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Rates and predictors of three-year mortality in older people in rural Tanzania

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ABSTRACT

Background: There are few data on mortality rates in the general elderly living in sub-Saharan Africa. We aimed to detail three-year mortality rates in a population of rural community-dwelling older adults in northern Tanzania.
Methods: We performed a community-based study of 2232 people aged 70 years and over living in Hai district, Tanzania. At baseline, participants underwent clinical assessment for disability, neurological disorders, hypertension, atrial fibrillation and memory problems. At three-year follow-up mortality data were collected. Mortality rates were compared to UK estimates.
Results: At follow-up, data were available for 1873 subjects (83.9%). Of those, 208 (11.1%, 95% CI 9.7–12.5) had died. The age-standardised mortality rate was 10.2% (95% CI 8.8–11.6). Age-standardised mortality rates were lower than estimated for the UK (13.9%). In Cox regression analysis, greater age, higher levels of functional disability, use of a walking aid, subjective report of memory problems, being severely underweight and being normotensive were significant predictors of mortality.
Conclusions: Those who survive to old age in Tanzania appear to have relatively low mortality rates. Physical and cognitive disabilities were strongly associated with mortality risk in this elderly community-dwelling population. The association between blood pressure and mortality merits further study.
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1. Introduction

It is widely acknowledged that many countries in sub-Saharan Africa (SSA) are undergoing a transition in terms of the demographic profile of the population and also in terms of the profile of major diseases (Salomon et al., 2012). This has the potential to transform the nature of health service need across the region, with a change from a situation of high infant mortality, low life expectancy and health services geared towards the treatment of the acute effects of communicable diseases, such as HIV/AIDS, malaria and tuberculosis, to the long term management requirements of chronic non-communicable disease in the elderly (Reidpath & Allotey, 2012; Salomon et al., 2012). Robust epidemiological data from countries in SSA are needed to inform health service planning. Data are needed on health outcomes in the general population to allow disease specific data to be framed appropriately (Wang et al., 2012).

Tollman et al. (2008) have discussed the possible impact of changing trends in mortality on healthcare provision in Agincourt, South Africa. They followed a cohort of 70,000 people of all ages from 1992 and recorded 6153 deaths over a ten year period. Non-communicable disease accounted for 37% of all deaths in those aged 50 years and over. The authors noted that despite increases in deaths due to infectious diseases over the study period, the burden of non-communicable diseases remained high. The number of subjects requiring long-term care in 2002 was disproportionately higher compared to those requiring acute care, suggesting an increase in chronic disease burden over the 10-year period. Another study from Agincourt looked at the role of social conditions and disability on mortality in people aged 50 years and over. Mortality was associated with lower quality of life and fewer household assets, increased disability and being single (Gomez-Olive et al., 2014).

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The Global Burden of Disease study has shed light on age, sex and disease-specific mortality rates in 187 countries worldwide between 1990 and 2010. Furthermore the World Health Organization Study of Ageing (WHO-SAGE) is currently collecting data on mortality in Ghana, South Africa, Mexico, Russia, India and China (He, Muenchrath, & Kowal, 2012). However, there are currently very limited data in cohorts of older adults in SSA.

The aim of this study was to report three-year mortality rates, and identify predictors of mortality, in a cohort of community-dwelling elderly people living in rural northern Tanzania.

2. Methods

Ethical approval for the study was obtained locally from Tumaini University ethics committee (reference number: 283) and nationally from the Tanzanian National Institute of Medical Research (reference number: NIMR/HQ/R.8a/volIX/962).

2.1. Setting

The Hai district of northern Tanzania is located on the southern side of Mount Kilimanjaro and includes a Demographic Surveillance Site (DSS). The population census within the DSS, completed on 1st June 2009, recorded the population of the 52 villages as 161,119, of whom 8869 were 70 years and over. Villages within the district are classified as upland or lowland depending on their topography. Most villages within the DSS are served by either a small health centre or a dispensary supplying basic treatments. There are three small hospitals in the district, and a tertiary hospital in the adjacent district. The DSS is broadly representative of the rural population of Tanzania; people live within large family units, with the majority being subsistence farmers and daily activities consist of work on their shamba (small holding), running the household and taking care of family members. They have little disposable income and for financial, diagnostic and supply reasons few are on regular medication (Adult Morbidity and Mortality Project (AMMP), 2004).

2.2. Baseline identification of the study population and data collection

Data were collected between 1st November 2009 and 31st July 2010. The point prevalence date was the 1st January 2010 (Dewhurst et al., 2013). Collecting accurate information on patient age can be difficult in SSA, as few people have a birth certificate (Adult Morbidity and Mortality Project (AMMP), 2004). Age was calculated from birth year and confirmed using memory prompts. This method has been validated and shown to be accurate to within three years (Paraiso et al., 2010).

We planned to see one-quarter of the entire population aged 70 years and over in the DSS. Using a random number generator, 12 villages, with a total census population of 2425 aged 70 years and over, were selected. After exclusions, refusals and additions the final cohort was 2232 people. Participants were seen at a place of their convenience (village health centres or patients' houses). Signed informed consent was obtained from each participant. In cases where patients were unable to consent due to cognitive impairment, written consent was obtained from a close relative.

2.2.1. Assessments

Age, sex, height, weight and use of any walking aids were recorded. Height was measured without shoes on using a steel tape measure. Weight was measured without shoes, but fully clothed using a set of weighing scales. Most people wore only light clothing. The majority of men wore shirt and trousers, whilst women were in kangas (two pieces of light cloth wrapped around body) with a vest underneath. A BMI of <20 was taken as an indicator of under-nutrition, a BMI of <18.5 as severe under-nutrition and a BMI of >25 as overweight (World Health Organization Expert Committee, 1995).

The Barthel index (BI) was completed. This was through interview with the patient, or next of kin if the patient was unable to reliably answer the questions due to cognitive impairment. The BI is an ordinal scale which asks questions regarding ten activities of daily living (ADL) with questions given varying weights and the total score ranges from 0 to 20 (Mahoney & Barthel, 1965). It is culturally and disease non-specific and simple modification allows easy use in low-income countries. Thus, direct comparison between disability levels worldwide can be made. It has good inter-rater reliability and can be consistently used in all disorders that result in physical disability. The BI was translated into Swahili and back-translated to ensure accuracy. Local census enumerators were trained in its use. Efforts were made to make it culturally non-specific by minor modification of one question; ability in climbing stairs was changed to ability to walk up a steep hill. Heslin et al. (2001). define severe, moderate and mild or no disability as a BI of less than 15, 15–18 and 19 or 20, respectively. We utilised these cut-offs in our analyses (Dewhurst, Dewhurst, Gray et al., 2012; Kisoli et al., 2015).

All study participants underwent 12-lead electrocardiography (ECG) (performed by research doctor or trained local worker) using a GE MAC 1200 (GE Healthcare, Amersham, UK). Two research doctors diagnosed atrial fibrillation/flutter (AF) according to the definitions provided by the European Society of Cardiology guidelines (Camm et al., 2010). Full details of the prevalence of AF in Hai have been published (Dewhurst, Adams et al., 2012).

A validated neurological screening instrument (consisting of 21 questions with a high sensitivity and specificity) followed by neurological history and examination (to confirm or refute a neurological diagnosis) and further validation by a neurologist, movement disorder expert or geriatrician identified cases of neurological disease (Dewhurst, Dewhurst, Orega et al., 2012). These were diagnosed based on WHO ICD 10 and other specialist classifications (World Health Organization, 2001a). To provide data on cognitive function participants (or their next of kin) were asked two questions, '*Do you have persistent problems understanding not because of a hearing problem? Has there been deterioration in your memory that stops you doing your normal daily activities without assistance?*' For the purposes of this study, a positive answer to either or both questions was taken as evidence of memory problems. These two questions were designed as a practical and simple screen for memory problems within our cohort in the context of the current study. They were not designed to provide a formal diagnosis of cognitive problems.

Blood pressure (BP) was recorded in the right arm using an appropriately sized cuff, with the arm supported at the level of the heart. In accordance with the World Health Organization (WHO) (2001b) STEPS protocol, three measurements were taken in the sitting position one minute apart after five minutes resting quietly, with an average taken of the last two readings. If there was greater than 10 mm Hg difference in either the systolic and/or diastolic readings comparing the second and third recordings, further readings were taken until two consecutive measurements were concordant within this range. A newly-calibrated A&D UA-767^{TM} (A&D Instruments Ltd., Abingdon, UK) BP monitor was used to record BP (Rogoza, Pavlova, & Sergeeva, 2000). Hypertension was defined as BP $\geq$ 140 mm Hg systolic, or 90 mm Hg diastolic, pressure, or currently receiving anti-hypertensive medication with a BP $<$ 140/90 mm Hg. Hypotension was defined as BP $\leq$ 90 mm Hg systolic, or 60 mm Hg diastolic, pressure (Williams et al., 2004).

Patients were also asked if they had any known visual problems or whether they had diabetes, though no formal testing for the presence of these conditions was conducted.

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