Park availability and major depression in individuals with chronic conditions: Is there an association in urban India?

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ABSTRACT

Green space exposure has been positively correlated with better mental-health indicators in several high income countries, but has not been examined in low- and middle-income countries undergoing rapid urbanization. Building on a study of mental health in adults with a pre-existing chronic condition, we examined the association between park availability and major depression among 1208 adults surveyed in Delhi, India. Major depression was measured using the Mini International Neuropsychiatric Interview. The ArcGIS platform was used to quantify park availability indexed as (i) park distance from households, (ii) area of the nearest park; and within one km buffer area around households - the (iii) number and (iv) total area of all parks. Mixed-effects logistic regression models adjusted for socio-demographic characteristics indicated that relative to residents exposed to the largest nearest park areas (tertile 3), the odds [95% confidence interval] of major depression was 3.1 [1.4–7.0] times higher among residents exposed to the smallest nearest park areas (tertile 1) and 2.1 [0.9–4.8] times higher in residents with mid-level exposure (tertile 2). There was no statistically significant association between other park variables tested and major depression. We hypothesized that physical activity in the form of walking, perceived stress levels and satisfaction with the neighborhood environment may have mediating effects on the association between nearest park area and major depression. We found no significant *mediation* effects for any of our hypothesized variables. In conclusion, our results provide preliminary and novel evidence from India that availability of large parks in the immediate neighborhood positively impacts mental well-being of individuals with pre-existing chronic conditions, at the opportune time when India is embarking on the development of sustainable cities that aim to promote health through smart urban design – one of the key elements of which is the inclusion of urban green spaces.

1. Introduction

Today, more than 50% of the world's population live in urban areas (WHO, 2014). Rapid and unplanned urbanization continues to reduce the availability of green spaces in people's living environments, which is unfortunate in light of accumulating evidence indicating that green environments enable recovery from urban stressors (Berto, 2014). Exposure to green spaces has been positively associated with lower mortality, better physical and mental health indicators, and higher levels of physical activity (Gascon et al., 2015a; Hartig et al., 2014; Lachowycz and Jones, 2013; Maas et al., 2009; Mytton et al., 2012; van den Berg et al., 2015; Villeneuve et al., 2012; Vries et al., 2016; Wilker et al., 2014). Green spaces have also been shown to reduce air and noise pollution, and mitigate heat island effects (James et al., 2015). The corollary that low exposure to green spaces is associated with higher prevalence of chronic conditions has been demonstrated (Astell-Burt et al., 2014a; Gascon et al.,
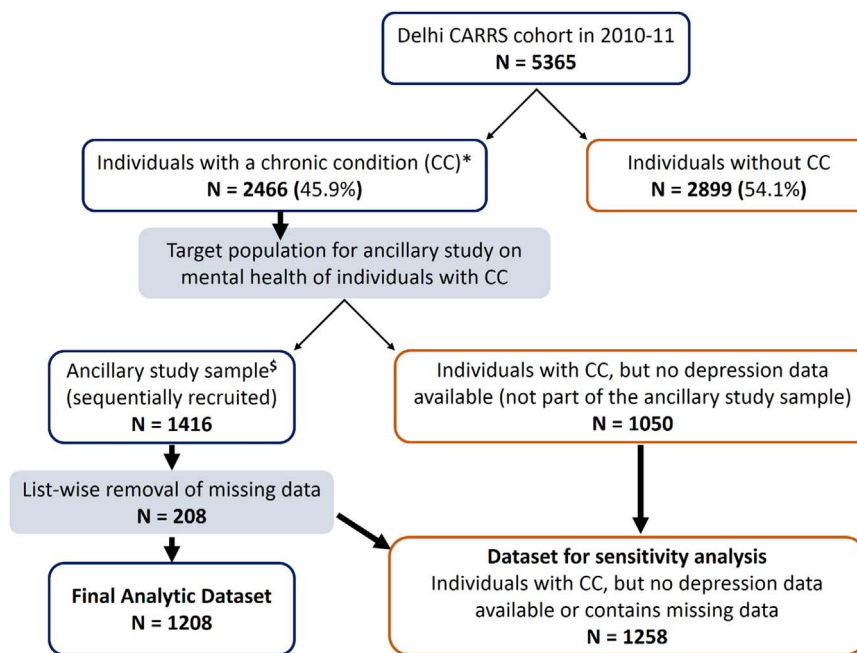
Fig. 1. Flowchart of participant recruitment.

2015b; Richardson et al., 2013b; Tamosiunas et al., 2014), particularly for depressive symptoms (Alcock et al., 2014; Beyer et al., 2014; McEachan et al., 2016).

Individuals with chronic conditions are particularly vulnerable to developing depression. For example, individuals with type 2 diabetes mellitus have twice the risk of developing depression (Katon, 2008), and an estimated 9.3–23% of individuals with one or more chronic conditions are depressed, which is significantly higher compared to the general population (Moussavi et al., 2007). However, the potential for green space exposure to buffer against major depression among individuals with a pre-existing chronic condition has not received adequate attention. This aspect is of high societal relevance to India, since chronic conditions, including major depression, account for more than 50% of the disease burden in India, which for a population of 1.2 billion people translates to more than 260 million disability adjusted life years at the national level (Global Burden of Diseases, 2015). Green spaces in the form of neighborhood parks may be a valuable buffer against depression in cities by offering a space for physical activity, lowering mental stress, and increasing one's satisfaction with the immediate living environment. However, rapid socioeconomic development in Indian metropolitan cities is leading to shrinking green spaces, the impact of which is hitherto unknown. Therefore, understanding the potential mitigating role of green spaces on mental health in urban India is particularly relevant.

This study aims to fill two important gaps in the available literature. First, most studies on the association between green space exposure and health are based in high income countries. It is unknown whether green space exposure impacts physical and mental health in large urban metropolises of low and middle income countries (LMICs) like India, whose socio-cultural and socio-economic milieus are very distinct and diverse, currently experiencing rapid rates of unplanned urbanization and shrinking green space, and where urban stressors (crowding, noise, traffic), the burden of disease and related risk factors, as well as health inequalities are more severe than in high income countries (Glaeser, 2014; Nambiar et al., 2017).

Second, given India's low per capita income and large income disparities prevalent in metropolitan cities, another set of findings compel inquiry in the Indian context. Prior studies have indicated a stronger association between green space exposure and mental health among low SES groups compared to high SES groups (Maas et al.,

2009; van den Berg et al., 2015). Green spaces have also been shown to buffer mental-health inequalities of individuals with varying levels of economic hardship (Mitchell et al., 2015). Empirical evidence generated from India on this topic would not only enable comparisons with studies based in high income countries, but also provide alternate solutions to pressing public health needs of the country.

In this study, we specifically assess the association between park availability and major depression among individuals with one or more chronic conditions in Delhi, India - one of the largest metropolitan cities in the world undergoing rapid rates of unplanned urbanization, and providing an excellent example of an urban setting with environmental, health and social stressors typically found in the Indian subcontinent. As a secondary objective, we also explore if there is evidence to indicate that physical activity, mental stress, and satisfaction with the neighbouring environment mediates the association between park availability and major depression.

2. Methods

2.1. Study design and sample

We utilized data from the baseline cross-sectional survey of the Centre for Cardio-Metabolic Risk Reduction in South Asia (CARRS) study. Details of CARRS surveillance protocol, indicators and study instruments have previously been published (Nair et al., 2012). Briefly, CARRS is a multi-centre (Delhi and Chennai, India and Karachi, Pakistan) study that collected data on cardio-metabolic disorders, their risk factors (central obesity, insulin resistance, glucose intolerance, dyslipidaemia), associated morbidity and mortality, socio-demographic characteristics and physical activity, in non-pregnant adults aged ≥ 20 years. Baseline data was collected in 2010–11 through questionnaires, laboratory estimates of biological samples and anthropometric measurements. Data was collected from at most 20 households from each primary sampling unit (municipal wards in Delhi and Chennai; census enumeration blocks in Karachi), selected using a multistage cluster random sampling technique. The average population size of the primary sampling units (wards) in Delhi was ~ 30,000.

The sample for this study was drawn from a Delhi-only ancillary study designed to estimate the prevalence of Axis I psychiatric disorders among individuals with an underlying chronic condition