Prevalence and associated factors of depression among older adults in rural Tanzania

Research Report

Presented in fulfilment of the requirements of the degree of
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Declaration

By submitting this thesis, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third-party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

I would also like to declare that I am involved in the UK funded Identification and Intervention for Dementia in Elderly Africans(IDEA) and Dementia Prevention and Enhanced Care (DePEC) Projects in Kilimanjaro, Tanzania as Co-investigator (primarily in data collection). I have also co-authorized five articles related to depression and dementia emanating from this work in Kilimanjaro, Tanzania. This dissertation is based on the cross-sectional two-stage community-based dementia study which was conducted as part of the IDEA project. My roles in this present study were conceptualization of the study, data extraction, formal analysis and writing of the dissertation report.

This dissertation includes 1 publication-ready manuscript. The development and writing of this paper were the principal responsibility of myself and, for each of the cases where this is not the case, a declaration is included in the dissertation indicating the nature and extent of the contributions of co-authors.

Signed: DA

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1. Extended literature review

1.1 Global burden of depression

Global mental health is an integral part of the United Nation's Sustainable Development Goals.[1] Mental disorders affect over one billion people worldwide and accounts for more than 32% of years lived with disability (YLDs); surpassing both communicable and other non-communicable diseases.[2] Depression affects over 300 million individuals and contributes significantly to the global burden of mental disorders.[3] In Sub-Saharan Africa (SSA), the total disability adjusted life years (DALYs) due to mental disorders increased by 113.9% between 1990 and 2017, and of the 13.6 million DALYs attributable to mental disorders, approximately 5 million DALYs (40%) were due to depression.[4] The number of incident cases of depression worldwide increased from 172 million in 1990 to 258 million in 2017, representing an increase of 49.9%.[4] The number of cases of major depressive disorder (MDD) increased in all geographical regions, 124.3% in Central SSA, 124.1% in Western SSA and 106.8% in Oceania.[4] Depression thus remains a major public health problem and a leading cause of global disability.[3] Depression accounts for 5.7% of YLDs among adults aged over 60 years.[5]

1.2 Epidemiologic transition and its consequences

Globally, rapid economic, demographic, and epidemiological transitions have shifted the main cause of death worldwide from infectious to noninfectious conditions, resulting in longevity at the expense of greater morbidity and disability.[2] Globally, the population of persons aged 60 years and older is anticipated to double between 2017 and 2050; 14% of this global increase will occur in Africa.[6] A larger and older population in SSA will lead to an increase in the burden of non-communicable diseases. By 2050 the burden of mental illness is estimated to increase by 130% in SSA.[7]

Depression is the commonest mental disorder in older adults globally and the significant increase of worldwide disease burden due to depression has been attributed to population ageing[3] and similar epidemiological predictions exist for ageing and depression in SSA.[8] As a result of this anticipated increase in global burden of

depression, detection and treatment of depression in seniors will become increasingly important.

1.3 The magnitude of depression in older adults

Depression is the commonest mental disorder in older adults worldwide, affecting 7% of the world's older population.[5] Prevalence estimates of depression in older adults in high-income countries is estimated at over 12% in community settings[9] rising to 15% of those attending primary care facilities and 12% - 23% among older adults with chronic disease.[10,11] The point prevalence estimates for MDD in elders in the community have been reported to be 4.4% in women and 2.7% in men.[12] In adults aged 50 years and older the prevalence estimates for current and lifetime major depressive disorder has been shown to be 3.29% and 16.52%, respectively.[13] Epidemiological data for depression emanating from low and middle income countries are scarce, but suggests depression is equally common in older adults worldwide.[14] Community estimates for depression ranges between 1.6% and 44% in Sub-Saharan countries, including Nigeria,[15] Botswana,[16] Ghana,[17] South Africa,[18] and Egypt.[19] Prevalence estimates in older adults attending hospital settings are higher, reflecting findings in high income countries, with depression estimates of 25.2% in Uganda[20] and 34.7% among older adults attending diabetes clinics in Guinea.[21]

1.4 Factors associated with depression among older adults

Depression in older adults, as in all other age groups, results from a complex multidirectional interaction between biologic, psychological and social factors.[22] Findings regarding the effect of age on depression have been inconsistent. Reynolds and coworkers[23] noted a decline in the prevalence of depressive disorders in older adults as age increased (5.25% for ages 65–74 years, 4.41% for ages 75–84 years, and 5.0% for ages ≥85 years). However, a systematic review and meta-analysis[24] comprising 24 community based studies in the US found an increase in prevalence of depression through the geriatric age range. Compared to older adults aged between 75 and 79 years of age, there was a noted increase in the prevalence of depression in those aged 85 years and older (20% to 25%) and in seniors aged 90 years and older (30% to 50%).

Regarding the influence of gender on the risk of depression in older adults, studies have consistently found that female gender increases the risk for depression. Luppa and associates[24] found higher rates of depression in older adult females (between 4.0% and 10.3%) compared to older adult males (between 2.8% and 6.9%). In their systematic review of 20 studies involving seniors aged 70 years and older, Butchtemann and coworkers[25] found a higher incidence rate of clinically significant depressive symptoms among older adult females compared to their male counterparts. A higher prevalence of depression among community dwelling older adult females has also been reported in Egypt.[19] A recent study involving adults aged 55 years and over from 18 countries found higher prevalence estimates of depression in women than men.[26] Gender also appears to influence the risk of recurrence, where a higher recurrence rate of depression for older women (73.1 per 1000 patient-years) than for older men (51.6 per 1000 patient-years) has been noted.[27]

The literature has been consistent regarding the relationship between marital status and risk of depression in older adults. A recent study[26] utilizing data from large ageing cohort studies from 18 countries involving adults aged 55 years and older, found higher standardised depression prevalence among widowed, divorced or separated, and single adults who were never married compared to married adults. A meta-analysis of pooled data from nine European centres also found increased risk of depression among widowed/separated older adults.[9] In their systematic review involving 11 studies, Onrust et al.,[28] reported increased relative risk of depression among widowed older adults compared to married subjects.

Cardiovascular risk factors have also been shown to influence the development of depression, where older adults with cardiovascular risk factors have an increased likelihood of developing depression. The prevalence of depression among older adults with cardiovascular disease (CVD) has been shown to range between 15% to 25%[29-30]. Among older adults who have had a stroke the prevalence rates for MDD was 19.3% and 23.3% in inpatient and outpatients settings, respectively.[31] However, it is known that a bidirectional relationship exists between depression and CVD, where older adults with CVD have a higher incidence of depression and the converse being true as well.[22,32]

Consistent associations between self-rated health status and depression in older adults have been reported in several studies. Several studies[14,15,34,35] have reported increased risk of depression in older adults rating their overall health as very bad or bad compared to those with positive rating of subjective health status. Padayachey et al.,[34] found that poor self-rated health status had sensitivity of 90% and a specificity of 69.5% against the Geriatric Depression Scale in detecting depressive symptoms in older adults. Moreover, a large 14-centre cross national study in nine Western European countries noted consistent associations between physical health and depressive symptoms among adults aged 65 years and over.[36] In addition, poor perceived health status has been associated with increased risk of death, functional and cognitive impairment [37] and strongly predicts depression in older adults.[38]

Studies have identified adverse life events, including daily hassles, bereavement, medical illness, and injuries as life stressors that may predict depression in older adults.[33,39] Other stressors that have been found to increase the risk of depression among older adults include lower income[40] and less education.[40,41] Impaired social relationships, ranging from social isolation to poor social support has also been shown to increase the likelihood of depression in older adults.[19,33,42,43]

1.5 The consequences of depression in older adults

Studies have consistently shown that untreated or under-treated depression in older adults carries deleterious consequences.[42] In older adults, depression is more likely to run a chronic or relapsing course[44] and is linked to increased suicide and non-suicide mortality[45,46] and morbidity.[43] Depression in older adults aggravates comorbid conditions such as ischaemic heart disease and diabetes,[11] impairs recovery and rehabilitation from conditions such as stroke, increases prevalence of malnutrition[47] and reduces adherence to effective interventions.[11] Older adults with depression are less likely to maintain their physical and cognitive abilities; are more socially isolated, and are less likely to pursue health care treatments.[48] Depression in older adults is also associated with poor quality of life and need for assistance with activities of daily living.[49] Depression in the elderly is also associated with increased risk of developing

dementia.[50] The costs of depression in older adults are enormous, depressed older adults have total health care costs approximately 50% higher compared to their counterparts without depression.[51,52] An impending crisis looms as the health systems in LMICs are not prepared to address the increase in the burden of depression and its consequences in older adults.

1.6 Treatment gap for depression and its causes

Treatment gap in mental health care is the difference between the number of people with mental disorders and the number of those people who are able to access appropriate services.[53] The treatment gap in mental health care may also be expressed as the proportion of individuals who require care but do not receive treatment.[53] The treatment gap for major depression for several regions have been reported, WHO European Region (45.4%), Americas (56.9%), Africa (67%), Eastern Mediterranean (70%) and the Western Pacific (48.1%).[53] Data for treatment gap for depression in older adults are currently limited but a recent study suggests that the treatment gap for depression in older adults stands at 79% across European regions, much higher than the estimated 56% for the population aged 15 years and over.[54] The treatment gap for depression in older adults may result from under-diagnosis, limited accessibility to services, affordability, and availability of effective interventions for depression in older adults. The reasons for under-diagnosis of depression in older adults include individual, physician and societal factors.[55,56] Seniors are less likely to recognize signs and symptoms of depression and to pursue treatment.[55] They are also more likely to present with somatic symptoms that may be difficult to distinguish from those of co-existing chronic medical conditions,[57] institutional and societal stigmas towards mental disorders may prevent acknowledgment of depression among older adults and limit accessibility and availability of effective interventions.[54] In primary health care settings in LMICs where most of the depressed older adults attend, the availability of elderly friendly antidepressants is limited.

Despite depression being the leading cause of global disability,[2,3] there is scarcity of data on the prevalence and associated factors of depression in SSA, which may lead to under-diagnosis, non-procurement of drugs for treatment of depression and widening of

the treatment gap. In this study we aimed to determine the prevalence of depression and its treatment gap among older adults in the Hai district in rural Tanzania. We further aim to understand how sociodemographic factors, cardiovascular risk factors and self-rated health status affect depression in this group.

Publication-ready manuscript

The following manuscript has been prepared for submission to International Journal of Geriatric Psychiatry. The journal's aims and scope, as well as author guidelines are given in Appendix A.

Prevalence and associated factors of depression among older adults in rural Tanzania

Running title: Depression in older adults

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Data availability statement

The anonymised data related to our manuscript can be made available by the corresponding author upon request, with permission from the relevant research ethics committee.

Conflict of Interest

The authors declare that they have no competing interests.

Abstract

Objectives: Depression is the commonest mental disorder in older adults worldwide, affecting 7% of the world's older population and accounting for 5.7% of years lived with disability among adults aged over 60 years. We conducted a secondary data analysis to determine the point prevalence, associated risk factors and treatment gap for DSM-IV depression among older adults in the Hai District, rural Tanzania.

Methods: The primary data source was a cross-sectional two-stage community-based dementia study where older adults aged ≥70 years (n=296) were fully-assessed for dementia and depression in the second stage. Age-adjusted prevalence of depression was determined based on the WHO standard population using the Direct Method. Univariate and multivariate logistic regression models were performed.

Results: Of the 296 older adults assessed for depression, 48 were diagnosed with depression based on Diagnostic and Statistical Manual of Mental Disorders-IV criteria. The median (Inter Quartile Range) (IQR) age was 80 (75–88) years. Age-adjusted point prevalence of depression was 21.2% (95%CI: 16.6–21.9) and the treatment gap for depression was 100%. There was reduced odds of depression in older adults who rated their physical health as good or very good (AOR=0.22; 95%CI: 0.10–0.46; p<0.001), or moderate (AOR 0.26; 95%CI: 0.10–0.66; p=0.005).

Conclusions: Depression in older adults is associated with physical health status and there is an alarmingly high treatment gap. Future research on depression in older adults should focus on effective interventions to address physical morbidity, psychosocial factors and the treatment gap.

Key words: Prevalence, Risk Factors, Depression, Older adults, epidemiology, Tanzania.

Key points

- Despite depression being the commonest mental disorder in older adults reported worldwide, in Sub-Saharan Africa, the epidemiological data on depression in this population group are limited.
- We found point prevalence estimates of depression in older adults similar to those reported in community-based studies in high income countries.

- Self-rated overall physical health status was associated with depression in older adults.
- Future research on depression in older adults should focus on the physical morbidity, psychosocial factors and the treatment gap.

1. Introduction

It is currently estimated that depression affects 300 million people, or 3.8% of the world's population.[1] Globally, the population of persons aged 60 years and over is anticipated to double between 2017 and 2050, with a majority of this global increase occurring in low and middle income countries (LMICs).[2] A larger, and older, population in Sub-Saharan Africa (SSA) will lead to an increase in the burden of non-communicable diseases, and, by 2050, the burden of mental illness will increase by an estimated 130% in this region.[3]

Depression is the commonest mental disorder in older adults worldwide, affecting 7% of those aged over 60 years and accounts for 5.7% of years lived with disability (YLDs) among adults in this age group.[4] The total number of older adults with depression is projected to increase significantly in SSA due to population ageing.[5] In SSA, the total disability adjusted life years (DALYs) due to mental disorders increased by 113.9% between 1990 and 2017, and of the 13.6 million DALYs attributable to mental disorders, approximately 5million DALYs (40%) were due to depression.[6]

Prevalence of depression in older adults in high-income countries (HICs) is estimated at over 12% in community settings,[7] increasing to 15% among older adults attending primary care centres, and 12%-23% amongst those with chronic conditions.[8] While epidemiological data from LMIC settings are few, available data suggests depression is equally common in older adults as in HIC.[7] In SSA there is a paucity of epidemiological data for depression in older adults. Community estimates for depression in older adults

vary greatly in SSA countries, ranging between 1.6% and 44% in Nigeria,[9] Botswana,[10] Ghana,[11] South Africa,[12,13]and Egypt.[14]

In this study we aimed to to determine the point prevalence, associated factors and treatment gap for depression among community-dwelling older adults in rural Tanzania.

2. Methods

2.1 Study Design and Setting

We conducted a secondary analysis of data collected in the Hai dementia prevalence study, recruited from six villages in Hai Demographic Surveillance Site (DSS) located in Kilimanjaro region, Northern Tanzania.[15,16] Detailed information on the two-stage study design, age verification and stratification process has been reported elsewhere.[15] The data used in this study were collected between April and September 2010.[15] Several studies have provided detailed description of this site and population sample.[15-18]

2.2 Study Population

After stratification for highland and lowland situation of the villages, 1260 adults aged 70 and over were eligible for screening. Older adults who did not grant informed consent, or whose carers did not assent and those with an acute medical illness were excluded from the study. A total of 1198 older adults consented to screening for dementia in phase I and a subsequent sample of 296 older adults, stratified for cognitive screening performance, underwent detailed clinical examination for dementia and depression by Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria in phase II.

2.3 Measures

Detailed information on data collection instruments and dementia screening, depression assessment, and data management has been previously reported.[15] Screening at baseline was completed using the Community Screening Instrument for Dementia (CSI-D) with the Consortium to Establish Registry for Alzheimer's disease (CERAD)-10word task. Those stratified for phase II assessment were assessed by two qualified physicians using the 10/66 protocol based on the Geriatric Mental State/Automated

Geriatric Examination for Computer Assisted Taxonomy (GMS/AGECAT).[15,19] The 10/66 protocol has been extensively validated and used in LMICs.[19] The 10/66 protocol includes sociodemographic information, living arrangements, income, health expenditure, social networks, self-reported physical and sensory impairments, functional impairment (WHO-DAS II), lifestyle and cardiovascular risk factors, smoking and alcohol consumption, diet, frequency of exercises and health service use.[20] The GMS/AGECAT, Neuropsychiatric Inventory and abbreviated neurological examination were also completed.[20] The GMS/AGECAT groups symptoms to identify primary diagnoses where a syndrome cluster of depression with level of confidence of three or more was considered a case of depression.[20] In addition, a bedside clinical history and examination was performed to establish diagnosis by DSM-IV clinical criteria to corroborate the algorithm findings.

2.4 Data Analysis

To obtain accurate estimates of depression prevalence we calculated weighted proportions and 95% confidence intervals for depression to account for participants not evaluated for depression during phase I.[21] Sampling weight for each participant was derived as the number of participants evaluated for dementia in phase I divided by the number of participants who were screened for both dementia and depression within each of the three screening strata (no dementia, possible dementia, probable dementia). The sampling weights were then multiplied by the number of participants diagnosed with depression in their stratum to calculate the estimated number of cases of depression in that stratum. These were summed to give an estimated number of cases across the 6 villages. The total number of cases was then divided by the total population of adults aged 70 years and over to ascertain the estimated prevalence of depression. The age-adjusted prevalence of depression was determined based on the WHO standard population using the Direct Method. The expected numbers of depression cases for each stratum were computed by multiplying stratum-specific prevalence by the size of the stratum in the WHO standard population. These were then summed to get the total expected cases which were then divided by the total WHO

standard population of adults aged 70 years and over to get the directly age standardized prevalence of depression.

All analyses were done using SPSS version 20 (IBM, New York, USA).[22] All continuous data were non-normally distributed and analyzed using non-parametric statistical tests. The continuous variable age was transformed into a categorical variable to enable the calculation of age-adjusted prevalence based on the WHO standard population. Pearson's Chi-Squared test or Fishers exact test were used to examine the association between categorical variables and depression in older adults. Pearson Chi-Squared value with Yates' correction for continuity was recorded for 2 x 2 tables. The 95% confidence intervals for prevalence were calculated assuming a binary distribution and using the Phase II population as the denominator.

Variables with $p < 0.05$ were entered into binary logistic regression models to determine which were associated with depression in older adults. Multivariate logistic regression models were constructed using forward stepwise selection based on the Wald test to assess the association between the independent factors and depression. The Hosmer-Lemeshow goodness of fit test, the Cox & Snell R^2, the Nagelkerke R^2, and the analysis of studentized residual values were used to assess the accuracy of the models. Significance was set at $p < 0.05$ and two-tailed tests were used.

2.5 Ethical Considerations

Ethics approval for the primary study was granted by the National Institute for Medical Research, Dar-es-Salaam, Tanzania *(*Reference No*:* NIMR/HQ/R.8A/Vol.IX/1839).The present analysis was approved by the Health Research Ethics Committee, Stellenbosch University (HREC reference No: 20/05/118). This study was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained for capacitous older adults, and assent was sought from the next of kin for those who were lacking capacity to consent. All data were anonymised to ensure privacy and confidentiality of participants' personal information, with each participant assigned a unique identifier.

3. Results

3.1 Sociodemographic characteristics of the study population

Table 1 summarizes the sociodemographic characteristics of the study population assessed in phase II. A total of 296 older adults were involved in the study. The median (IQR) age was 80 (75–88) years. The majority of participants were female (n=202, 68.2%) and widowed (n=170, 57.4%). Most participants had no formal education (n=168, 59.4%, 13 missing values) and the majority were illiterate (n=190, 67.1%, 13 missing values). All participants belonged to a religious denomination, with 77.7% identifying as Christian (n=230), 22% as Muslim (n=65) and 0.3 as Jewish (n = 1). Most of the participants were not receiving any social service benefits (n=239, 80.7%) and had no health insurance (n=280, 94.6%).

Table 1: Sociodemographic characteristics of the participants (n=296)

Variables	Frequency (%)
Age: Md = 80 (IQR:75,88)	
70– 74	70 (23.6)
75–79	68 (23.0)
80–84	56 (18.9)
≥85	102 (34.5)
Sex	
Female	202 (68.2)
Male	94 (31.8)
Marital Status	
Never Married	11 (3.7)
Married/Cohabiting	102 (34.5)
Widowed	170 (57.4)
Divorced/Separated	13 (4.4)
Literacy[†]	
Literate	93 (32.9)
Illiterate	190 (67.1)

Education[†]	
No Formal education	168 (59.4)
Incomplete Primary	99 (35.0)
Completed Primary	15 (5.3)
Completed Secondary	1 (0.3)
Religion	
Roman Catholic	48 (16.2)
Anglican/Protestant	159 (53.7)
Other Christian	23 (7.8)
Jewish	1 (0.3)
Muslim	65 (22)
Social Benefits	
Yes	57 (19.3)
No	239 (80.7)
Health Insurance	
Yes	16 (5.4)
No	280 (94.6)

[†]There were 13 missing values for literacy and education

3.2 Point prevalence of depression and treatment gap for depression among older adults

Table 2 summarizes the results of the prevalence of depression among older adults. We identified 48 cases of depression according to the DSM-IV criteria; of which 9 participants were diagnosed with both dementia and depression**.** The crude point prevalence of depression was 21.2% (95%CI: 16.6–25.9). The age- adjusted prevalence was 21.2% (95%CI: 16.6–25.9). None of the older adults diagnosed with depression were on treatment for depression at the time of assessment, thus the treatment gap for depression was 100%.

Table 2: Point prevalence of depression among older adults

CSI-D† screening category	Screened population	Assessed for depression (%)	Cases of depression	Scaling factor	Estimated number of cases
No dementia	910	72 (7.9)	17	12.6	214
Possible dementia	104	56 (53.8)	8	1.857	15
Probable dementia	184	168 (91.3)	23	1.09	25
Total	1198				254
Crude prevalence (95%CI)					21.2 (16.6–25.9)
Age-adjusted prevalence (95%CI)					21.2 (16.6–25.9)

†CSI-D: Community screening instrument for dementia.

3.3 Factors associated with depression among older adults: bivariate logistic regression

We noted several associations with depression status including marital status, hearing impairment, receiving social service benefits, self-rated overall physical status, having insurance and admission to hospital in the past three months (Table 3). Compared to older adults who were married or cohabiting, older adults who were never married had increased odds of depression (OR=2.61; 95%CI: 1.37–495; p=0.003). Conversely, older adults who reported hearing problems which did not interfere with their daily activities (OR=0.18; 95%CI: 0.04–0.74; p=0.02), older adults with a health insurance plan (OR=0.29; 95%CI: 0.10–0.85; p=0.02), and those with no history of hospital admission (OR=0.18; 95%CI: 0.05–0.637; p=0.01) had reduced odds of depression compared to their counterparts. Older adults who rated their overall health as being very good or

good (OR=0.24; 95%CI: 0.12–0.49; p=0.004) and moderate (OR=0.27; 95%CI 0.11–0.67; p<0.001) also had reduced odds of depression compared to those who rated their overall health as being very bad or bad.

Table 3: Factors associated with depression among older adults: bivariate logistic regression

Variable	Proportion, N (%)	B†	OR (95%CI)	*P*-value
Marital Status				
Married/cohabiting	25 (52.1)	1.00	1.00	----
Never married	2 (4.2)	0.96	2.61 (1.37–4.95)	0.003
Widowed/divorced/separated	21 (43.8)	0.25	1.29 (0.27–6.15)	0.75
Benefits				
Yes	9 (18.7)	0.04	1.04 (0.47–2.29)	0.92
No	39 (81.2)	1.00	1.00	---
Hearing problem				
None	43 (89.6)	1.00	1.00	---
Yes, does not interfere at all	1 (2.1)	-1.73	0.18 (0.04–0.74)	0.02
Yes, interferes	4 (8.3)	-0.69	0.50 (0.03–7.99)	0.62
Self-rated health status				
Very good/Good	8 (17.0)	-1.43	0.24 (0.12–0.49)	0.004
Moderate	17 (36.2)	-1.31	0.27 (0.11–0.67)	0.001
Bad/Very Bad	22 (46.8)	1.00	1.00	-----
Hospital admission				
No	43 (89.6)	-1.73	0.18 (0.05–0.64)	0.008
Yes	5 (10.4)	1.00	1.00	----
Health insurance				
No	42 (87.5)	1.00	1.00	----
Yes	6 (12.5)	-1.22	0.29 (0.10–0.85)	0.024

†B: coefficient of regression

3.4 Factors associated with depression among older adults: multivariate logistic regression

Multivariate logistic regression models containing five independent factors (hearing problem, marital status, health insurance, hospital admission, self-rated overall health status) were performed. Physical health status and marital status significantly contributed to the model (Table 4). Older adults who had never married had a significantly increased chance of being diagnosed with depression (AOR=2.77; 95%CI: 1.36–5.66; p=0.01), while older adults who rated their overall health status as being very good or good (AOR=0.22; 95%CI: 0.10–0.47; p<0.001) and moderate (AOR=0.26; 95%CI: 0.10–0.66; p=0.005) were less likely to have depression.

Table 4: Factors associated with depression among older adults: multivariate logistic regression

Variable	Proportion, N (%)	B†	AOR‡ (95%CI)	*P*-value
Marital status				
Married/cohabiting	25 (52.1)	1.00	1.00	---
Never married	2 (4.2)	1.02	2.77 (1.36–5.66)	0.001
Widowed/divorced/separated	21 (43.8)	0.55	1.73 (0.34–8.83)	0.51
Hearing problem				
None	43 (89.6**)**	1.00	1.00	---
Yes, does not interfere at all	1 (2.1)	-0.10	0.37 (0.07–1.87)	0.23
Yes, interferes	4 (8.3)	-0.05	0.96 (0.05–19.80)	0.98
Self-rated overall health status				
Very good/Good	8 (17.0)	-1.53	0.22 (0.10–0.47)	0.001
Moderate	17 (36.2)	-1.37	0.26 (0.10–0.66)	0.01
Bad/Very Bad	22 (46.8)	1.00	1.00	-----
Hospital admission				

No	43 (89.6)	-0.99	0.37 (0.08–1.77)	0.21
Yes	5 (10.4)	1.00	1.00	----
Health insurance				
No	42 (87.5)	1.00	1.00	----
Yes	6 (12.5)	-0.48	0.62 (0.15–2.56)	0.51

†B: coefficient of regression; ‡AOR: adjusted odds ratio.

4. Discussion

To the best of our knowledge this is the first study in SSA to determine the point prevalence of depression among older adults in the community based on standard diagnostic criteria rather than a screening tool. We found that the point prevalence of depression in older adults in Tanzania was associated with poorer self-reported physical health status and had a high treatment gap.

The crude, and adjusted prevalence rates of depression were 21.2 (95%CI: 16.6–25.9) and 21.2 (95%CI: 16.6–25.9), respectively. It is hard to compare our results on the prevalence of depression with those of other studies because of different methods used for assessment of depression[9-13] (screening scales vs. standard diagnostic criteria), study setting[8] (urban vs. rural, community vs. hospital settings), different population characteristics[13] (older adults with HIV vs. older adults without HIV), types of prevalence[9-13] (life-time prevalence, point prevalence, 12-month prevalence) and different age cut-offs used.[9-13] However, our prevalence estimates appear to be consistent with estimates on the prevalence of depression reported in other studies. A study by Baiyewu and co-workers,[21] which used a research design similar to our study but involving adults aged 69 years and over, and using the 30-item Geriatric Depression Scale, reported an overall prevalence of depression of 21.4% among older adults in Ibadan, Nigeria. Our prevalence estimates are also similar to those reported by Horackova and colleagues in a cross-sectional study based on the data from the

Survey on Health, Ageing and Retirement in Europe , which reported a prevalence of depression of 26% among older adults in Western European countries.[23]

None of the older adults who were diagnosed with depression were on treatment leading to a depression treatment gap of 100%. This treatment gap is larger than reported in other studies. Horackova and colleagues have estimated the treatment gap for depression in older adults at 79% across European regions, much higher than the estimated treatment gap of 56% for the population aged 15 years and older.[23] This large treatment gap may be attributable to seniors being less likely, than younger adults, to recognize signs and symptoms of depression and to pursue treatment.[24] They are also more likely to present with somatic symptoms that may be difficult to distinguish from those of chronic co-existing medical conditions,[25] institutional and societal stigmas towards mental disorders that may prevent acknowledgment of depression among older adults, limited accessibility and availability of effective interventions,[23] and the belief among older adults that depression is part of ageing.[26]

In the univariate analysis we found significant association between hospital admission, having an insurance plan, hearing problems, self-rated health status, marital status and receiving benefits and depression status. However, only marital status and self-rated overall health status remained significant in the multivariate analysis. The older adults who never married were almost three times more likely to be diagnosed with depression compared to their counterparts who were either married or cohabiting. The small number of older adults who never married precludes any meaningful conclusions. However, our findings replicate the results of a meta-analysis of pooled data from nine European centres which also found an increased risk of depression among widowed/separated older adults.[27]

With regard to self-rated overall physical health status and depression, we found that the odds of depression were reduced in adults who rated their overall health as being very good/good or moderate compared to their counterparts who rated their physical

health as being very bad/bad. Our findings replicates those of Gureje et al.,[9] who also noted an increased likelihood of depression among the older adults who rated their overall health as being bad or very bad. Effective preventive interventions for depression in older adults should therefore address physical morbidity in this group.

Data regarding the effect of age on depression have been inconsistent. Our findings differ from those previously published,[28,29] where conflicting prevalence estimates were noted in older people. It has been argued that an increase in prevalence of depression in older adults may reflect over-diagnosis due to increased complaints of loss of interest and motivation, which may be affectively neutral and probably related to cognitive impairment.[27]

Our findings are consistent with those of Luijendijk et al.,[30] who found that gender was not significantly related to depression in older adults. However, this is in contrast to the findings of other studies which found higher rates of depression in older adult females compared to older adult males.[14,29,31] Büchtemann et al.,[31] argued that gender differences in the prevalence of depression among older adults may be attributable to other psychosocial parameters, physical health, and methodological artefacts rather than biological sex per se.

Regarding the influence of cardiovascular and cerebrovascular risk factors on the development of depression, our findings contradict those of other studies which noted increased prevalence of depression among older adults with cardiovascular and cerebrovascular risk factors.[7,32] The small proportion of older adults who reported cardiovascular and cerebrovascular risk factors may account for the lack of association between these factors and depression in our study. Our findings on the relationship between income, education, religion and social support and depression contrast with those of other studies which found that lower income,[33] less education,[33,34] low levels of church attendance,[27] and impaired social relationships[14,35,36] increase the likelihood of depression among older adults. It is argued that inconsistent results between social

factors and depression may reflect the intricate nature of these parameters in studies of depression in older adults, a lack of universally accepted tools for measuring social support, and the extent to which social dysfunction reflects external stressors versus older adult's own social functioning.[35]

Our findings should be interpreted in consideration of the following limitations. Firstly, the cross-sectional nature of the primary study limits our ability to establish the causal relationship between the factors and depression. Secondly, since the data were collected primarily for dementia, it is likely that older adults with mild depression may have been missed. However, our study is likely to capture more individuals with moderate to severe depression as they may demonstrate cognitive impairment and are therefore more likely to have low scores on CSI-D. Our findings may have therefore underestimated the prevalence of depression among older adults in Hai DSS. Thirdly, since the data were collected ten years ago, the prevalence of depression might have changed. However, there are no previous studies conducted in Tanzania on the community prevalence of depression among older adults and this study therefore provides a basis upon which future epidemiological studies monitoring the trend of depression among older adults can be compared.

5. Conclusion

This study provides invaluable information on the prevalence, associated factors and the unmet needs for the treatment of depression among older adults in rural Tanzania. Depression in older adults is associated with poorer physical health status and a high treatment gap. Effective interventions for depression in older adults should therefore address physical morbidity, psychosocial factors and the treatment gap.

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Appendix A – Journal guidelines: International Journal of Geriatric Psychiatry

The guidelines can be accessed on:
https://drive.google.com/file/d/1KkloZAW6C7pjqnQkS7Oxz8hRbiPzUb-p/view?usp=sharing

Appendix B – Ethical Approval

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Approved with Stipulations.

New Application

03/08/2020

Project ID: 15339

HREC Reference No: S20/05/118
Project Title: PREDICTORS OF DEPRESSION AMONG OLDER ADULTS SCREENED FOR DEMENTIA IN HAI DISTRICT ,TANZANIA

Dear Dr DAMAS Mlaki

The **New Application** received on 11/05/2020 was reviewed by members of the **Health Research Ethics Committee** via Minimal Risk Review procedures on 03/08/2020 and was **approved with stipulations.**

Please note the following information about your approved research protocol**:**

Approval date: 03 August 2020

Expiry date: 02 August 2021

The stipulations of your ethics approval are as follows:

Administrative issues

- The proposal states on page 1 that it is student research. But then on two separate occasions states that it is not for degree purposes. And then in the HREC project funds section it states that it is for 'Non sponsored student research'. We are not sure whether it is for student research or not. Please clarify.
- There are a number of typographical and spelling errors that should be corrected.
- Referencing in protocol is not up to standard – this should be corrected.
- There is no reference in the synopsis of whether ethical approval had been received by the UK university – 10/66 Dementia Study Group. Is there an ethical approval from Newcastle University or another UK Institution? If so, this should be stated, and the approval letter included in the application.

Social and scientific value

- The applicant states this it is a 'cross-sectional study with an analytical component'. – what is an analytical component? Please clarify
- HREC is not sure what the phrase "What is the magnitude of depression…." means. Does the applicant mean prevalence? Or is it about severity?
- Secondary research questions should be adapted to include that part of the question must be about whether sociodemographic factors influence the risk. One has to ask whether they do before you ask the extent to which they influence.
- The applicant states that "This will be a cross-sectional study". This is not true as it is secondary analysis of data already collected. This terminology makes it appear that the cross-sectional study will be happening – this is not the case. This needs to be corrected throughout the proposal.
- Be cautious of language that is not scholarly – 'dire', 'grim' to name two examples.

Scientific validity

- When did actual data collection take place – given that this is secondary analysis? Please clarify.

Informed consent process

- The applicant states that because this is secondary data analysis consent for data sharing is not applicable. However, may you please confirm that the ethical approval received in Tanzania includes approval for data sharing.

Please remember to use your project ID 15339 and ethics reference number S20/05/118 on any documents or correspondence with the HREC/UREC concerning your research protocol.

Translation of the consent document(s) to the language(s) applicable to your study participants should now be submitted to the HREC.

Please note that this decision will be ratified at the next HREC full committee meeting. HREC reserves the right to suspend approval and to request changes or clarifications from applicants. The coordinator will notify the applicant (and if applicable, the supervisor) of the changes or suspension within 1 day of receiving the notice of suspension from HREC. HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note you can submit your progress report through the online ethics application process, available at: https://apply.ethics.sun.ac.za and the application should be submitted to the Committee before the year has expired. Please see Forms and Instructions on our HREC website for guidance on how to submit a progress report.

The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-research-approval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: Forms and Instructions on our

HREC website (www.sun.ac.za/healthresearchethics) If you have any questions or need

further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mrs. Melody Shana

Coordinator

HREC1

National Health Research Ethics Council (NHREC) Registration Number:

REC-130408-012 (HREC1)·REC-230208-010 (HREC2)

Federal Wide Assurance Number: 00001372
Office of Human Research Protections (OHRP) Institutional Review Board (IRB)
Number: IRB0005240 (HREC1)·IRB0005239 (HREC2)

The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects;the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition); as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.

Appendix C– Data Collection Tools

The data collection tools can be accessed on https://drive.google.com/file/d/1fYImkQOXUS5f4qocM_Ft14LpjHbq0Aah/view?usp=sharing