cooling centre during a heatwave), while other times, population-wide initiatives may have a higher benefit:cost ratio (e.g., better building codes, city planning regulations for green space, and heat warning systems). Health for all

is a primary aim and a guiding concept for climate change mitigation and adaptation efforts to reduce health hazards associated with climate change.[11]

Increasing The Level of Ambition For Adaptation and Mitigation

Climate mitigation policies and health system resilience to climate-related hazards should be developed concurrently, because even if GHG emissions were completely eliminated today, additional climate change (less than 0.5 °C) is unavoidable over the next few decades due to the inherent inertia of the complex climatic system, which will increase the magnitude and pattern of health risks over the next few decades. While research and practise in health adaptation are developing, the levels of investment and ambition are insufficient to meet the demands. Increasing resilience will almost certainly be most effective via cross-sector cooperation, since many of the health hazards associated with climate change are impacted by choices made in other sectors. For instance, urban encroachment into forest areas would almost certainly raise the danger of mosquito-borne illnesses. Regardless of political borders or budget restrictions, health authorities need more expertise and investment to deal with the growing burden of climate-related health effects as climate change continues. A well-considered and coordinated adaptation strategy must be created at several government levels, with the efficiency of each approach dependent on a variety of conditions.[12] Significant adaptive approaches for reducing heatwave-related mortality/morbidity that may be explored and implemented by health authorities at all levels of government, from local to worldwide.

• The development of heat/health early warning systems (HHEWS); • Urban planning that explicitly considers 'heat island' and 'greenness' effects; • Housing standards that account for rising average and extreme temperatures (e.g., insulation and air conditioning installation); • Community education programmes about the health risks associated with heatwaves and protective measures to mitigate these risks; and • The creation and refinement of climate-resilient health-care facilities.[13]

Additional study in the following areas may provide important insights for establishing local to national-level climate resilience measures: (1) Conduct an assessment and prioritisation of the health hazards associated with climate change at various regional and temporal dimensions. Climate change is anticipated to have an impact on both communicable and non-communicable illnesses, altering the size and pattern of climate-sensitive health outcomes; when thresholds are exceeded, some of these changes may be quick and significant. Proactive prioritising based on environmental data (e.g., expected changes in temperature and precipitation, as well as air pollution) has the potential to avert increased illness and death. (2) Determine the optimal method for using surveillance data to determine illness thresholds, integrate emergency planning, and forecast future loads. It is necessary to do research to assess the resilience of health monitoring systems when climate-related health hazards develop and increase in particular places. Additionally, it is necessary to identify relevant environmental factors, such as proxy data (e.g., pollen, toxic algal blooms, and dominant vector species), for inclusion in monitoring systems, as well as to connect

environmental and health outcome data. Additionally, long-term research are required to quantify the links between meteorological factors and health outcomes, as well as to determine the degree to which climate change has already changed disease loads and/or promoted changes in vector and pathogen dispersion through time. This is critical for the development of evidence-based health policy. (3) Forecast future health hazards associated with climate change under various climatic and socioeconomic scenarios in order to create and execute effective and efficient treatments. (4) Integrate data mining and machine learning into iterative management cycles, resulting in the development of relevant decision-making models and the potential for future adaptation. (5) Effectively convey to the public and policymakers the health concerns associated with climate change, including information on preparation and protection against climate-sensitive dangers. (6) Motivate and enlighten policymakers, prioritise continuing investments in climate-related health protection, and describe the returns on climate-related health protection investments across a range of time horizons in a changing environment. Numerous topics relate to the priority of developing health system resilience to additional risks, such as pandemic illness preparedness. The recommended research priorities have the potential to mainstream adaptation and resilience across a broad spectrum of risks. However, climate change is seldom portrayed as a health concern, and national health ministries are rarely the primary organisations responsible for mitigation and adaptation. Why is this the case? Several reasons for this include the fact that the majority of governments prioritise economic growth above health and are more concerned with the economic consequences of climate change. Additionally, it is incredibly difficult to get adequate attention from health agencies, who are preoccupied with more pressing health concerns (e.g., patient care). Until recently, climate change was not considered a public health issue. Climate scientists, epidemiologists, and health policymakers must increase communication at all levels, from local to global. Additionally, public health interventions are critical to coping with the growing implications of climate change. Both top-down and bottom-up methods are required to achieve co-benefits in health and climate.[14,15]

Conclusions

Cross-sectoral collaboration is essential to reducing greenhouse gas emissions and preparing for the inevitable consequences of climate change over the next few decades. Increasing ambition and investment in policies, technologies and tools is also critical to reducing threats and preparing for the inevitable consequences of climate change over the coming decades. These initiatives may aid in the generation of meaningful and usable information to decrease health risks, including how to include the protection of population health into policy assessments and development decisions at all levels of government, from local to regional, national, and global.

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REVIEW ARTICLE

The Impact of Technology on Air Pollution and Health Research

Jahangir Sarwar Khan[1], Junaid Khan[2], Riaz Ahmed[3], Malik Shehr Yar[4]

Abstract

We present a review of emerging technologies and how these can transform personal air pollution exposure assessment and subsequent health research. Estimating personal air pollution exposures is currently split broadly into methods for modeling exposures for large populations versus measuring exposures for small populations. Air pollution sensors, smartphones, and air pollution models capitalizing on big/new data sources offer tremendous opportunity for unifying these approaches and improving long-term personal exposure prediction at scales needed for population-based research. A multi-disciplinary approach is needed to combine these technologies to not only estimate personal exposures for epidemiological research but also determine drivers of these exposures and new prevention opportunities. While available technologies can revolutionize air pollution exposure research, ethical, privacy, logistical, and data science challenges must be met before widespread implementations occur. Available technologies and related advances in data science can improve long-term personal air pollution exposure estimates at scales needed for population-based research. This will advance our ability to evaluate the impacts of air pollution on human health and develop effective prevention strategies.

Keywords: Air pollution, epidemiology, exposure assessment, sensor.

Introduction

The impact of air pollution on human health is enormous. In 2015, long-term exposure to ambient fine particle matter air pollution (PM2.5) was linked to 4.2 million deaths and a loss of 103.1 million healthy years of life (representing 7.6 percent of global mortality). While our understanding of the intricate links between air pollution and human health has grown significantly over the past few decades, knowledge gaps and associated uncertainties continue to hinder our capacity to ameliorate air pollution's detrimental effects. Exposure assessment is a significant, if not the primary, barrier to better understanding and mitigating the health effects of air pollution. Estimating individual exposure to air pollution for large populations remains a difficult task, but it is critical for estimating health effects, analyzing exposure sources and routes, identifying sensitive groups, and finding intervention options. The notion of the exposome, defined as "the entirety of environmental exposures from conception on," has recently prompted exposure scientists to create novel ways for assessing a variety of human exposures, using both internal biomarkers and exterior exposure metrics. While the potential for internal indicators of environmental exposure is fast expanding, they remain restricted for the most concerning air contaminants. As a result, exposure scientists

must utilize new data sources, methodologies, and technologies in order to provide more accurate assessments of external personal air pollution exposures.[1]

The present level of air pollution exposure research may be divided between techniques for modelling large population exposures and methods for assessing small population exposures. These techniques are not mutually exclusive, since individual measures are utilized to construct and assess models, but they are distinct in their research designs, applications, strengths, and weaknesses. Geographic information systems (GIS), deterministic models (e.g., AIRMOD, RLINE, SHEDS), and remotely sensed data have formed the basis of the majority of air pollution modelling efforts to date, utilizing spatiotemporal estimates of ambient air pollution concentrations to derive exposure estimates from residential locations, typically for large populations. Personal measurements of air pollution concentrations have historically been limited to small sample sizes and brief time periods, owing to sensor limitations and logistical and financial restrictions associated with sampling large numbers of persons for extended periods of time. Both paradigms (modelling and measurement) are continuously expanding as a result of new technology and large-scale data analytics, opening up new avenues for personal exposure assessment methodologies.[2]

We offer a high-level overview of existing technologies and associated data science breakthroughs, as well as how they potentially alter air pollution exposure assessment and health research when combined. Numerous reviews have been published on the evaluation of air pollution exposure for epidemiological investigations, on current methodologies for estimating the exposome, and on personal sensor technology.[3] We therefore confine our review to technological advancements in the areas of air pollution sensors (for personal measurements), smartphones (mHealth and GPS applications), and air pollution models based on "big data" (i.e., large volumes of poly-dimensional data collected from traditional and novel data sources). We discuss an ongoing project (PURE-Air) that is seeking to integrate novel technology and approaches in order to assess the effects of air pollution on cardiopulmonary illness in a worldwide population. Together, these technologies will push the envelope of what is possible in the science, epidemiology, and prevention of personal air pollution exposure. Finally, this assessment will provide suggestions on how the field might benefit on these exciting potential moving ahead.

Framework

The conceptual foundation for this study is shown in Figure 1, as is how existing technology and associated data science may contribute to long-term, large-scale personal exposure evaluations.

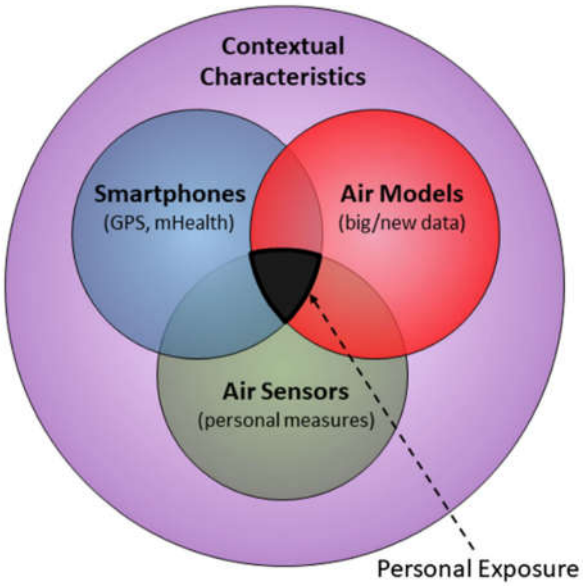

Fig-1: Conceptual framework of technology and associated improvements in data science and how collectively they might enhance long-term personal air pollution exposure estimates at scales required for population-based research.

The technologies presented in this section fall into one of three categories: air pollution sensors, smartphone apps, and air pollution models. Each of the three domains provides pertinent and distinctive information on personal air pollution exposure, and they work in concert to generate innovative exposure data that cannot be gleaned from any of the domains alone. For instance, air pollution models cannot capture individual exposures without specific time-activity pattern information, and even then, models applied to smartphone-based GPS location data remain models (and not observations) of air pollution concentrations. Personal assessments are therefore unlikely to capture exposures over a lengthy period of time (years to decades), necessitating integration with air pollution models and time-activity patterns. Additionally, "contextual variables" (economic, social, environmental, cultural, institutional, and political features) have an impact on all three domains and the link between air pollution exposures, health consequences, and preventative options. Accurate long-term personal exposure estimates for large populations will therefore need the integration of various areas through cross-disciplinary cooperation.[4] We illustrate this using data from the current PURE-Air project, which is seeking to combine various technologies and approaches in order to more accurately estimate air pollution exposures and health impacts in a large global cohort study. Additionally, we describe the obstacles and possibilities that these technologies provide.

Air Pollution Sensors

Personal measurements are the gold standard for determining one's exposure to air pollution (with high-quality validated instruments ideally over long periods of time). Obtaining such data for broad populations has remained a significant problem owing to cost and logistical restrictions. As a result, the majority of personal measurement research have used small sample numbers and/or short time periods. For example, in a birth cohort in Sao Paulo, Brazil, NO2 and O3 were measured for 7–18 days in each trimester of 366 pregnant women using passive personal samplers, while 122 individuals in Barcelona were monitored for black carbon during a 3-week period using the micro-aethalometer AE51. While these studies are substantial by contemporary standards, they fall well short of our goal of personal measurements for large study populations (i.e., sample numbers adequate to capture the chronic effects of air pollution) and time periods relevant to the disease process being researched (i.e., years to decades for most chronic diseases). While the paradigm for air pollution monitoring is shifting—from big regulatory fixed-site stations to smaller mobile sensors—there are still a limited number of affordable and accessible sensors capable of properly measuring personal air pollution concentrations. Wearable sensors are advancing quickly as start-up businesses work to build low-cost sensors that cost a tenth of the price of typical scientific monitors. The available low-cost sensors have been detailed elsewhere, and although the most are not yet appropriate for use as wearable monitors, others are in development. Personal air sensors include the TZOA (http://www.tzoa.com) particle monitor (US$140 for the consumer version); the AIRBEAM (http://aircasting.org) PM2.5 monitor (US$250); the Flow (https://plumelabs.com/en/products/flow) PM2.5, NOx, O3, and VOCs monitor (price tbd); the ATMOtube (https://atmotube.com/) VOCs These sorts of monitors are comfortable to wear and link through Bluetooth to a smartphone to broadcast data online and send alerts depending on concentration levels. Given the fast development of low-cost air pollution sensors, it is critical to assure the accuracy of new sensors.[5] A recent search on crowdfunding portals such as Indiegogo, Kickstarter, or GoFundMe for "air pollution monitor" shows hundreds of new air pollution monitors under development. Other commentary and toolkits for assessing new monitors have addressed the problem of unvalidated air pollution sensors. Determining new sensors' ability to reliably detect pollutant concentrations is critical for ensuring that individual data are genuine and may be utilised for scientific study. The Air Quality Sensor Performance Evaluation Center (AQ-SPEC) was established for this aim and to educate the public about monitor performance. They compared 19 "cheap" particle detectors and ten gaseous sensors to government reference standards and found very inconsistent concordance (with R2 values ranging from 0 to 0.99). Additionally, the EPA has produced an Air Sensor Toolbox for Citizen Scientists (https://www.epa.gov/air-sensor-toolbox) that contains information on how to choose and operate low-cost portable air sensors. Once sensors have been validated and the cost and ease of use have been reduced, they are likely to be widely used by individuals outside of research studies, supplementing existing measurements available through quantified self-movement and increasing citizen science air pollution monitoring activities. CitiSense, for example, is a citizen-led air quality monitoring initiative that is establishing a sensor-based citizen observatory in

numerous cities around Europe.[6] The CleanSpace Community (https://our.clean.space/cleanspace-movement/) is another programme that makes use of a smartphone app to examine local air quality data, connects it to the CleanSpace Tag air sensor, and rewards users with "CleanMiles" for changing their travel patterns. iSPEX is another citizen science measurement approach that use a low-cost optical attachment for cellphones to determine the optical thickness of aerosols and then contributes these observations through an app to generate fine-scale spatial and temporal maps.[7] These studies demonstrate how personal air pollution measurements might ultimately be utilised for massive epidemiological analyses if high-quality personal air pollution sensors become available to the general public.

Smartphones

By enabling the gathering of personal air pollution sensors and GPS time activity data, as well as offering a platform for new kinds of air pollution health studies, smartphones will enable personal air pollution exposure evaluations at the sizes required for population-based research. There are presently 3.8 billion smartphone users worldwide, with that number expected to almost quadruple to 6.8 billion by 2022. Seventy-seven percent of adult smartphone users in the United States of America have downloaded an app, with 29 percent downloading a health-related app. Quantified-self movements, in which people employ sensors to track and improve their own health and behaviour, have also exploded in popularity. Smartphones and mHealth (defined as all mobile health technologies that can be used to advance health research, including smartphones, monitors (e.g., Fitbit), and electronic health records) are becoming increasingly prevalent in all areas of health research, providing numerous opportunities for advancing air pollution exposure assessment and epidemiology. Beyond simplifying personal exposure measurements, the most direct use of cellphones to improving air pollution exposure estimates is the collecting of time-activity patterns through GPS. The majority of users (71 percent) constantly carry and sleep with their cellphones within arm's reach. The collection and use of GPS data and time-activity patterns for the purpose of predicting air pollution exposure have been widely described elsewhere. The critical point to make here is that the general population's use of cellphones (and rising adoption of health and research applications) enables the gathering of time-activity patterns on potentially hundreds of thousands of people over extended periods of time (i.e., months to years).[8] Glasgow et al. demonstrated this utility by tracking 42 participants' GPS locations every five minutes for three months using the smartphone application "Apolus (Air, Pollution, Exposure)." While cleaning and analysing the volume of data collected by GPS presents challenges, Gonzalez et al. examined 100,000 anonymized mobile phone users for six months and observed a high degree of temporal and spatial regularity in time-activity patterns. This shows that continuous GPS tracking may not be necessary to analyse long-term activity patterns in health studies and that, for example, seasonal measures lasting a week may capture a significant portion of the time-activity variation associated with air pollution exposures. Additionally, smartphones can serve as the primary platform for conducting new air pollution health studies, including recruiting participants, obtaining electronic consent, collecting survey and biometric data, assessing outcomes, and transmitting data for linkage to other

databases, such as medical health records.[9] As an illustration, one of the critical components of the NIH precision medicine cohort initiative, which aims to recruit one million participants, is a patient technology systems center that "...taps into converging trends of increased connectivity, via social media and mobile devices, and Americans' growing desire to participate actively in medical research." To facilitate access to these technologies, new open-source platforms for developing smartphone apps and mHealth applications are being created. For instance, the open-source Apple Research Kit (https://www.apple.com/researchkit/) enables independent researchers to develop research applications, reuse code from earlier apps, and recruit participants by using the community's knowledge and reputation. In the realm of air pollution, this platform was used to construct the Asthma Mobile Health Study (AMHS) (http://apps.icahn.mssm.edu/asthma/) to evaluate asthma triggers (including local air pollution concentrations) and therapy. In the six months after its inception, the AMHS app was downloaded over 50,000 times. The study effectively demonstrated the efficacy of doing research solely via a smartphone app by correlating asthma symptoms to changes in temperature, pollen, and air pollution, including the 2015 Washington State wildfires. However, this research identified numerous limitations that may be used to influence future air pollution epidemiology studies using cellphones. These factors included selection bias, retention bias, reporting prejudice, and worries about privacy. Only 8524 of the 50,000 users who downloaded the AMHS app completed the permission procedure, and only 2317 were identified as robust users. As expected, these people were younger, whiter, richer, and more educated than those in the CDC asthma registry. Based on their experience with the AMHS app, Chan et al. concluded that studies conducted entirely through smartphone applications are best suited for studies requiring rapid enrollment, posing minimal risks, testing hypotheses within short time frames, requiring frequent data collection, utilizing passive data collection (e.g., GPS), not requiring representative samples, and utilizing an analysis plan that accounts for attrition and missing data. Several of them fit well within the context of air pollution, while others do not.[10]

Air Pollution Models

It seems improbable that continuous personal air measurements and GPS data will be obtained during the time periods necessary to capture chronic (i.e., decade-long) air pollution exposures. As a consequence, long-term exposures must be predicted using environmental models of air pollution concentrations. Other evaluations have discussed in detail the existing modelling methodologies for assessing air pollution exposure. To summarise, one of the domain's biggest assets is its capacity to harness different data sources, and with the arrival of "big data," there are tremendous chances to better air pollution modelling. One data source that is undergoing significant change as a result of new technical advancements is remote-sensed air pollution data. The availability and resolution of remotely sensed data have increased rapidly over the past decade, expanding the geographic coverage of many spatial models by giving estimates of air pollution in areas where no or extremely scarce ground-level data existed before. Satellite-derived estimates of PM2.5 that have been calibrated against ground-based monitoring data are now available at a 1 km resolution for every point on Earth. These satellite-derived air pollution measurements may

also be integrated with precise land use variables, such as emission sources (e.g., roads, population density, and land use), to predict finescale spatiotemporal patterns of air pollution. For instance, we constructed a worldwide model of NO2 concentrations with a resolution of 100 m 100 m (using satellite estimations and land use factors) that accurately predicts 54% of the variance in NO2 measured at 5220 air monitors in 58 nations.[11] Satellite-based estimates of air pollution exposure are likely to continue improving for the foreseeable future, as new technologies improve the spatial and temporal resolution of new satellites, such as the European Space Agency's Sentinel-5 and Sentinel-5P, which are scheduled to launch in September 2017. With the availability of large data sets, such as satellite-based estimates of air pollution, new data integration and modelling techniques are required. For example, machine learning is being used to integrate remote sensing data, meteorological, and ground-based observations in order to forecast daily PM2.5 levels worldwide from 1997 to 2015. These nonlinear and nonparametric modelling techniques have a number of benefits over more standard linear regression-based approaches for resolving the geographical and temporal variability of air pollution concentrations. Deep learning algorithms are also being developed for air pollution prediction, and their use to high-resolution satellite data in conjunction with other ground-based photos is anticipated to improve our capacity to forecast air pollution and facilitate continual improvement of these forecasts. Similar methods for forecasting poverty using satellite photos have also been developed. Finally, new data mining approaches are generating fresher, bigger, more diverse, and more finely resolved datasets of ambient air pollution, as well as the variables that predict these exposures, that may be used to inform sophisticated modelling of spatiotemporal air pollution concentrations.[12] The quantity of data from ground-level air monitoring that can be used to calibrate models of ambient air pollution exposure is likewise growing quickly. Hourly air quality index data, for example, can now be displayed using regulatory monitoring data from 9000 stations in 800 major cities in 70 countries (http://aqicn.org/map/world/). Additionally, nontraditional measurement sources provide novel data that may help enhance the accuracy of air pollution models. Citizen science programmes such as Citi Sense, Clean Space Community, and the iSPEX monitoring effort, all of which are listed above, provide examples of community-sourced data on air quality. Additionally, air monitors have been mounted to a variety of mobile agents in the environment, including Google Street View vehicles. These measures provide light on local sources that are often overlooked by regulatory monitoring stations, which are primarily concerned with regional population exposures.[13] In the future, these forms of community-sourced and mobile measurements will help to further minimize error in spatiotemporal models by focusing collection on high-priority space-time locations, boosting model representation, and contributing to more rigorous model assessments.

Contextual Characteristics

Contextual variables (i.e., the economic, social, environmental, cultural, institutional, and political qualities of a location) are critical for assessing the link between air pollution and health, as well as for translating research into policy and prevention. Technological advancements have enhanced our capacity to examine the contextual factors that determine individual behaviours, air pollution concentrations and exposures, health consequences (including inequities), and preventative potential. Smart cities/communities may be thought of as the context-specific version of the quantified self-concept, in which cities employ sensors and big data to quantify community traits, many of which are relevant to air pollution. To mention a few, new data streams are being generated via linked infrastructure, autonomous cars, street view images, citizen science monitoring networks, and cellphone data. For example, geo-referenced Google Street View imagery analysed using machine learning or deep learning algorithms can be used to derive a wealth of contextual characteristics relevant to air pollution exposures, such as vehicle congestion, vehicle fleet mix, street canyons, street vegetation buffers, and pedestrian traffic.[14] Additionally, cellular network data may be utilised to characterise population time-activity patterns and movement in order to increase estimates of air pollution exposure. Additionally, the volume of data presently accessible for cities enables the evaluation of several environmental and social exposures concurrently (rather than in isolation). Quantifying spatially linked exposures to air pollution (e.g., noise, green space, poverty, and exercise) is critical for understanding cumulative exposures and identifying novel preventative options. The Internet and social media are new data sources that may help capture the complex social and political contextual aspects of communities that may affect exposure to and management of air pollution. For instance, between January and March 2017, we gathered over 15 million tweets (text messages posted on the social media network Twitter) on air pollution in over 30 languages. Tweets may be correlated with regulatory-mandated air quality concentrations to study human attitudes and sentiments about air quality, self-reported changes in health and mental status, and behavioural changes attributable to air quality circumstances. Over a third of these tweets included photos that may be analysed for pollution-related properties, similar to the Google Street View imagery discussed above. While the Internet and social media are not extensively employed in air pollution research, they have been effectively used to collect context in other health studies.[15] Such societal context measures are rarely included in air pollution research, despite the fact that public awareness of air pollution risks, regulations, air pollution forecasts/notifications, and support for clean air and pollution mitigation all have an effect on the physical and psychological effects of air pollution on human health.

Challenges And Opportunities

The most significant impediment to calculating long-term human air pollution exposures continues to be data science methodologies for dealing with massive, dynamic, multi-level data. Technological improvements are propelling the big data revolution, as are the breakthroughs in data sciences required to handle this data. Estimating

personal exposure to air pollution via the integration of smartphone and air monitoring data streams, modelling air pollution concentrations, and characterization of contextual characteristics relevant to air pollution and health research will require complex and powerful data processing approaches. Recent developments in general purpose computing on graphics processing units (GPGPU) hardware and software have resulted in a huge reduction in the time needed to handle terabyte-scale data. Additionally, web systems such as Google Earth Engine, which enables petabyte-scale analysis of global satellite data (https://earthengine.google.com/), are lowering the barriers to obtaining and processing massive volumes of data. Health care and customised treatment were among the first industries to embrace large-scale data analytics. Personal exposure assessment and environmental epidemiology are extremely likely to gain similarly from advances in large-scale data science.[16] We can lower the barrier to new data science approaches by sharing data processing scripts as opensource code in creative commons communities such as GitHub (for example, see the authors' GitHub page at https://github.com/larkinandy/LUR-NO2-Model for code from the global NO2 model development), which will aid in identifying, evaluating, reproducing, and validating successful methods. The data science community's growing acceptance of open-source code sharing will promote transparency and repeatability, lowering the bar for more complicated (and integrated) exposure assessment methodologies. Additionally, the technical advancements discussed here have significant implications for precision medicine/health. While epidemiology and personal medicine/health are fast convergent, the role of air pollution exposure assessment (and environmental exposures more broadly) in this equation has not been well addressed. While the majority of precision medicine/health initiatives exclude environmental components beyond common biomarkers (e.g., lead), delivering these initiatives via apps enables the collection of GPS data (to inform modelled air pollution exposure estimates) and the inclusion of low-cost air pollution sensors.[17] Clearly, rigorous approaches (e.g., air pollution sensors, exposure algorithms) will be required to guarantee that accurate data is utilised to assess and convey individual exposures. Persons as passive participants in environmental health research (having information extracted from them) will transition to individuals as active providers of information, deciding how and with whom to share their data under both the mHealth and precision medicine/health paradigms. This will need presenting participants with useful (and practical) information in order to maintain their engagement and interest in a research project. This will need more individual environmental exposure evaluations that may be used to guide risk communication and behavioural modifications aimed at mitigating exposures. Providing participants with information about their air pollution exposures, comparisons to their cohort or local community, and guidance on how to minimise exposures will be a critical component of any mHealth or precision environmental health effort. This will provide methodological difficulties for aetiology research, since the study itself may result in behavioural changes and decreases in air pollution. This, however, opens up interesting possibilities for evaluating preventative measures, which have hitherto been restricted to air quality alerts. Ethical and privacy problems continue to be significant concerns that need serious consideration. Numerous reviews and commentary go into depth about these difficulties. Specific ethical and privacy considerations should be underlined in relation to the topics examined here. Concerns about the acquisition, storage, and analysis of GPS data raise apparent privacy concerns that must be

addressed. Equity concerns around the availability of smartphones, personal sensors, and tailored health care will also raise ethical concerns, given that poor socioeconomic groups bear the brunt of air pollution yet lack the means to capitalise on these new technology. This will also have a significant impact on the generalizability of results produced from these sorts of technologies and, in certain cases, may potentially compromise the study's conclusions owing to selection bias.[18] Since air pollution exposure research progresses toward personal measurements, distinguishing between public and commercial uses of data will become critical, as these distinctions have significant ethical consequences. Finally, there are fears that customized exposure research may divert attention away from population-based methods to mitigating the health effects of air pollution.

Conclusion

At the moment, approaches for estimating personal air pollution exposures are roughly divided into those for modelling exposures for large populations and those for measuring exposures for small populations. Air pollution sensors, smartphones, and modelling air pollution concentrations with big/new data provide enormous prospects for integrating these methodologies and improving long-term personal air pollution exposure prediction at population-based study scales. Not only is a multidisciplinary approach required to quantify personal exposures for epidemiological research, but also to identify the causes of these exposures and novel preventative prospects. While emerging technologies have the potential to improve air pollution research, ethical, privacy, logistical, and data science hurdles must be overcome before broad use occurs.

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REVIEW ARTICLE

Garden And Health In Pakistan

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Abstract

There is concern that the health care system may be unable to meet the demands of an ageing and growing population in the future. Pharmaceutical medicines, while revolutionary, are becoming more costly, and their effectiveness isn't always as high as it seems in early, ecstatically reported clinical studies. In addition, drugs are given despite the risks of side effects, which are a major cause of hospitalizations, especially for the elderly, who are underrepresented in clinical trials.

The stark difference in life expectancy across various parts of the nation underscores the reality that health is influenced by a variety of social, economic, and environmental variables.

Along with better informing patients and healthcare providers on the actual effectiveness and dangers of medicines, there are possibilities to treat certain physical and mental problems using complementary or alternative treatments, as well as promote lifestyle changes. Treatments like these have the potential to relieve the financial and administrative burden on the health care system, especially in primary care, but they should only be suggested by health experts if there is solid proof that they are helpful; many are unproven.

Green Care

So-called green care, or treatment including exposure to plants and gardening, is one category of holistic therapies that aims to heal the entire person and has undergone extensive study via surveys and randomised trials. Several studies have shown that just looking at nature or seeing pictures of it may improve one's mood and mental health.[1] Observing plants was shown to change EEG records in a research conducted in Japan and to decrease feelings of anxiety and panic, lower blood pressure, and reduce muscular tension.[2] Another research conducted in Japan showed that looking at a green hedge rather than a concrete barrier had physiological benefits.[3] The environmental psychologist Roger Ulrich conducted a ground-breaking randomised trial that found that post-operative ward views of plants and trees enhanced patients' moods, reduced painkiller usage, and decreased surgical complications and duration of stay. Patients receiving dental treatment had similar benefits, and seeing natural landscapes and listening to natural noises enhanced their bronchoscopy experience. Patients in a cancer ward who were exposed to sculpture gardens devoid of vegetation in a randomised controlled trial experienced side effects. Pain and anxiety may be reduced after surgery by showing patients photos of countryside on the walls of their rooms, whereas abstract images raised discomfort.[4] A study on the psychological impacts of art gallery visits would be fascinating! In a Swedish mental institution, paintings depicting abstract motifs were often vandalised, but rarely landscapes. Mental

health organisation MIND found that taking brief walks in a garden was better for your mental health than taking short walks through a retail complex. The results indicated that the latter was worse.[5]

Another randomised trial found that exposing post-operative patients to eight different types of indoor plants decreased both pain and duration of stay, while also improving patient satisfaction with their hospital rooms (and their overall experience in the hospital). Players' choices may be influenced by seeing images of flowers while playing the dictator game, an economic simulation that asks whether people are motivated purely by self interest. Placing plants in a computer area increased productivity while lowering blood pressure, according to another research Patients with mental health issues have found success using indoor gardening as a treatment. However, plants' benefits do not stop at their aesthetic look; their leaves filter the air of pollutants, dust, and germs, and they also release what scientists term "negative ions" from their leaves. Despite extensive advertising touting the advantages of charged ions, the data to support this claim is weak.[6]

Many studies in the UK and other countries agree that higher proportions of green space, especially biodiverse habitats, are associated with less depression, anxiety and stress, even after controlling for possible confounding factors such as deprivation. Green space is associated with longer life expectancy in Japan. Experiencing green space seems to decrease health disparities caused by poverty, but correlations cannot be used to prove a theory. This kind of research is hampered by difficult-to-disentangle residual confounding relationships between green space, greater income, better housing, and better health (like smoking less). Even while green space has been shown to increase physical activity, it's possible that it also boosts social connection.[7]

Gardens

Florence Nightingale advocated for therapeutic gardens in hospitals because they benefit patients, visitors, and hospital personnel alike. People who utilise these places report greater pleasure, which Ulrich attributes to their positive effects on stress, particularly if the areas promote biodiversity.[8]

Several hospitals and care facilities now include gardens connected to them. These gardens offer a view from the rooms as well as a place to visit. One-quarter of individuals with disabilities said gardening was one of their favourite pastimes, according to a Mintel study conducted for the charity Thrive, which promotes therapeutic and social gardening opportunities. Almost two-thirds of those polled said they had a garden, and 87% said they had access to one. In general demographic surveys, a significant majority of people believe that gardens are good for their health. Gardens like those in the National Garden Scheme and those managed by the National Trust are seeing an increase in visits. A reduced incidence of dementia and better health outcomes have been linked to gardening in many nations, and the practise has demonstrated economic advantages for mental health services, for example.[9]

Green Care Farms have become very popular in northern Europe, with hundreds of them currently existing in both Norway and the Netherlands. Those with mental health issues, intellectual impairments, or substance abuse

problems, in addition to the elderly, may be assigned to work on working farms, where they will likely be exposed to animals.[10]

The Effects of Gardening on Body and Mind

What is it about gardening that is so good for you? Exercise, social contact, and time in the sun are all part of this programme. In the summer, sunlight reduces blood pressure and boosts vitamin D levels, and the fresh fruit and vegetables that result have a beneficial effect on the body's nutritional status. In addition to restoring dexterity and muscle, gardening provides cardiovascular activity that may burn as many calories as going to the gym. Digging, raking, and mowing all burn a lot of calories, so it's no surprise that many homes have a gym attached to them. People with learning impairments and poor mental health benefit from the social contact offered by therapeutic and community gardens, which may help combat social isolation. Furthermore, the social advantages of such initiatives have been linked to a delay in the onset of dementia symptoms (an effect that might be partly due to the beneficial effects of exercise). Exercise in a garden, employing constraint treatment on a paretic leg, for example45, is more effective, pleasant, and long-lasting for patients recuperating from myocardial infarction or stroke than therapy in conventional exercise venues. Patients who like gardening may find it useful enough to pursue it as a career. There are also effective programmes that enlist volunteers to assist elderly individuals who are unable to care for their gardens, with both the volunteer and the owner benefiting from social contact, as well as the product and a shared interest, in the process.[11]

Physical inactivity is the fourth largest cause of early mortality, according to Intelligent Health, and it leads to diseases of the body and mind that may be prevented. According to the Department of Health, increasing adult activity by only 10% may delay 6,000 deaths and save the country £500 million per year. Regular, moderate-intensity exercise may help prevent dementia, as well as heart disease, diabetes, and cancers of the breast and colon. An Australian research showed that gardening was more beneficial than walking, education, or keeping a moderate alcohol consumption in preventing dementia. It raises one's self-esteem and affects the brain's electrical activity. Similarly, leisure-time moderate exercise is linked to increased longevity regardless of weight, especially when combined with exposure to natural scenes, although some studies have suggested that exercise declines with reduced cognition; a reverse causation bias. However, there is no conclusive evidence to support this.

Although high intensity exercise is beneficial, it's not required to get these results. This is fortunate since older people are less likely to engage in cycling and gym-based exercise, and these activities may be costly. As a result, engaging in outdoor activities like gardening or strolling through green areas may be beneficial for both preventing and treating disease.

Alternative treatments such as gardening and nature have a demonstrated track record of being cost efficient and widely accessible, however complementary therapies have been found to be less successful. Knitting, on the other hand, may be beneficial![12]

The Green Environment

Global air pollution has been connected to an estimated 8000 premature deaths each year, according to the 2016 RCP study on pollution. This problem is also related to a significant number of early deaths in the Pakistan. The terrible air quality in Karachi has been brought to the attention. High death rates in acute medical wards have been linked to poor air quality. Larger forests, as well as urban woods and plants in buildings, gardens, parks, and roads, may all help to balance this problem. Many poisons and particles are removed from the air by trees, which release them into the soil where microorganisms metabolise them or trap them in the hairs on the leaves that fall later in the year. The quantity of particles inside is reduced by roadside trees. In spite of their smaller leaf surfaces, evergreen trees are more efficient in the winter than their deciduous counterparts. When it comes to volatile chemicals, trees do release a range of them, but they also help to keep the air around roadways cleaner. A single maple tree, for example, can remove up to 48 pounds (22 kilogrammes) of particulates and 100 pounds (45 kilogrammes) of carbon each year, as well as harmful metals, nitrogen oxides, and sulphur dioxide. There may be a connection between living near highways and developing dementia and other health issues as a result of exposure to pollutants produced by moving cars, such as nitrogen oxides, carbon dioxide, ozone, metals, organic compounds, and variously sized particles.[13]

Hedges and other plants absorb carbon dioxide and release oxygen, helping to slow climate change. Forests alone could offset a fifth of the world's emissions of carbon dioxide due to human activity. As a bonus, they help the environment by lowering air pollution and noise, as well as cutting down on wind, water runoff, and erosion. By reducing the demand for air conditioning in buildings, shade and the evaporation of water from leaves may decrease pollution production and air conditioning use. In addition to offering a recreational area for exercise, lawns and grass can collect pollutants and pass them on to soil microorganisms. Soil pollution in industrial regions may be helped by plants. Historic tree preservation and addition are difficult since architects do not want to disturb existing trees. As a result, trees must be preserved or included in planning permission requirements, and then carefully maintained.[14]

What Can Health Professionals Do?

Exercise in the garden, green areas, parks, and the countryside should not be seen as dangerous by health care providers or their patients. But instead, they should focus on what's good for the patient's physical and mental health can do. Patients may be directed to therapeutic gardening initiatives in their communities where occupational therapists with horticulture training may assist them in managing and treating their medical conditions. Preventing disease or lessening the consequences of an existing impairment has been known as "social prescribing" or "community referral," and these practises have the potential to enhance people's physical and emotional health. Gardens can also assist to level the playing field for those with impairments, both mental and physical.

The advantages of gardening for veterans in particular have been well examined. The consequences of physical injuries, such as post-traumatic stress disorder (PTSD), may be addressed, and training for a new job in the growing horticulture sector is one option. Hospital and hospice staff should promote the creation of gardens in their facilities. Schools and jails should do the same. In order to influence the design of new health service buildings, they should try to insist that all patient and staff rooms have views of outside nature, and they should place indoor plants in atria and communal areas, as well as in surgeries and clinics, even if they are mistakenly banned from wards. Window boxes and balconies, too, may be put to productive use. In addition, health care providers should urge schools to teach gardening skills and the advantages that come with it.[15,16]

Aside from that, health care providers can urge local governments to plant more trees, since the Pakistani government alone intends to plant two million additional trees by 2025. There will have a positive impact on the environment if we have more green places like parks, gardens, and allotments. Gardens and green space abound despite our cities' seeming congestion; on average, one fifth of the land in cities is reserved for green space. Roof gardens, green walls, and hanging pots are becoming more popular, even in densely populated areas like New York and Singapore. A clean and well-maintained neighbourhood boosts community pride while reducing crime and social isolation. Green space must be emphasised in the minds of city planners, as it is in Holland.

Gardens and gardening should be integrated into hospitals and institutions to improve public health, as proposed by Pakistani Prime Minister. I believe medical experts would lead the charge in this effort.

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REVIEW ARTICLE

Effects of Noise Pollution on Human Health – A Review Article

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Abstract

Noise pollution is no longer a fresh issue for the average person, particularly in industrial areas and major urban areas. Any sound that disturbs the listener is considered a source of noise pollution. The frequency of a sound has an influence on the human psyche. From 0 to 180 dB, the human ear can detect a broad range of sound intensity. There are several ways that humans contribute to the creation of noise. Research in this article focuses on the various sources of noise pollution, the dB scale, equipment used to measure noise levels, the impacts of noise, and the adverse health effects that can result from noise pollution, as well as the control of indoor noise and the Indian penal codes to prevent noise pollution. In today's world, noise must be managed and avoided by using numerous effective ways at the source. Understanding how noise is generated, how it affects people and how it's prevented and controlled is the goal of this research.

Keywords: Noise Pollution, Hypertension, Prevention, Human being, dB scale, Impacts of noise.

Introduction

The Latin word "nausea" is the source of the term "noise," according to the Oxford English Dictionary. Noise is the result of the incorrect sound being played at the wrong time and location. Unwanted sound that is sent into the air without consideration to the potential harm it causes is what is meant by noise pollution. The same noise has not had the same effect on everyone. Individuals' sensitivity to sound varies greatly, and this varies depending on whether they are at home or at work. The decibel is the most often used unit for measuring sound intensity (dB). Some individuals have the ability to hear frequencies that others cannot. There are several sources of noise pollution, including automobiles and pedestrians in the neighborhood, television and music systems, public address systems, and electrical appliances. Noise may have a negative impact on the health of most individuals living in large cities or towns, as well as those who work in industries.

Causes of Noise Pollution

Industrialization

There are a lot of enormous machinery in the workplace that are capable of making a lot of noise. In addition, a wide range of machinery, including compressors, generators, exhaust fans, and grinding mills, contribute to the noise. This is why it is common to see factory and industry employees wearing ear plugs to reduce noise exposure.

Poor Urban Planning

Poor urban planning is also a major factor in many developing nations. Noise pollution is a result of overcrowding, big families sharing a tiny area, fighting over parking, and other conflicts over basic necessities.

Social Events

Noise levels are at their highest during most social occasions. Even if it's a wedding, a party, a tavern, or a place of worship, individuals tend to defy the laws of the area and cause a nuisance. It's not good for the health of those who live nearby when individuals blast music at full volume and dance till the early hours of the morning. You'll often see folks at marketplaces making a lot of noise in order to get people's attention.

Transportation

People find it difficult to adapt to the constant cacophony of traffic, aircraft flying above, and subterranean trains. A regular individual is unable to hear well because of the excessive level of noise.

Construction Activities

In practically every country, you may find people working on construction projects of all kinds: mining, constructing bridges and dams, stations, highways, and even flyovers. Every day, we need to build new buildings and bridges in order to accommodate more people and minimise traffic. Because of the construction equipment's noise, it's a negative.

Household Chores

We are always surrounded by technology and utilise it heavily in our everyday lives. Your quality of life and the health of the environment are greatly impacted by the noise pollution from gadgets such as your TV or mobile phone, a mixer grinder, pressure cooker, vacuum cleaner, washing machine and dryer, chiller or air conditioner. Pollution not only harms the local animals, but it also has a negative impact on human health.

Effects of Noise Pollution

Hearing Problems

Unwanted sounds that our ears aren't designed to filter might create physical issues. Our ears are able to withstand a certain amount of noise without damaging them. It is possible for man-made sounds like jackhammers and horns to be too loud for human ears to handle. As a consequence of constant exposure to high levels of noise, we might suffer from hearing loss and damage to the eardrums. We are also less sensitive to the noises that our ears take up without us realising it in order to maintain a steady rhythm in our body

Health Issues

Mental health may be negatively impacted by excessive noise pollution in workplaces, construction sites, pubs, and even our own homes. Excessive noise levels have been connected to aggressive behaviour, sleep disturbances, continual stress, weariness, and hypertension. Because of this, later in life, they may lead to more serious and long-lasting health problems

Sleeping Disorders

Noise that is too loud might disrupt your sleep and cause you to become irritated and uncomfortable. If you don't get enough sleep, you're more likely to suffer from exhaustion and perform less effectively at work and home. Taking a good night's sleep is thus suggested to offer your body the rest it needs.

Cardiovascular Issues

The prevalence of high blood pressure, cardiovascular disease, and cardiac difficulties brought on by stress is on the increase. High-intensity noise has been linked to an increase in blood pressure and heart rate by disrupting the natural flow of blood. On the basis of our knowledge of noise pollution and how we deal with it, we may be able to reduce their impact.

Trouble Communicating

Noise at high decibels may be disruptive, and it may be difficult for two people to interact. As a result, you may have a hard time comprehending what the other person is saying. A strong headache and emotional imbalance may be caused by continuous loud noise.

Effect on Wildlife

Due to noise pollution, wildlife has a far greater impact on the environment than people. Animals have a greater sense of hearing than we do because it is essential to their survival. At home, excessive loudness might have a negative impact. Pets are more aggressive in homes with a lot of noise because they feel threatened. Disorientation and behavioural issues plague them more often. As a result of hearing loss, animals are more vulnerable to predators and their numbers decline. Others become less effective at hunting, causing a shift in the ecological equilibrium. Due to human-created noise, species that rely on mating sounds to reproduce are frequently unable to hear these calls. Thus, they are unable to reproduce and the population declines as a consequence When migrating, certain animals rely on echolocation to find their path.

Table 1: Typical noise levels of various sources of noise

S/N	Sources of noise pollution	Level dB(A)
1	Air compressors	95-104
2	110 KVA diesel generator	95
3	Lathe machine	87
4	Milling machine	112
5	Oxy-acetylene cutting	96
6	Pulveriser	92
7	Riveting	95
8	Power operated portable saw	108
9	Steam turbine (12,500 kW)	91
10	Pneumatic chiselling	118
11	Quiet garden	30
12	Ticking clock	30
13	Computer rooms	55-60

Solutions

Noise pollution may be reduced by planting trees and plants near sound sources.
Noise pollution may be reduced with regular car maintenance and tune.
Noise absorption materials may be used in the walls, windows, and ceilings of a building.
Keeping the equipment lubricated and serviced is much like keeping a vehicle running smoothly.
Noise from the outside may be reduced by installing soundproof doors and windows.
Noise pollution is a public health issue that has to be addressed via public education campaigns.

Conclusion

This article examines the consequences of noise pollution on the human body and mind. In addition to motor vehicles and factories, airports, rail transit systems and public address systems also contribute significantly to noise pollution. Most of our daily actions, whether we are aware of it or not, contribute to the problem of noise pollution. Noise pollution has a negative impact on the human body, causing discomfort, loss of attention, and even hearing loss, which is often overlooked. Noise-generating sources must make an effort to lower their unwanted noise levels. The scientific ways of noise suppression may be used if it is still unbearable. Public education, government, and non-governmental organisations (NGOs) may all play important roles in the fight against noise pollution in the future.

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ORIGINAL ARTICLE

Assessment of Awareness Regarding Climate Change in Rawalpindi Medical University

Malik Shehr Yar[1], Muhammad Umar[2], Riaz Ahmed[3], Junaid Khan[4]

Abstract

Background: Climate change has emerged as one of the most pressing environmental problems in recent years. It is critical that the public's knowledge of climate change be examined before implementing mitigation solutions.

Aim: To find out how well Rawalpindi Medical University's employees and students are aware of the Climate Change.

Materials and Methods: Rawalpindi Medical University employees and students who had signed a written consent form for the survey were included in the study. When it came time to conduct the in-person interview, we used a questionnaire that had been pre-tested. There was an evaluation of responses. To conduct statistical analysis, percentages and proportions were employed.

Results: A total of 733 people over the age of 18 were surveyed in this study. 91.68% of the 672 people who took the survey agreed that the climate is changing. 81.40% of the 547 people who took the poll believe that human activity is causing climate change. 85.71 percent of the 576 people who answered the survey's questions said they were concerned about global warming. Television was the most popular medium for conveying climate change-related information (59.78 percent). UNFCC, Kyoto Protocol, and IPCC awareness was determined to be low. Deforestation was cited as the primary cause of climate change by 549 people (74.90 percent). According to 530 (72.31 percent) of the respondents, climate change is to blame for water-related difficulties. 529 (72.17 percent) of those polled said that the direct physical dangers of severe climatic occurrences are the most significant health-related effect caused by the effects of climate change. 65.21 percent of those polled (678 people) said that making lifestyle changes (63.33 percent) was the best way to combat climate change and prevent it from worsening.

Conclusion: Rawalpindi RMU workers are aware of the effects of climate change on the world as a whole. The people of Rawalpindi believe that individual actions are more essential than collective ones in reducing climate change. Advocacy initiatives to raise awareness of mitigation efforts are a good idea, according to experts.

Keywords: Awareness, climate change, community, Rawalpindi, population

Introduction

Climate change has recently risen to the top of the list of most critical environmental threats. Climate change is projected to have a devastating effect on both human and natural systems. Human lifestyles, consumerism, and actions that pollute and exploit resources in an unsustainable manner are a major contributor to climate change. Agriculture and fisheries, as well as ecosystems, are predicted to be negatively impacted by climate change.[1]

Climate change and global warming must be taught to the general populace.[2] In contrast to volunteer mitigation, volunteer adaptation is often driven by the availability of relevant information.[3] Humans and society at large will suffer unless action is taken by both the private and public sectors to combat climate change. Due to the large number of urban populations and high-risk urban environments in emerging nations, the issue of adaptation, vulnerability and coping must be addressed promptly. [4]

To address all of these issues, it is essential to gauge public understanding of climate change. Workers at Pakistan's Rawalpindi Medical University were polled to discover whether they had any awareness of this issue.

Materials And Methods:

Those who have lived in Rawalpindi from infancy were asked to participate in the current cross-sectional study at the Rawalpindi Medical University. Respondents were given a thorough explanation of the survey's goals and conditions, and the information they provided was treated with strict confidentiality. The poll included an adult who had provided written informed permission. Closed and open-ended questions were included in a pre-tested questionnaire that was used to interview each respondent in person. Epi Info 2002 statistical software was used to evaluate the data. Statistical Analysis was conducted using Proportions and Percentages.

Results

During the study, 733 participants were interviewed in person. 672 (91.68 percent) of the respondents indicated that the global climate is changing, while 547 (81.40 percent) answered that human activities are a significant role. Of the 576 persons who took part in the poll, 85.71 percent expressed worry about the effects of climate change. The most popular mediums for learning about climate change were television (59.78%), newspapers and magazines (42.11%), radio (13.39%), and the internet (11.39%). (9.23 percent). UNFCC (United Nations Framework Convention on Climate Change), Kyoto Protocol, and IPCC (International Panel on Climate Change) were not widely known, while only 33 (4.50%) were aware of the IPCC (International Panel on Climate Change). More over seven in ten people (74.90 percent) who responded to the poll believe that human activities such as deforestation are the primary cause of climate change (224) while vehicular pollution is the cause according to 60.85percent and pollution due to industries is cause according to 46.66precent.

Table 1: Factors Contributing to Climate Change

Factors	**Frequency (%)**
Deforestation	549 (74.90)
Vehicular Pollution	446 (60.85)
Industrial Pollution	342 (46.66)
*Frequencies are not mutually exclusive	

According to 530 (72.31 percent) of the respondents, climate change is the primary cause of water-related difficulties (quantity and quality). 450 (61.39 percent) of those polled said that climate change had an impact on health. In addition, 392 (53.48 percent) agricultural outputs were reduced, 321 (43.79 percent) energy-related challenges were encountered, and 144 (14 percent) natural catastrophes occurred often (19.65 percent). Climate change prevention strategy action plans should address all of these challenges.

Some 529 (72.17%) respondents said extreme climatic events were the most involve fundamental impact of climate change, leading to water illnesses 501 (68.35 percent), scalar illnesses 437 (59.62 percent), under nourishment 164 (22.37 percent), and potential dangers from natural disasters 108. (14.73 percent). Some 312 (43.79 percent) of those asked said that climate change-related challenges are same no matter where you reside; others (421 (56. 21 percent) disagreed.

According to 478 respondents (65.21 percent), the most effective way to combat climate change and avoid additional climatic changes is to make lifestyle adjustments. Climate change education and awareness, as well as greater scientific study into different elements of climate change, were ranked as the most essential factors by 400 (54.57 percent) of the respondents (45.70 percent). According to 143 (19.51 percent) of the respondents, international collaboration and partnership is also important. [Table 2]

Table 2: Strategies for mitigating climate change

Strategy	Frequency (%)
Lifestyle changes	478 (65.21)
Awareness and education	400 (54.57)
Scientific research	335 (45.70)
International partnership and cooperation	143 (19.51)
*Frequencies are mutually exclusive	

Personal and lifestyle modifications including planting and maintaining trees, utilizing non-conventional sources of energy, using public transportation systems rather than personal automobiles instead of using electricity, teaching people about mitigating climate change were cited by 210 (28.65%) respondents.

Discussion

672 (91.68 percent) of the respondents in the current cross-sectional poll said that the global climate is changing, whereas 547 (81.40 percent) of the respondents said that human activities are causing climate change. More over one-third of Indians (32 percent) believe they are aware of the effects of climate change, according to a Gallup poll conducted in 2009. This figure is consistent with prior years' findings. More urban Indians, who tend to be more educated, report being conscious of climate change than their rural counterparts. According to the United Nations, urban India has a population of 41 percent, while rural India has a population of 28 percent. [5]

Also in Brazil, China, South Africa and the United States was the Gallup poll done. Seventy-five percent of Brazilians, 41 percent of South Africans, 59 percent of Chinese, and 94 percent of Americans were aware of the issue. 5 As of October 2002, 85 percent of adults in the United States had seen, heard or read about climate change. Researchers at the University of Oklahoma conducted a six-study that found that the majority of Americans perceive and think that global warming might be an issue. [7]

More than 75% of respondents in the current study said that deforestation was the most major contributor to climate change, with 446 (60.85%) saying that automobile pollution was the second most significant contributor, followed by industrial pollution with 342 (24.85%). (46.66 percent). For Read and colleagues, the most important factors in climate change were decreased biomass (57 percent), car use (41 percent), and industrial activity (24 percent) (32 percent). [8]

People questioned said that climate change has been connected to health issues 61% of the time. According to 529 (72.17 percent) of respondents, extreme climatic events are the most significant health-related impact of climate change, followed by waterborne diseases 501 (68.35 percent), scalar diseases 437 (59.62 percent), under nourishment 164 (22.37 percent), and potential dangers due to natural calamities 108 (22 percent) (14.73 percent). Survey respondents in the United States, Canada and Malta predict environmental problems as a consequence of climate change in 60% to 80% of cases, according to our findings [9]

478 (65.21 percent) of the respondents in this study said that lifestyle improvements would be most beneficial in preventing additional climate change. Read et alresearch .'s found that 75% of respondents believe that individuals should take personal responsibility for reducing climate change. 8

In 2006, Lorenzoni and Pidgeon explored how the publics of Europe and the United States perceive climate change. Even though many individuals are concerned about climate change, the survey indicated that this problem is of secondary priority in contrast to other aspects of everyday life. Personal experience, knowledge, the balance of benefits and costs, and faith in other society actors are the most common ways in which people connect to climate

change. For this purpose, they use results from numerous research projects as well as surveys in order to examine these elements. 9

To begin, Rishi et al. say, it's important to look at how deeply individuals care about the issue's potential consequences for future generations and how emotionally invested they are in it, i.e. their affective worries. Secondly, the human psyche's cognitive components are critical. It is impossible for people to care about climate change unless they are fully informed of the nature of the problem and how it will effect them. Following cognitive comprehension and emotional concerns, there is a requirement for real action or conative component in order to address the situation. 4

When confronted with difficult choices regarding how to cope with global climate change, survey data may be useful for politicians and decision-makers. This kind of survey data may show positive or negative attitudes toward ideas, broad levels of knowledge, and anxieties or fears; but, it is less reliable in predicting actual behaviour or explaining the causes for these feelings. 10,11

There must be widespread support for the United Nations Framework Convention on Climate Change and its Kyoto Protocol if it is to succeed. U.N. environmental programme has produced a "handbook for government focal points" after a recent series of UN-sponsored workshops and its own experience in supporting outreach programmes. Increasing awareness is a shared endeavour across Africa, Asia-Pacific, Europe, and Latin America/the Caribbean. The Climate Change Convention recognises the need of incorporating stakeholders and the general public in the process of addressing climate change. Public education and awareness activities, as well as efforts by governments to ensure that the public is informed and promote public participation in addressing climate change, are essential. 12

Conclusion

Rawalpindi residents working at RMU are aware of global climate change and the role humans play in causing climate change, according to this poll. Non-scientific resources are the most common sources of knowledge. Climate change awareness was found to be lacking, according to a recent study. It's encouraging that the vast majority of responders favour personal climate change mitigation efforts. As a result, a large-scale national survey is necessary. Surveys like this one will help to provide the groundwork for climate change mitigation efforts. Additionally, it is advised that climate change awareness campaigns/programs be launched in order to better prepare for the future.

Limitation of the study

The research sample was drawn from a small geographic region, which may have influenced the results.

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ORIGINAL ARTICLE

Knowledge and Perception of Smog In Families of Employees of Services Hospital Lahore, Pakistan

Malik Shehr Yar[1], Junaid Khan[2] , Salman Haseeb Ch[3], Riaz Ahmed[4]

Abstract:

Objective: An investigation into Lahore, Pakistan's socio-demographics and smog knowledge and prevention practises is the goal of this study.

Methodology: 300 people from the city of Lahore were surveyed for this descriptive study. Research began on November 1st and lasted until December 28 of 2020. Samples were taken using a convenient sampling method. SPSS version20 was used to analyse the data. Qualitative data was analysed using descriptive statistics and the chi-square test of significance.

Results: There were 68% who were unsatisfied and 14% who were pleased with the air quality. Eighty-four percent of people were concerned about the potential worsening of the pollution situation. More than half of the people polled said that the present situation was mostly due to the actions of the residents. Sixty-seven percent of those polled said they were taking precautions at home, while just 59 percent said they used face masks outdoors.

Conclusion: Lahore residents' understanding and perception of pollution were heavily influenced by socio-demographic characteristics. Although the vast majority of respondents didn't use face masks outside, they did take precautionary precautions indoors.

Key words: Smog, Haze, Air pollution, Health practices

Introduction

One of the most critical conditions for a long and healthy life is clean air. We are unable to breathe pure air because of growing industrialisation. Every human being on the planet is at risk from air pollution. Pollution and haze have a significant influence on both physical and mental health1. Smog, a mix of fog and smoke, is an increasingly common type of Air Pollution. Carbon dioxide, nitrogen oxides and volatile organic compounds in the atmosphere are the primary sources of photochemical carbon dioxide. Gas pipes, paints, and cleaning solvents are all sources of volatile organic compounds (VOC). Smog is generated when these particles come into contact with sunlight2. Researchers in the United States looked at the connection between air pollution and mortality and found that roughly 200,000 people each year die as a result of the toxins emitted by motor cars, power plants, and the homes they heat and cook in3. Many health effects are related with smog in England, and it is not new. However, despite the fact that pollution in the United States has recently decreased, present levels are linked to negative health effects and a shorter life expectancy in low-income areas5. PM2.5 is a primary cause of death and a major contributor to the global burden of illness, according to the World Health Organization (WHO). Pollution has been linked to lung cancer in China, according to a recent research. Lahore, Pakistan's second-largest metropolis, is suffocated by haze. Smog's ill impacts have intensified significantly, according to a new study.

Smog has plagued Lahore for the last several years, causing health issues and a number of traffic accidents owing to the city's poor visibility (The News, 2016). Asthma episodes are exacerbated by itchy eyes, respiratory issues, and coughing and wheezing. C.O.P.L.D. was shown to be accelerated by air pollution, according to a study9. The goal of

this research was to learn more about how Lahore residents feel about pollution, what they know about it, and what precautions they've done to avoid it.

Methodology:

After receiving their informed permission, researchers performed this cross-sectional study on 300 people. The Institutional Ethical Review Committee gave its approval to the investigation. Researchers from Rawalpindi performed a study among SIMS Lahore's non-medical staff, using the non-probability convenient sampling approach. Close-ended questions make up the bulk of this survey. 147(49 percent) responded 10 years, 121(40 percent) agreed 3-5 years, and 32(11 percent) were hoping for improvement in the near future when asked how long it would take for air quality to improve. (Table 2). 190(63%) of the respondents blamed themselves, 69(23%) of the government, and 41(14%) of the industry for the present predicament. Social media accounted for 208 percent of all information, books and newspapers for 55 percent, expert lectures for 18 percent, and personal connections for 37 percent (12 percent).

Statistical Analysis

PSS version 20 was used to analyse the data. Analysis of the relationship between education, gender, degree of knowledge, attitude, and practise was conducted using a Chi-square test of significance Statistical significance was defined as a p-value of 0.05 or less.

Results

There were 181 female responders and 119 male respondents out of a total of 300 participants. The average person was 24.39 years old, with an additional 8.1 years added on (range 10-66). (the range is from 10 to 66). Table 1 shows that of the total, 203 people (or 67 percent) had at least a bachelor's degree (Table1). 202(68%) of the people polled were dissatisfied with the air quality, whereas 55(18%) were delighted, and 43(14%) had an average level of happiness. 84 percent of the respondents expressed worry about the possible worsening of haze.

When asked how long it would take to improve air quality, 147 percent said it would take 10 years, 121 percent said it would take 3 to 5 years, and 32 percent said it would take in the near future (Table 2). As seen in the second table. Respondents blamed themselves for 63% of the current situation, the government at 23%, and industry at 14%. Most of the information came from social media, with books and newspapers accounting for just 18% of the total (12 percent). In other words, it's a 12 percent chance.

There were 200 (67%) people adopting preventative measures indoors, and 76 (38%) people cultivating green plants inside, out of the total population. Majority Outdoor activity was decreased by 66%, weekend travel by 61% and window opening by 51% of those polled. Majority Of the 124 (41 percent) who used a face mask, 62 (50 percent)

utilised cotton face masks, while 176 (59 percent) didn't use any at all. The link between satisfaction with air quality and educational level was statistically significant (p 0.001). (Table 1). (See Table 1 for further information). Respondents' educational level was statistically significant (p=0.001) in determining how long it would take for air quality to improve (Table 2).

Table 1. Association between satisfaction with air quality and education.

		Satisfaction with air quality			Total	*p* value
		Yes	No	Maybe		
Educational status of respondents	Illiterate	1	1	0	2	0.01
	Primary Education	6	5	4	15	
	Matric	6	9	1	16	
	F Sc/A levels	11	8	10	29	
	Bachelor's Degree	25	154	24	203	
	Masters	6	25	4	35	
Total		55	202	43	300	

Table 2. Association between education and believed time frame for air quality improvement.

		Time for air quality to improve			Total	*p* value
		Short term	3-5 years	At least x10 years		0.01
Educational status of respondents	Illiterate	0(0%)	1(50%)	1(50%)	2	
	Primary Education	4(27%)	10(67%)	1(6%)	15	
	Matric	5(31%)	6(38%)	5(31%)	16	
	FSc/A levels	4(13%)	15(52%)	10(35%)	29	
	Bachelor's Degree	13(6%)	76(38%)	114(56%)	203	
	Masters	6(17%)	13(37%)	16(46%)	35	
Total		32(10%)	121(40%)	147(49%)	300	

Discussion

At its worst in November 2016, the air quality in Lahore was a result of poor vision and hazardous pollutants that resulted in several health issues, such as coughing and eye discomfort. According to our findings, 68% of respondents were unsatisfied with the current air quality, and 84% were anxious that it will become worse.

Now, Lahore is ranked as one of the most polluted cities in the world. The government and the people must work together to solve this problem. More than six out of ten people (63 percent) believe that every person is to blame for the pollution problem. This demonstrates the community's willingness to participate in finding a solution to this problem. According to a survey, people in China are more concerned about their own safety than they are about reducing air pollution. Only 11% of respondents believed that air quality will improve in the near future, while the majority said it would take three to ten years.

There was a preference for television and the internet over conventional forms of knowledge including newspapers, books, and lectures. They provide a greater range of information that is easy to obtain. Survey respondents cited the internet and television as their top sources for knowledge about pollution, with just 18% citing books and newspapers.

Asthma episodes may be triggered or worsened by exposure to pollution, as well as lung damage12. Only 41% of those polled reported using face masks when out and about, whereas 67% of those polled said they did so while staying home. Nevertheless, even with this increased knowledge, there is still room for improvement in terms of security. It is not possible to shield yourself from the haze by wearing a face mask. 13

According to the WHO Air Quality Guidelines14, the present criteria for air quality control are inadequate to safeguard public health, and the European Commission agreed. Lack of action on pollution and its consequences on health has led to a worsening of current conditions, a research by Karachi medical students found 17. Medical students in Lahore, Pakistan, were found to have a high level of understanding on smog, and their primary source of information was social media, much as our research. 18

Conclusion

The vast majority of those polled expressed displeasure with the city's air quality. In light of the anticipated worsening in air quality and its detrimental impacts on health, respondents had taken precautionary steps such as cutting down on outdoor activity, reducing weekend travel, and limiting the time windows were open; yet, a minority of respondents had used face masks.

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AUDIT REPORT

Audit of Rawalpindi Medical University's Clean and Green Initiative (Audit Report of 2019-2020)

Shazia Zeb[1], Malik Shehr Yar[2], Junaid Khan[3], Jahangir Sarwar Khan[4]

Introduction

Trees play a critical role to our existence on earth. They provide us with numerous products that we utilize in our daily lives, from food to furniture, paper to cosmetics and a host of products in between. Their aesthetic appeal is universal, and they make our world a much more beautiful space.

With ever growing zeal and zest, the Government of Pakistan has started National Planation Campaign according to vision of honorable Prime Minister Mr. Imran Khan. Considering it a obligation and in compliance to the Sustainable Development Goals, Rawalpindi Medical University started its Clean and Green Initiative Campaign. Ultimate aim of the University is to turn its Campus into a Green Campus according to the International Standards and play its role in mitigating the effects of Climate Change. RMU established Green Task Force to ensure lush green outfields, and planting hundreds of trees. The Global Climate Risk Index has placed Pakistan on the fifth spot on the list of countries most vulnerable to climate change in its annual report for 2020. RMU is playing its parts by conducting plantation campaigns, with zealous involvement of students & faculty. All allied hospitals, medical college, RMU colony are decorated with different varieties of plants.

RMU has water conservation system in place. For energy saving, RMU has reduced its energy utilization and now a Solar System is being installed.

Rawalpindi Medical University is committed to achieve the goal of 'net zero carbon emissions' by 2050.

Objectives of the Audit

Following are the major objectives of the audit:

- To introduce and aware students to real concerns of environment and its Sustainability.
- To secure the environment and cut down the threats posed to human health
- To bring out a status report on environmental compliance.

Methodology

The methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations.

Following areas are covered:

- Water management
- Energy Conservation
- Green area management

Observations

1) Water Management

Major sources of water are the Reservoir Tanks and Tube-well. Water is used in both Campuses of the university as well in the hostels. . On an average the total use of water in the University is 32,000 L/day, which include 31, 000 L/day for domestic, gardening purposes and 1500 L/day for drinking purpose. University spends millions of rupees on the purification of water to ensure clean drinking water. In Pakistan, 40% illnesses are related to use of unsafe water. Single filtration plant plant having capacity 2000L/h can provide water to 2000-3000 people.

Table 1: Cost of Filtration Plants

Plant with capacity	Cost
Chlorination/dechlorination system ($2m^3$/hr)	0.5 Million +taxes
Reverse osmosis($2m^3$/hr)	1.5Million +taxes
Ultrafiltration (UF) ($2m^3$/hr)	1.5Million + taxes
Ionization for Arsenic Removal ($2m^3$/hr)	0.5Million + taxes

Water is conserved through Tube-wells, which save around 0.5 Gallons of water per annum. Wudu water is reused for gardening and giving water to food and non-food producing plants.

Recommendations

- Gardens should be watered by using drip/sprinkler irrigation system to minimise water use.
- More focus should be on Rain Water Harvesting

2) Energy Management

It was observed that University focused on various energy conservation mechanisms. In summers, ACs were kept off from 8am to 11am (working hours 8am to 2 pm). Also, University has taken “Switch Off” initiative to Switch off the fans, lights, and screens when not in use or if switching off few fans, lights, or screen could fulfill the needs. Computers were operated in power saving mode with adjusted brightness levels. It also focused on the purchase of 5-star ACs to have efficiency and less consumption of energy. University plans to shift University Campuses on Solar Energy and for that technical requirements are being fulfilled.

Recommendations

- In campus premises electricity should be shut down from main building supply after occupancy time, to prevent power loss due to eddy current.
- Support renewable and carbon-neutral electricity options on any energy purchasing consortium, with the aim of supplying all college properties with electricity that can be attributed to renewable and carbon-neutral sources.
- It is preferable to purchase electricity from a company that invests in new sources of renewable and carbon-neutral electricity.
- Installation of LED lamps instead of CFL and replacing the old tube lights with the new LED tubes.
- Cleaning of tube-lights/bulbs to be done periodically, to remove dust over it.

3) Green Area Management

University has focused on horticulture and involved prominent figures of the health sector and the country, namely Air Chief Marshall Sohail Aman and Provincial Health Minister Dr. Yasmin Rashid, in the plantation drive to project the importance of Planting trees. University's Green Task Force and its program of 'Clean and Green Initiative' has turned the RMU's campuses along with the Allied Hospitals of RMU into Green Zones with extensive plantation appreciated by students especially and it inspired them to take part in such activities. University also celebrates Plantation Day yearly where new plants are planted. There is record of every single tree or plant that is planted with the mention of type of specie and date of plantation.

Sohail Aman
Air Chief Marshal Pakistan

Table 2: Details of Plants In RMU & Allied Hospitals

S.NO.	DEPARTMENT	TOTAL
1	RMU Old Campus	351
2	RMU New Campus	28
3	Holy Family Hospital	875
4	Benazir Bhutto Hospital	654
5	District Headquarter Hospital	344
6	RMU staff colony & Girls Hostels	695

Table 3: Plants Details At Holy Family Hospital

S. No.	Plant Name	Numbers	S. No.	Plant Name	Numbers
1.	Palkan	30	19.	Shatooat	31
2.	Lastunia	68	20.	Jangli Amlok	04
3.	Lajastunia	57	21.	Hi Bax	09
4.	Sukh Chain	132	22.	Lokatch	02
5.	Barri	07	23.	Papli	02
6.	Taali	34	24.	Jangli Ratha	10
7.	Arjun	12	25.	Jaman	05
8.	Fayqas	181	26.	Pipal	03
9.	Paam	38	27.	Cheer	09
10.	Safyda	24	28.	Khajoor	02
11.	Papular	12	29.	Bour	01
12.	Daryk	68	30.	Khachnar	01
13.	Marva	36	31.	Aam	03
14.	Chqranda	07	32.	Aro Karia	04
15.	Batel Burash	23	33.	Amrood	02
16.	Saroo	09	34.	Kali Marach	07
17.	Pila Taquma	31	35.	Khati	07
18.	Sumbal	04		Total	823

Table 4: Plants Detail At Benazir Bhutto Hospital

Sr. No.	Plant Name	Quantity	Sr. No.	Plant Name	Quantity
1.	Palkan	40	18.	Bour	01
2.	Lastonia	165	19.	Aam	23
3.	Lajistonia	69	20.	Amrood	10
4.	Sukh Chain	20	21.	Shahtoot	07
5.	Tali	13	22.	Jangli Amlok	01
6.	Faygus	82	23.	Bugam Belia	55
7.	Palm	06	24.	Rubber Plant	10
8.	Sufaida	13	25.	Din ka Raja	04
9.	Popular	06	26.	Raat ke Rani	01
10.	Darekh	42	27.	Anaar	03
11.	Batel Burash	09	28.	Injeer	01
12.	Saroo	17	29.	Motia	04
13.	Sumbal	04	30.	Lemon	01
14.	Jaman	09	31.	Malta	03
15.	Pipal	04	32.	Apple	01
16.	Cheerh	26	33.	Lokaat	02
17.	Khajoor	02		Total	654

Table 5: Plants Detail At District Headquarter Hospital

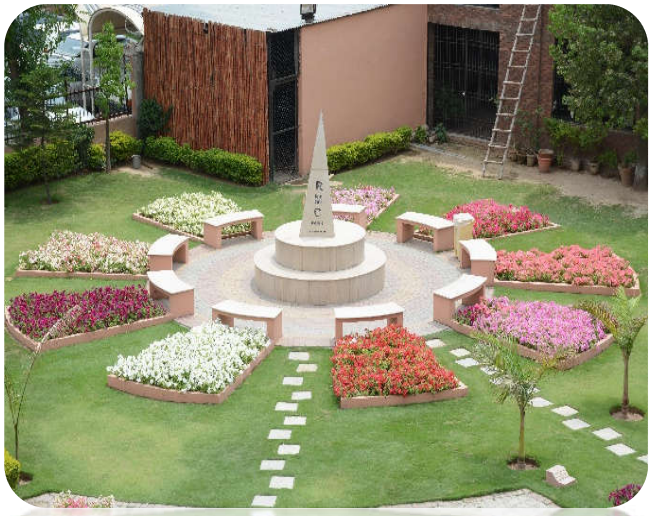
Sr. No.	Plant Name	Quantity	Sr. No.	Plant Name	Quantity
1.	Dareek	49	16.	Badaam	1
2.	Toot	21	17.	Bottle barsh	2
3.	Silver Plant	6	18.	Amlook	2
4.	Mango	19	19.	Amrade	10
5.	Sukh Chain	15	20.	Neeam	2
6.	Jaman	18	21.	Papolur	8
7.	Lasoodha	1	22.	Anar	3
8.	Rubber Plant	6	23.	Saroo	1
9.	Khajoor	4	24.	Peepal	1
10.	Sombal	6	25.	Adhoo	01
11.	Tali	4			
12.	Kachnar	1			
13.	Safeeda	33			
14.	Shafleera	3		Total	217

Table 6: Detail of Plants RMU New Teaching Block

Sr. No.	Plant Name	Quantity	Sr. No.	Plant Name	Quantity
1.	Bottle Palm	08	**5.**	Felkum	01
2.	Aerokeria	04	**6.**	Tehli	01
3.	Aestrokolia	06	**8.**	Ficus	05
4.	Eistunia	02		**Total**	**27**

Table 7: Plants Detail At RMU Old Teaching Block

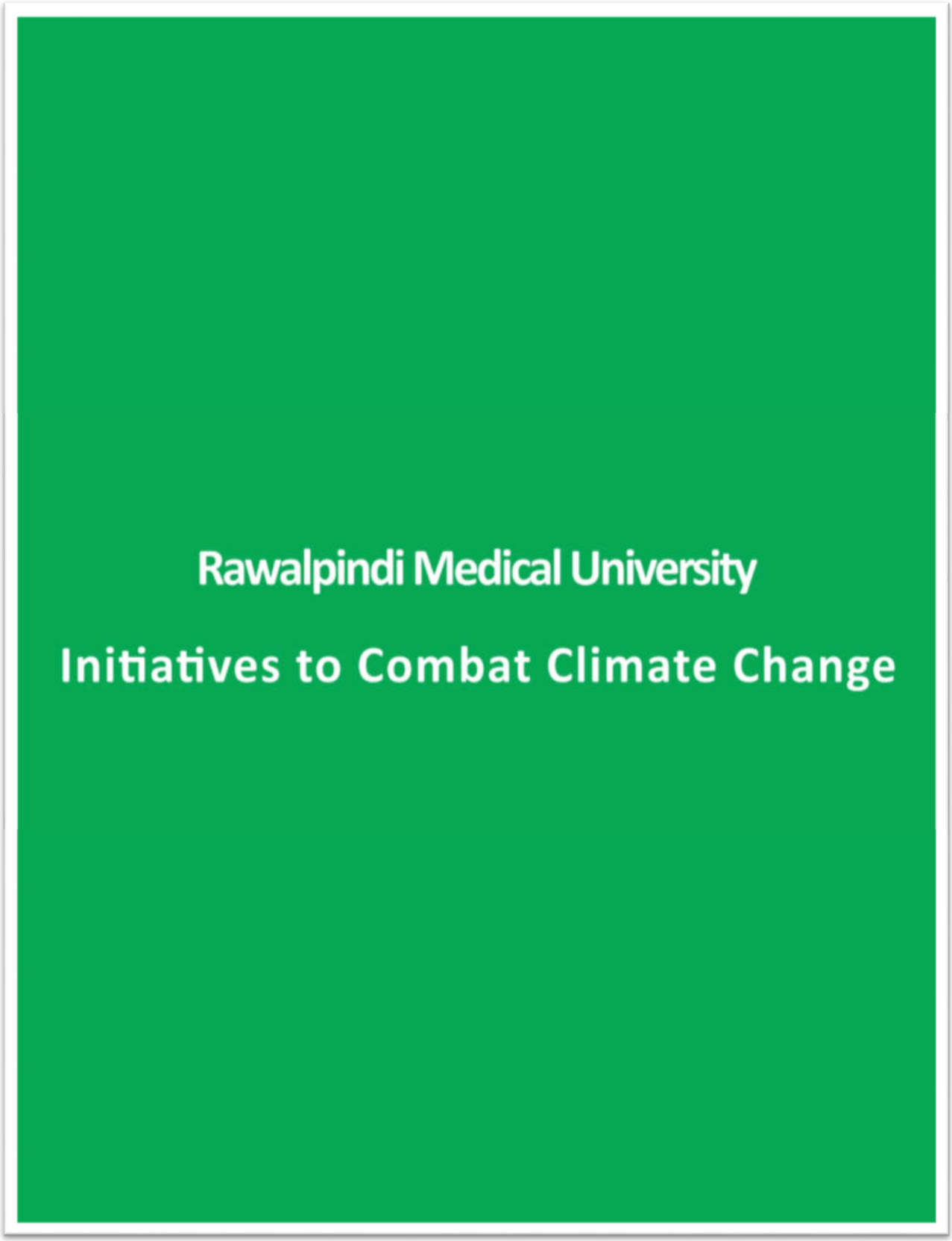
Sr. No.	Plant Name	Quantity	Sr. No.	Plant Name	Quantity
1.	Bottel Palm	17	**11.**	Alstonia	22
2.	Table Palm	23	**12.**	Sukhchain	1
3.	Sumbal	3	**13.**	Bohar	1
4.	Decorative	26	**14.**	ango	1
5.	Jecoranda	9	**15.**	Apple	1
6.	Silver Roge	9	**16.**	Safeda	70
7.	Toun	32	**17.**	Marva	1
8.	Amaltas	3	**18.**	Tahli	1
9.	Gule Chaina	6	**19.**	Shahtoot	26
10.	Darke	98		**Total**	**350**




AUDITORIUM

Recommendations

- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.
- Celebrate every year 5th June as 'Environment Day' and plant trees on this day to make the campus more Green.
- Indoor plantation to inculcate interest in students, Bonsai can planted in corridor to bond a relation with nature.
- Green library should be established.


Rawalpindi Medical University
Initiatives to Combat Climate Change

RMU Clean and Green Initiative

Seminars and Talks on Climate Change

RMU Rain Harvesting Project, RMU Main Campus

RMU Solar Energy Project