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Original Study

The Prevalence and Correlates of Frailty in Urban and Rural Populations in Latin America, China, and India: A 10/66 Population-Based Survey

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A B S T R A C T

Background: There have been few cross-national studies of the prevalence of the frailty phenotype conducted among low or middle income countries. We aimed to study the variation in prevalence and correlates of frailty in rural and urban sites in Latin America, India, and China.
Methods: Cross-sectional population-based catchment area surveys conducted in 8 urban and 4 rural catchment areas in 8 countries; Cuba, Dominican Republic, Puerto Rico, Venezuela, Peru, Mexico, China, and India. We assessed weight loss, exhaustion, slow walking speed, and low energy consumption, but not hand grip strength. Therefore, frailty phenotype was defined on 2 or more of 4 of the usual 5 criteria.
Results: We surveyed 17,031 adults aged 65 years and over. Overall frailty prevalence was 15.2% (95% confidence inteval 14.6%–15.7%). Prevalence was low in rural (5.4%) and urban China (9.1%) and varied between 12.6% and 21.5% in other sites. A similar pattern of variation was apparent after direct standardization for age and sex. Cross-site variation in prevalence of frailty indicators varied across the 4 indicators. Controlling for age, sex, and education, frailty was positively associated with older age, female sex, lower socioeconomic status, physical impairments, stroke, depression, dementia, disability and dependence, and high healthcare costs.
Discussion: There was substantial variation in the prevalence of frailty and its indicators across sites in Latin America, India, and China. Culture and other contextual factors may impact significantly on the assessment of frailty using questionnaire and physical performance-based measures, and achieving cross-cultural measurement invariance remains a challenge.

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Conclusions: A consistent pattern of correlates was identified, suggesting that in all sites, the frailty screen could identify older adults with multiple physical, mental, and cognitive morbidities, disability and needs for care, compounded by socioeconomic disadvantage and catastrophic healthcare spending.
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According to a 2012 systematic review, prevalence of frailty in high income countries varies substantially among studies, with different operational definitions of frailty contributing to heterogeneity.[1] When restricted to studies using the frailty phenotype,[2] weighted average prevalence was 9.9% [95% confidence interval (CI) 9.6–10.2]. In the Survey of Health, Aging and Retirement in Europe, overall prevalence for those aged 65 years and over, according to a modified Fried phenotype was 17.0%, ranging from 5.8% to 27.3% by country, and increasing from Northern to Southern Europe.[3] Excluding those with difficulties in performing activities of daily living, prevalence ranged from 3.9% to 21.0%. Until recently, there have been few studies of frailty in low- and middle-income countries. However, a 2016 review of studies from Latin America and the Caribbean identified 21 publications,[4] with an overall frailty prevalence of 19.6% (95% CI 15.4%–24.3%). Studies from the multicountry Survey on Health, Well-Being, and Aging in Latin America and the Caribbean (SABE) project,[5] Mexico,[6] Costa Rica,[7] and Peru[8] all suggest a higher prevalence in Latin America than has been observed in high-income countries, consistent with studies of Hispanic populations in the United States.[9] Conversely, findings from the nationally representative Chinese Health and Retirement Longitudinal Study suggest a lower prevalence of frailty (7.0% of those aged 60 years and over), higher in rural regions, and in the economically disadvantaged North West of China.[10] Studies from high-income countries in north America and Europe suggest an increasing prevalence of frailty with older age,[2,3,11] a higher prevalence in women compared with men,[1–3] and an inverse socioeconomic gradient,[2] with similar findings from studies from Latin America,[5,6,8] and China.[10]

There have been few cross-national studies of the prevalence of frailty and its indicators using common standardized assessments in all settings. The validity of comparisons across separate studies conducted in different countries is doubtful, given the variable operationalization of the frailty phenotype.[12,13] We, therefore, set out to present prevalence data from rural and urban catchment area sites in 6 countries in Latin America, and in India and China, where 4 of the 5 frailty phenotype indicators were applied using a uniform methodology and consistent training of research workers. We explore cross-site variation in prevalence after standardizing for age and sex, and in the sociodemographic and health correlates of frailty. We examine the independent association of frailty with healthcare spending and costs. We have previously published on the predictive validity of the frailty phenotype and its indicators in these sites, which, other than exhaustion, reliably predicted the onset of dependence and mortality independent of sociodemographic variables, diagnoses, and disability.[14]

Methods

Settings and Study Design

We conducted catchment area surveys of participants aged 65 years and older in urban sites in Cuba (Havana and Matanzas), Dominican Republic (Santo Domingo), Puerto Rico (Bayamon), Venezuela (Caracas), and urban and rural sites in Peru (Lima and Canete), Mexico (Mexico City and Morelos state), China (Xicheng and Daxing), and India (Chennai and Vellore). For convenience, these sites are referred to subsequently by their country and urban or rural location. The protocols for the 1-phase surveys, comprising; a clinical interview; a health, medical history, healthcare utilization and lifestyle interview; a cognitive assessment; a physical examination; and an informant interview are detailed elsewhere.[15,16] Recruitment was by signed informed consent. Studies were approved by local ethical committees, and the King's College London Research Ethics Committee.

Measures

Full details are available elsewhere.[15] Here we summarize the measures directly relevant to the analyses presented in this article.

Frailty

The physical frailty phenotype proposes 5 frailty indicators (exhaustion, weight loss, weak grip strength, slow walking speed, and low energy expenditure). Individuals are frail if they meet 3 or more of the 5 criteria, prefrail if they meet one or 2, and nonfrail if they meet none of the 5 criteria.[2] We assessed 4 of the 5 indicators of frailty, but using a slightly different operationalization to those originally proposed[2] for exhaustion, weight loss, and energy consumption, and omitting hand grip strength. Exhaustion was assessed using an item (Q.48.1) from the Geriatric Mental Status (GMS) structured clinical interview[17]; those reporting feeling worn out or exhausted were considered to have this frailty. Self-reported weight loss was assessed using item (Q53.1) from the GMS, those reporting weight loss of 10 lbs (4.5 kg) or more in the last 3 months were considered to have this frailty. Slow walking speed was assessed using a timed walking test (5 meters at usual speed, turn, and return to the starting point) with the slowest fifth in each catchment area subpopulation within each sex and height stratum (divided by median height for sex) considered to have a slow walking speed. For sensitivity analyses, we used an alternative population independent approach, applying the same cutpoint of 16 seconds or longer to complete the task across all sites, allowing 3 seconds to make the turn; this corresponds to a walking speed of $<$0.8 m/s. Those who rated themselves as "not at all physically active" in response to the question "Taking into account both work and leisure, would you say that you are; very, fairly, not very, or not at all physically active?" were considered to have low energy expenditure. As handgrip strength was not measured we considered participants frail if they fulfilled 2 or more of the 4 frailty indicators; for the overall frailty criterion, the effect is the same as imputing a value of 1 for handgrip strength.

Healthcare utilization and costs

Details of healthcare cost estimations are provided elsewhere.[18] Participants were asked about contacts with primary healthcare professionals, public hospital doctors, other publically provided professionals, and private healthcare services (private doctors, dentists, and traditional healers). For each service, participants were asked how often they had used it in the last 3 months, the duration of the consultation, and fees for the service. Travel costs were also elicited. Lengths of stay and out of pocket costs for hospital admissions, and total costs of medication paid out-of-pocket for any of these services were also recorded. Out-of-pocket costs comprised the total annualized payments made by healthcare service users. Total costs from a public perspective reflect the actual cost to the provider, regardless of financing, including staff salaries, facilities

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