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An Analysis of Several Tree Properties and their Benefits

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ABSTRACT: ***In cities, the urban forest is a green infrastructure system that provides a variety of environmental, economic, social, and health benefits and functions. Although the environmental advantages of urban trees are widely known, no study has yet looked at how urban trees impact human health. This review offers a thorough overview of current research on the health effects of urban trees, which may be used to guide future research, policy, and nature-based public health initiatives. Keywords reflecting human health, environmental health, and urban forestry were utilized in a systematic search. The research examined had a wide range of objectives and methods, but they all point to significant health consequences linked to people's exposure to trees. This study will aid future research and practice by demonstrating why trees should be deliberately promoted as a social determinant of public health in urban forest design and management.***

KEYWORDS: ***Diversity, Forest, Health, Tree, Urban.***

1. INTRODUCTION

In cities, the urban forest is a green infrastructure system that provides a variety of environmental, economic, social, and health benefits and functions. Although the environmental advantages of urban trees are widely known, no study has yet looked at how urban trees impact human health. Air pollution, UV radiation, heat exposure, and pollen are among the issues covered in the Reducing Harm category, which accounts for 41% of research. Attention restoration, mental wellness, stress reduction, and clinical results are all part of Restoring Capacities, which accounts for 31% of the total. Birth outcomes, active living, and weight status are among the subjects covered under Building Capacities, which accounts for 28% of the total.

The research examined had a wide range of objectives and methods, but they all point to significant health consequences linked to people's exposure to trees. This study will aid future research and practice by demonstrating why trees should be deliberately promoted as a social determinant of public health in urban forest design and management [1]. From an aesthetic and practical standpoint, trees are among the most prominent natural elements in towns and cities. The urban forest is a critical component of various urban ecosystems and landscapes, as well as a kind of green infrastructure system. Individual trees, assemblages of trees in parks, groves, and extensively forested natural areas, which are distributed across public and private properties and along streets, waterfronts, railways, and riverbanks, make up the urban forest, which is made up of diverse tree species and vegetation structures [2].

In recent decades, urban forests' ecological roles and benefits have been intensively studied. Trees may reduce greenhouse gas emissions by storing carbon, reduce storm water runoff by intercepting and absorbing rainfall, and offset the urban heat island effect by lowering surface

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and air temperatures on a local scale. The connection between urban trees and human health, on the other hand, is still a work in progress. The scholarly literature on the relationship between nature and human health has exploded in recent years, focusing on urban greening, green space, open space, parks, therapeutic landscapes, and restorative settings, among other things. Reviews have consolidated knowledge of related health effects as the evidence base has grown, but many have focused widely on nature, green space, and greenness as the data base has grown [3].

In order to guide and educate planning, design, and implementation choices, more knowledge on particular characteristics of urban tree conditions and exposures is required. Local governments and other organizations are becoming more interested in promoting and improving community-based nature as a social predictor of health. Effective implementation, from a practical perspective, requires a deeper understanding of particular natural components and how they may affect health outcomes. Policy, professional personnel, and finances are often devoted to departmental administrations handling parks, trees, vegetation in rights-of-way, natural areas, or landscapes linked with development, rather than to generalities of nature [4].

While previous studies have looked at nature, green space, and greenness, no systematic study has looked at the whole body of data on the human health effects of trees in urban settings. Salmond et al. review concentrated on street trees and health, but it didn't go into detail about other types and configurations of the urban forest. This scoping review fills in the gaps in the literature by combining empirical data on how urban trees and forest experiences affect human health. Scoping reviews are used to assess "the extent, range, and nature of research activity in a topic area" and for "reconnaissance" to clarify working definitions and conceptual boundaries of a topic or field, especially when there is a large and diverse body of literature that is not amenable to a systematic review. We screened the literature across a variety of disciplines, sources, and study methods (including epidemiology, medicine, environmental and atmospheric sciences, psychology, and other social sciences), then summarized the findings in a conceptual framework that can be used to inform future research questions and methods [5].

The structure of forests and how they are used differ dramatically all across the globe. Timber production has been a unifying topic in forest research. Other forest products and services, other than wood, have increased increasing significance in recent decades. Researchers have discovered that gathering in natural woods is critical for millions of impoverished people in developing nations to survive, while individuals in developed countries have begun to recognize recreational and biological benefits. This review offers a thorough overview of current research on the health effects of urban trees, which may be used to guide future research, policy, and nature-based public health initiatives. As a result, the global trend of reducing native forests and expanding alien monoculture plantations devoted only to wood production has sparked controversy in many nations. People have called for the preservation of natural forests as well as changes to plantation forestry [6].

Using indigenous tree species and combining various types may improve the naturalness of planted forests. These two options are often addressed in conjunction. However, addressing them together may lead to misunderstanding since the processes that affect product and service

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yield are distinct. At the theoretical level, the processes of influence are similar all over the globe when the emphasis is only on variety. Despite this, I am not aware of a study that covers the majority, if not all, of the benefits and drawbacks of tree variety on the effectiveness of forestation (both reforestation and afforestation). In this brief overview, I will discuss how inter- and intra-specific tree variety affects forestation success. The goal is to classify the processes in a thorough manner and provide pertinent instances, rather than to examine all relevant material [7].

Intra-specific diversity refers to the variety between individuals within a species, whereas inter-specific diversity refers to the variability between species. This article focuses on genotypic tree variety within a forest (or stand) at a particular period, taking into account both intra- and inter-specific variation. However, some of the data provided is also relevant to environmental variability at the landscape level or through time at a specific site [8].

1.1. Benefits Of Diversity:

If the goal of forestation is to preserve tree biodiversity, it is self-evident that increasing the inter- or intra-specific variety of trees planted, seeded, or spontaneously regenerated is essential. Numerous articles make the case for biodiversity conservation, focusing on the economic benefits of variety, such as possible application in agriculture and the pharmaceutical sector, as well as ethical and aesthetic considerations. Although it is often emphasized that biodiversity must be maintained in nature in order for natural evolution to occur, it is equally essential to highlight that natural evolution is impossible without intra-specific variety.

The number of ecological niches rises as the number of tree species increases, as does the number of related species such as understory plants and animals. As a result, establishing a variety of tree species on a location not only conserves more trees, but also other creatures. While biodiversity protection helps the world as a whole, the majority of the effects of tree variety in forestation are local. Over 800 million people live in tropical forests and woods, relying on the diverse variety of food, medicinal plants, and other goods available in the forests. Smallholders who gather for their own use benefit from varied forests in the same way as foraging animals do since it is preferable for them to be able to harvest modest amounts of a variety of goods rather than an abundance of just one or two. Private forest owners, like biodiversity conservationists, may not have incentives to offer non-timber forest products to locals [9].

The hazards connected with forestation are much reduced when there is a larger variety of trees. Inter- or intraspecific diversity in biotic and abiotic stress tolerance, for example, raises the likelihood of a small percentage of trees dying but reduces the chance of all trees dying. This is advantageous since the value of a live tree increases as the number of trees left decreases, and in many instances, a percentage of trees dying is only helpful to stand growth. If little is known about the species or the site circumstances, or if the conditions are changing, diversity improves the chance that at least one species will produce well. In ecological literature, this phenomenon has been dubbed the "insurance hypothesis," particularly in connection to climate change [10].

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The danger of tree death or stagnation as a consequence of spatially distributed agents may also be reduced by diversity. Pests or diseases that need close contact to host trees cannot infect trees that are surrounded by non-host trees of the same species or genotype. Similarly, in the event of a forest fire or a severe wind, non-flammable and deeply rooted trees may safeguard their neighbours. However, trees that are readily combustible or unstable increase the danger of harm to their more resilient neighbours.

The more varied a forest is, the more random the pattern of dead trees after a disturbance should be. A spreading disturbance such as disease or fire in a monoculture frequently destroys a cluster of trees in one location while leaving other regions unaffected. If there is heterogeneity in edaphic conditions, the geographical pattern may be aggregated similarly following a non-spreading perturbation like drought. Even though the percentage of dead trees is the same, the more varied the forest is, the more random the pattern of dead trees will be, and the less damaging the disturbance will be. This is because survivors who benefit from greater resource availability as a result of their neighbour's death are more numerous, resulting in a more random and less clustered mortality pattern. In fact, their geographical distribution may resemble that of individuals who have been eliminated as a result of artificial thinning.

1.2. Disadvantages Of Diversity:

Despite the many advantages of forest tree variety in forestation, the bulk of the world's tree plantations are monocultures, with many having minimal intra-specific variation? One explanation for this is that establishing a monoculture with just one well-bred or naturally adapted and genetically restricted variation allows the best genotype of the best species to be used, while increasing diversity always necessitates the inclusion of inferior genotypes or species. Even though a mixed stand outperforms a monoculture of a well-bred variety on average, it may be beaten by a monoculture of a highly bred variety.

Allelopathy is a completely distinct mechanism. Some data suggests that chemical interactions between species have a negative impact on growth. However, nothing is known about its significance, which is probably modest. Forest management is further complicated by interspecific variety. Distinct species have different management methods, beginning with seed processing. Currently available research is often focused on commercially significant tree species with well-developed monoculture management regimes. The number of potential species combinations for mixes is endless, and the proportions of trees in the mixtures determine optimum management - just maintaining a stable mixture and keeping all of the species alive may be difficult, particularly if certain species develop faster than others.

1.3. Tree Pollen and Volatile Organic Compounds (VOCs):

We identified 40 research that looked at tree pollen and VOCs produced by trees, as well as their possible negative health consequences including exacerbating allergy, asthma, and rhinitis symptoms, as well as associated behaviour like suicidal self-directed violence. There were a variety of research types used, with cross-sectional studies being the most common, followed by time series, longitudinal/cohort, modelling, and experimental investigations. The majority of research have linked greater pollen concentrations to allergy aggravation, which may lead to increased anti-allergy medication use or hospital visits/admissions. However, many studies

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have shown that pollen concentrations alone may not predict poor health consequences since biophysical variables such as temperature, humidity, and ambient air pollution concentrations can create synergy, and there is a varied response linked with a person's age.

Pollen allergy prevalence is increasing over time, according to many time series studies. Furthermore, although pollen season lasts two to three months on average, climate change may result in greater pollen concentrations and a longer pollen season. However, not every tree pollen has the same allergy-inducing capacity; pollen sensitization levels were shown to be higher in certain tree species than in others across different geographies. Olive and silver birch trees in Spain, as well as alder and Japanese cedar trees in China, have been shown to have significant allergen city. Nonetheless, tree pollen has been shown to produce fewer allergy symptoms in certain people than other kinds of aeroallergens such interior house dust mites and other types of plant pollen like grass and weed pollen. Co-sensitivity to tree pollen and other allergens may further aggravate allergy symptoms.

2. DISCUSSION

Forest variety improves biodiversity protection, reduces risks in the production of wood and non-timber forest products, and encourages natural regeneration in restored forests. While the productivity and value of the goods produced may be raised or reduced, forest management is complicated by growing tree variety. Monocultures are thus preferred for wood production on most plantations throughout the globe. Polycultures, on the other hand, are planted when biodiversity protection is prioritized. Free access to a variety of restored forests in developing nations offers rural people with food, medicines, and other non-timber items that were previously regularly obtained from natural woods. More research, such as permanent plots on lesser-used species and growing mixes, should be conducted to alter mind-sets and encourage forest managers to utilize variety in order to address the difficulties of maintaining varied stands.

3. CONCLUSION

Using trees as a community health intervention is a long-term, even multi-decade investment. By actively putting the entire spectrum of research into practice, urban forestry and health professionals may work together to better incorporate human health outcomes into urban forestry best practices? Increased collaboration between health and environmental professionals could result in the development of evidence-based resources such as tree planting guidelines that support positive human health outcomes while taking into account site-specific characteristics and a variety of population needs (e.g., to support active living across all ages). Greater collaboration in the design process between health and environmental professionals could also help achieve the goals of co-designing for co-benefits. Trees planted primarily to improve storm water management, for example, could be configured to optimize a variety of other positive health outcomes, such as stress reduction and social cohesion.

Overall, we've discovered that being around trees has a number of health benefits. The importance of access is at the heart of this relationship. According to studies, there are frequently inequalities in tree distribution in metropolitan settings, with higher tree density observed in neighbourhoods with higher family incomes, potentially exacerbating existing

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socio-demographic health inequities. People who don't have the money to run air conditioning in their houses, for example, may live in areas that lack the cooling advantages of urban trees, making them even more vulnerable to severe heat. Adopting a health equity lens in urban forest planning and management can ensure a more equitable distribution of trees across towns and cities, as well as provide residents with access to tree-related health benefits.

The creation of more focused methods or treatments (e.g., urban greening and nature-based therapy) to optimize health benefits may also be informed by identifying who is susceptible to various health outcomes and where they live and work. Additional benefits can be gained when community members are involved in the development of these urban greening programs, such as increased civic engagement and social interaction. The majority of towns and cities have a number of conflicting financial objectives. According to our findings, urban trees may be a low-cost policy intervention with numerous environmental and human health advantages. Investing in proactive urban tree design and maintenance may pay off in both human and economic terms.

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