



## Multimorbidity and perceived stress: a population-based cross-sectional study among older adults across six low- and middle-income countries



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### ABSTRACT

**Background:** Stress in chronic conditions or multimorbidity ( $\geq 2$  chronic conditions) has been reported to affect clinical outcomes but there are no studies on the association between stress and chronic conditions/multimorbidity among older adults in low- and middle-income countries (LMICs). Thus, we investigated this association among adults aged  $\geq 50$  years across six LMICs.

**Methods:** A cross-sectional analysis using data from the World Health Organization's Study on Global Ageing and Adult Health (China, Ghana, India, Mexico, Russia, South Africa) was conducted. A perceived stress score [range 0 (lowest stress) – 100 (highest stress)] was computed based on two questions from the Perceived Stress Scale. Thirteen chronic conditions were assessed. Multivariable linear regression analyses were conducted.

**Results:** 34,129 adults with a mean age of 62.4 (SD = 16.0) years (52.1% females) were included. Overall, 56.6% (95% CI = 55.0%–58.2%) had multimorbidity. In the adjusted model including all countries, compared with those with no chronic conditions, higher numbers of chronic conditions were significantly associated with higher stress levels, dose dependently. In a countrywide meta-analysis, multimorbidity was associated with significantly higher stress levels in all countries (especially India and Ghana) although characterized by moderate heterogeneity ( $I^2 = 54.6\%$ ). For single chronic conditions, notably high stress scores were observed for depression, stroke, and hearing problems.

**Conclusion:** Chronic conditions and multimorbidity are associated with higher levels of stress in older adults in LMICs. Given that perceived stress and chronic conditions are collectively associated with worse health outcomes, low-cost, population-level integrated interventions to address stress among those with chronic conditions are urgently needed.

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## 1. Introduction

The recent Lancet Global burden of disease series confirm that whilst the average life expectancy continues to increase, the numbers of years lived with disability are also increasing [1,2]. Of particular concern are the rising number of chronic conditions, such as chronic low back pain, arthritis, diabetes and chronic respiratory conditions which are associated with considerable disability-adjusted life years and healthcare utilization [3–5]. With population ageing, people are now more likely to have multiple chronic conditions simultaneously, a condition often referred to as multimorbidity [6]. Indeed, recent studies have suggested that between 13 and 72% of the general population has multimorbidity [7,8], thus posing one of the greatest challenges in healthcare to our ageing population [6,9]. Multimorbidity is an important risk concept given its associated high healthcare costs, decreased quality of life and ultimately increased mortality [10,11].

To date, most of the research investigating multimorbidity has been limited to a single country and a paucity of data exists from low- and middle-income countries (LMICs). Clearly, this limits the representativeness of the research, and a lack of research considering multimorbidity in LMICs is a concern, given the fact that an increasing proportion of the world's population resides in this setting and the average age continues to rise in this region [12]. Moreover, there is increasing recognition that there is a rising burden of the number of chronic conditions in LMICs, yet the healthcare systems are not well equipped to deal with this public health demand [13].

Research has also started to consider the mental or emotional health burden of multimorbidity, such as perceived stress [14], a state in which one perceives their life situations stressful [15]. The relationship between some single chronic conditions and perceived stress has been investigated to date, partly driven by the potential deleterious influence of stress on the patient's treatment outcomes and wellbeing. For instance, in patients with asthma, arthritis, chronic back pain or diabetes, stress may intensify the effect of illness by increasing pain, functional limitations, and disability, as well as decreasing adherence to medical treatment protocols [16–18], all of which may further exacerbate stress [19].

Surprisingly, a paucity of multinational research has considered the relationship between multimorbidity and perceived stress. This is an important research gap given that a previous national Danish study identified that perceived stress may contribute to the heightened mortality in those with multimorbidity [11]. Previous research has suggested that multimorbidity is high in LMICs [14,20] and perceived stress levels are high due to considerable economic, environmental and health uncertainties, including less access to physical health care. Thus, this adds to the pressing need to explore this relationship within this context in older adults. One recent study reported the association between chronic conditions, multimorbidity and perceived stress in LMICs using data from the World Health Survey [14]. Whilst novel, the data were older and the study was not restricted to older adults, who are the population typically with the highest levels of chronic conditions and multimorbidity. Furthermore, data from China, India, and Russia, which collectively comprise a large proportion of the global population were not nationally representative. In addition, individual country estimates were not provided despite the potential between-country differences in factors (e.g., underlying disease profile, availability of health insurance and optimal treatment) that may influence stress levels associated with chronic conditions or multimorbidity. Finally, due to a lack of data, important chronic conditions such as hypertension, stroke, and chronic obstructive pulmonary disease (COPD), which are major contributors to the global disease burden [21], could not be included in the previous analysis.

Given the aforementioned gaps in the literature, the aim of the current study was to assess whether a variety of chronic conditions and multimorbidity are associated with higher perceived stress levels among community-dwelling older adults using nationally

representative data from six LMICs (China, Ghana, India, Mexico, Russia, South Africa) which broadly represent different geographical locations and levels of socio-economic and demographic transition.

## 2. Methods

### 2.1. The survey

Data from the Study on Global Ageing and Adult Health (SAGE) survey was analyzed. This dataset is publicly available through the World Health Organization (WHO) website (<http://www.who.int/healthinfo/sage/en/>). The survey was undertaken in China, Ghana, India, Mexico, Russia, and South Africa between 2007 and 2010. Based on the World Bank classification at the time of the survey, Ghana was the only low-income country, and China and India were lower middle-income countries although China became an upper middle-income country in 2010. The remaining countries were upper middle-income countries. Details of the survey methodology have been published elsewhere [22]. In brief, in order to obtain nationally representative samples, a multistage clustered sampling design method was used. The sample consisted of adults aged  $\geq 18$  years with oversampling of those aged  $\geq 50$  years. Following a common research protocol across countries, trained interviewers conducted face-to-face interviews using a standard questionnaire to collect information. The questionnaires were translated from English into the local languages, following the WHO translation guidelines. All interviews in Mexico were completed using a computer-assisted personal interview (CAPI), while a paper and pencil interview (PAPI) was used in the remaining countries with the exception of China where both CAPI and PAPI were used. The interviewers also conducted measurements of weight, height, and blood pressure. A stadiometer and a routinely calibrated electronic weighting scale were used to measure height and weight respectively. Blood pressure was measured three times with a one-minute interval using a Boso Medistar Wrist Blood Pressure Monitor Model S.

If a respondent was unable to undertake the interview because of limited cognitive function, then a separate questionnaire was administered to a proxy respondent. These individuals were not included in the current study. The survey response rate ranged from 51% (Mexico) to 93% (China). Sampling weights were constructed to adjust for the population structure as reported by the United Nations Statistical Division. Ethical approval was obtained from the WHO Ethical Review Committee and local ethics research review boards. Written informed consent was obtained from all participants.

### 2.2. Perceived stress (Outcome)

In line with previous publications [14,23,24], we assessed perceived stress in the last month with the use of two questions which were taken from the Perceived Stress Scale [25]. This validated scale has been widely used to measure perceived stress worldwide. The questions asked were: "How often have you felt that you were unable to control the important things in your life?"; and "How often have you found that you could not cope with all the things that you had to do?" The answer options to these questions were: never (score = 1), almost never (score = 2), sometimes (score = 3), fairly often (score = 4), very often (score = 5). As in a previous study which used the identical questions to measure perceived stress [14], we conducted factor analysis with polychoric correlations to incorporate the covariance structure of the answers provided for individual questions measuring a similar construct. The principal component method was used for factor extraction, while factor scores were obtained using the regression scoring method. These factor scores were later converted to scores ranging from 0–100 with higher values indicating higher levels of perceived stress [14].

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