Prevalence and correlates of common mental disorders among participants of the Uganda Genome Resource: Opportunities for psychiatric genetics research

Allan Kalungi (allankalungi1@gmail.com)
MRC/UVRI and LSHTM Uganda Research Unit
Eugene Kinyanda
MRC/UVRI and LSHTM Uganda Research Unit
Dickens Akena
Bizu Gelaye
Wilber Ssembajjwe
Richard Mpango
Terry Ongaria
Joseph Mugisha
Ronald Makanga
Ayoub Kakande
Beatrice Kimono
Philip Amanyire
Fred Kirumira
Cathryn Lewis
King's College London https://orcid.org/0000-0002-8249-8476
Andrew McIntosh
The University of Edinburgh https://orcid.org/0000-0002-0198-4588
Karoline Kuchenbaecker
University College London https://orcid.org/0000-0001-9726-603X
Moffat Nyirenda
Pontiano Kaleebu
Segun Fatumo
MRC/UVRI & LSHTM Uganda Research Unit https://orcid.org/0000-0003-4525-3362

Article

Keywords:

Posted Date: September 18th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3273341/v1

Additional Declarations: The authors have declared there is **NO** conflict of interest to disclose

Prevalence and correlates of common mental disorders among participants of the Uganda Genome Resource: Opportunities for psychiatric genetics research

Allan Kalungi[1,2,3], Eugene Kinyanda[3,4], Dickens Howard Akena[3], Bizu Gelaye[5,6,7], Wilber Ssembajjwe[4], Richard Steven Mpango[4], Terry Ongaria[8], Joseph Mugisha[8], Ronald Makanga[8], Ayoub Kakande[8], Beatrice Kimono[8], Phillip Amanyire[4], Fred Kirumira[9], Cathryn M Lewis[10], Andrew M McIntosh[11], Karoline Kuchenbaecker[12,13], Moffat Nyirenda[2,8], Pontiano Kaleebu[8], Segun Fatumo[1,2]

1 The African Computational Genomics (TACG) Research Group, Medical Research Council/ Uganda Virus Research Institute & London School of Hygiene and Tropical Medicine (MRC/UVRI & LSHTM) Uganda Research Unit, Entebbe, Uganda

2 The Department of Non-communicable Disease Epidemiology, London School of Hygiene and Tropical Medicine London, London, UK

3 Department of Psychiatry, College of Health Sciences, Makerere University, Kampala, Uganda

4 Mental Health Section, Medical Research Council/ Uganda Virus Research Institute & London School of Hygiene and Tropical Medicine (MRC/UVRI & LSHTM) Uganda Research Unit, Entebbe, Uganda

5 Department of Epidemiology, Harvard T.H. Chan School of Public Health, 677 Huntington Ave Room 505F, Boston, MA 02115 USA

6 The Chester M. Pierce, MD Division of Global Psychiatry, Massachusetts General Hospital, Boston, MA USA

7 Department of Psychiatry, Harvard Medical School, Boston MA US

8 Medical Research Council/ Uganda Virus Research Institute & London School of Hygiene and Tropical Medicine (MRC/UVRI & LSHTM) Uganda Research Unit, Entebbe, Uganda

9 Department of Psychology, College of Humanities and Social Sciences, Makerere University

10 Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology & Neuroscience, King's College London, de Crespigny Park, London, SE5 8AF UK

11 Division of Psychiatry, University of Edinburgh, Royal Edinburgh Hospital, Edinburgh, UK.

12 Division of Psychiatry, UCL Genetics Institute, University College London, London, UK

13 Genomics England, Queen Mary University, London EC1M 6BQ

Corresponding authors:

Allan Kalungi: allankalungi1@gmail.com. Segun Fatumo: segun.fatumo@lshtm.ac.uk

The African Computational Genomics (TACG) Group of Medical Research Council/ Uganda Virus Research Institute and London School of Hygiene & Tropical Medicine (MRC/UVRI & LSHTM) Uganda Research Unit and the Department of Psychiatry, Makerere University.

Abstract

Genetics research has the potential to alleviate the burden of mental disorders in low- and middle-income countries through the identification of new mechanistic pathways which can lead to efficacious drugs or new drug targets. However, there is currently limited genetics data from Africa. The Uganda Genome Resource is a well-characterized genomic database which provides opportunities for psychiatric genetics research among underrepresented people from Africa. We determined the prevalence and correlates of major depressive disorder (MDD), suicidality, post-traumatic stress disorder (PTSD), alcohol abuse, generalized anxiety disorder (GAD) and probable attention-deficit hyperactivity disorder (ADHD) among 985 participants of the Uganda Genome Resource. The prevalence of the disorders were: current MDD 19.3 %, lifetime MDD 23.3%, suicidality 10.6%, PTSD 3.1%, alcohol abuse 5.7%, GAD 12.9% and probable ADHD 9.2%. This is the first study to determine the prevalence of probable ADHD among adult Ugandans from a general population. We found a significant association between sex and alcohol abuse (adjusted odds ratio [AOR]=0.26 [0.14,0.45], p<0.001), alcohol abuse and GAD (AOR=1.78 [1.09,2.49], p=0.019). We also found a significant association between body mass index and suicidality (AOR=0.85 [0.73,0.99], p=0.041), alcohol abuse (AOR=0.86 [0.78,0.94], p=0.003) and GAD (AOR=0.93 [0.87,0.98], p=0.008). We also found a significant association between high blood pressure and lifetime MDD (AOR =2.87 [1.08,7.66], p=0.035) and probable ADHD (AOR =1.99 [1.00,3.97], p=0.050). We also found a statistically significant association between tobacco smoking and alcohol abuse (AOR=3.2 [1.56,6.67], p=0.002). In conclusion, the Uganda Genome Resource presents opportunity for psychiatric genetics research among underrepresented people from Africa.

Introduction

Mental disorders have persisted among the top ten leading causes of disease burden worldwide, with no evidence of a global reduction since 1990 (1). It is estimated that one in every eight people in the world lives with a mental disorder (2). They account for 4.9% of the global disability-adjusted life-years and 14.6% of the global years lived with disability (1). Some of the common mental disorders include major depressive disorder (MDD), generalized anxiety disorder (GAD), attention-deficit hyperactivity disorder (ADHD), suicidality, and post-traumatic stress disorder (PTSD).

The global age-standardized prevalence of any mental disorder has been estimated at 12.3% (1), while the individual global prevalence for anxiety disorders, depressive disorders, and ADHD have been estimated at 3.8%, 3.4% and 1.1% respectively, accounting for point, 12 month and lifetime prevalence using pooled prevalence ratios(1).

Over 80% of the burden of mental disorders pertains to low- and middle-income countries (LMIC) (3) where the treatment gap for psychiatric disorders approaches 90% (4). In Sub-Saharan Africa (SSA), an age-standardized prevalence of 13.4% has been estimated for any

mental disorder (1), while a prevalence of 4.5%, 3.5%, and 0.6% have been reported for depressive disorders, anxiety disorders and ADHD respectively. The age-standardized prevalence of depressive disorders is higher in SSA than in any other region globally (1)

In Uganda, the prevalence of any mental disorder has been estimated at 24.2% (95% C.I 19.8% – 28.6%) among adults (5). For depression, a pooled prevalence of 30.2% has been determined by a systematic review and a meta-analysis among heterogeneous samples (6), while prevalence estimates of 4.2 – 29.3% have been found among general populations from various study sites in Uganda (7, 8, 9, 10, 11). For anxiety disorders, a prevalence of 22.2% has been estimated among adults in Uganda (5). Depression and anxiety disorders affect approximately one in four persons in Uganda (5).

Mental disorders are associated with several psychological, genetic, biological, socioeconomic, and environmental factors. Mental disorders are heritable, and heritability estimates based on sibling data have been reported to vary from 30% for MDD to 80% for ADHD (12). Genetic studies have the potential to identify new mechanistic pathways for mental disorders, which can, in turn, lead to new drugs or drug targets for several mental disorders. Recent genome-wide association studies have provided insights into the genetic architecture of several mental disorders like MDD (13), suicidality (14), PTSD (15), schizophrenia (16), alcohol abuse (17), GAD (18) and ADHD (19).

Despite the genetic nature of several mental disorders being illuminated, there is limited genetics data from Africa. There is an urgent need to include people on the African continent (continental Africans) in global psychiatric genetics research if they (continental Africans) are to benefit from recent psychiatric genetics discoveries. The Uganda Genome Resource (20) provides an opportunity for psychiatric genetics research among people from Uganda. Briefly, the UGR comprises genotype data on ∼5,000 and whole-genome sequence data on ∼2,000 Ugandan individuals from 10 ethnolinguistic groups who are attending an open general population cohort (GPC) in south-western Uganda (20, 21). This cohort has contributed to several scientific discoveries in Uganda and worldwide (20) and is run by the MRC/UVRI and LSHTM Uganda Research Unit. The current study determined the prevalence and correlates of several mental disorders among participants attending the cohort and participating in the Uganda Genome Resource.

Methods

Study design

This study was undertaken within the GPC of MRC/UVRI & LSHTM Uganda Research Unit. The GPC is an active cohort of approximately 22,000 participants within 25 villages drawn from a sub-county in Kalungu district in Uganda (https://www.lshtm.ac.uk/research/centres-projects-groups/general-population-cohort). Approximately 1,066 GPC participants whose genetics data is available were assessed for current and lifetime diagnoses of major depressive disorder, generalized anxiety disorder, suicidality, and alcohol and substance abuse.

Clinical investigations

Trained psychiatric nurses administered a questionnaire to a random sample of consenting GPC participants. The questionnaire contained modules for MDD, suicidality, PTSD, alcohol abuse, and GAD from the Diagnostic and Statistical Manual for mental disorders edition 4 (DSM-IV) - referenced Mini International Neuropsychiatric Interview (MINI) version 5.0.0 (22). We had previously translated these modules into Luganda (the language spoken by most of the study participants) (23). The questionnaire also contained a module for the adult attention-deficit hyperactivity disorder self-report scale version v1.1 (24). We translated this checklist into Luganda and then used it to assess for traits of ADHD among the study participants.

Ethical considerations

This study complied with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Ethical and scientific clearance for this study was obtained from the science and ethics committee of the Uganda Virus Research Institute Science and Ethics Committee in August 2022 (Ref# GC/127/916), the Uganda National Council of Science and Technology (Ref# SS1404ES) and the Observational / Interventions Research Ethics Committee of London School of Hygiene and Tropical Medicine (Ref# 28167). Eligible GPC participants (GPC participants whose genetics data is available) were approached and informed about the study by psychiatric research nurses. Written informed consent was obtained from all eligible participants. Consented participants were assessed for mental illnesses, ADHD and alcohol and substance abuse by psychiatric research nurses. Participants who were found to have serious mental illnesses were referred to the mental health clinic at the MRC/UVRI and LSHTM Uganda Research Unit facility at Kyamuliibwa. Per the GPC protocol, each participant was given a bar of soap as compensation for their time.

Data Management

STATA version 17.0 was used for all statistical analyses. Frequencies of socio-demographic characteristics (gender, age, education level, marital status, body mass index) were described using frequencies and percentages for the categorical variables and median (interquartile range) for the continuous variables. The prevalence of dichotomized outcome variables (Current MDD, Lifetime MDD, Suicidality, PTSD, Alcohol abuse, GAD, and ADHD) was calculated with 95% confidence intervals. Spearman's rank correlation was used to assess for inter-item correlation coefficients between the outcome variables. Multivariate logistic regression models were used to evaluate the relationships between each outcome variable and their associated factors, adjusting for age and sex as *a priori* confounders. The likelihood ratio approach was used to determine the best fit for the final model. A two-sided $P < 0.05$ was considered statistically significant.

Results

Socio-demographic characteristics and clinical variables are shown in Table 1.

Position for Table 1

Prevalence of mental disorders

Lifetime MDD was the most prevalent mental disorder (23.3%, 95% CI = 20.7, 25.9), while PTSD was the least prevalent (3.1%, 95% CI = 1.8, 5.4). The prevalence of all the mental disorders assessed is shown in Table 2.

Position for Table 2

Correlations between the different mental disorders and alcohol abuse

There was a statistically significant positive correlation between lifetime and current MDD ($r = 0.8883$, $p < 0.05$). There was also a statistically significant positive correlation between suicidality and current MDD ($r = 0.3532$, $p < 0.05$) and lifetime MDD ($r = 0.3247$, $p < 0.05$). There was a statistically positive correlation between GAD and current MDD ($r = 0.2561$, $p < 005$), lifetime MDD ($r = 0.2311$, $p < 0.05$), suicidality ($r = 0.2868$, $p < 0.05$) and PTSD ($r = 0.1289$, $p < 0.05$). Table 3 shows the correlation matrix for all mental disorders and alcohol abuse.

Position for Table 3

Factors associated with the different mental disorders

There was a statistically significant association between sex and alcohol abuse (AOR=0.26 [0.14, 0.45], p<0.001) and GAD (AOR=1.78 [1.09, 2.49], p=0.019). Being female was a risk factor associated with GAD while protective against alcohol abuse. BMI was also statistically associated with suicidality (AOR = 0.85 [0.73, 0.99], p=0.041), alcohol abuse (AOR=0.86 [0.78, 0.94], p=0.003), and GAD (AOR=0.93 [0.87, 0.98], p = 0.008). Per unit increase in BMI was protective against suicidality, alcohol abuse and GAD. There was also a statistically significant association between high blood pressure and lifetime MDD (AOR=2.87 [1.08, 7.66], p=0.035) and probable ADHD (AOR=1.99 [1.00, 3.97], p=0.050). High blood pressure was a risk factor for lifetime MDD and probable ADHD. There was also a statistically significant association between tobacco smoking and alcohol abuse (AOR=3.2 [1.56, 6.67], p=0.002).

There was no statistically significant association between the investigated factors and PTSD and current MDD (please see supplementary material, Table S1).

Position for Table 4

Discussions

In this study, we determined the prevalence and correlates of MDD, suicidality, GAD, PTSD, probable ADHD, and alcohol abuse among participants of the GPC of MRC/UVRI and LSHTM Uganda Research Unit, who contributed genetics data to the Uganda Genome Resource.

We have observed a prevalence of 19.3 and 23.3% for current and lifetime MDD, respectively. This is more than the global prevalence of 3.4% reported for depressive disorders (1). This prevalence is also more than 4.5%, reported in SSA for depressive disorders (1). However, this prevalence is within the prevalence estimates of 4.2 – 29.3% reported among general populations from various study sites in Uganda (7, 8, 9, 10, 11). Higher endorsement of MDD in Uganda could be due to poverty, ecological factors and social deprivation (no formal education, unemployment, broken family, low socioeconomic status, food insecurity) (7, 8, 9, 11).

The observed prevalence of 3.1% for PTSD is less than 11.8%, reported in a post-war area in three districts of Northern Uganda (25). The observed lower prevalence could be due to the fact that this community has not experienced any war or major natural traumatic event since the Ugandan civil war, which ended in 1986. Notably, the observed prevalence is comparable to a cross-national lifetime prevalence of 3.9% reported by the World mental health survey (26).

The observed prevalence of 10.6% for suicidality is within the range of 1 - 55% and 0.6 – 14% prevalence for suicidal ideation and attempted suicide, respectively, which were observed by a systematic review and meta-analysis among a general population in Ethiopia (27). This prevalence is also comparable to a prevalence of 12.1% which was reported among randomly selected individuals from three districts of Uganda (28).

The observed prevalence of 5.7% for alcohol abuse is less than the average population lifetime prevalence of 10.7%, which was reported by the World mental health survey (29), and the prevalence of 9.8% was reported among adult populations in Uganda (30).

The observed prevalence of 12.9% for GAD is slightly higher than the lifetime prevalence of 9% which has been reported for the United States (31) and the 9.1% prevalence which has been observed among people living with human immunodeficiency virus (HIV) (32). However, a prevalence as high as 33.2% has been reported among HIV patients in a tertiary institution in Nigeria (33).

We have observed a prevalence of 9.2% for probable ADHD. This prevalence is more than the global prevalence of 1.1% reported for ADHD (1). This prevalence is also more than the prevalence of 0.6%, which has been reported in SSA (1). The big discrepancy between the observed prevalence and that reported by previous studies could be because the assessment tool used by this study assesses for ADHD symptoms without considering functional impairment, thus we report the disorder as probable ADHD. However, it is worth noting that no study has previously determined the prevalence of ADHD among adult Ugandans from a general population. It is also worthy of note that the observed prevalence is comparable to a prevalence of 11% which has been reported among Ugandan children attending pediatric neurology and psychiatry clinics at Mulago Hospital (34) and is less than the prevalence of 40.9% which has been reported among adult Ugandans with substance use disorder attending the Butabika Hospital (35).

Sex was significantly associated with both alcohol abuse and GAD. Female sex was protective against alcohol abuse, a finding which is consistent with findings from previous studies in Uganda and the rest of the world, where alcohol use was reported to be higher among men than women (30, 36, 37). Being female was, however, associated with increased odds of GAD. This finding is in line with previous studies which have reported women to be 2- to 3- times more likely to meet a lifetime criterion for GAD as compared with men (38, 39, 40). Increased risk for GAD among females could be due to fluctuations in progesterone and estrogen levels across the lifespan (41).

Body mass index was associated with suicidality, alcohol abuse and GAD. A unit increase in BMI was protective against suicidality. This finding is consistent with results from a systematic review and meta-analysis which has reported obesity and overweight to be protective against attempted suicide and suicide mortality (42). However, the definition of suicidality and sex need to be accounted for when interpreting associations between BMI and suicidality. For example, a positive association between obesity and overweight with suicidal ideation has been reported (42) and BMI has been found to be protective against suicidality among men and paradoxically a risk factor for suicidality among women (43). A unit increase in BMI was also protective against alcohol abuse. This finding is also consistent with results from a longitudinal study which reported that across adolescence, obesity was protective against alcohol-related problems during early adulthood (44). This finding supports the food-alcohol competition hypothesis that a tendency to consume processed or sweet high-fat foods compete with a tendency to drink alcohol (45). A unit increase in BMI was also protective against GAD. This finding is also in agreement with findings from a previous study that found a negative correlation between BMI and GAD among university students in Bahrain (46).

However, this finding contradicts findings from other studies that reported BMI as a risk factor for GAD (47, 48), and more studies will be required to elucidate this.

High blood pressure was significantly associated with lifetime MDD and ADHD. High blood pressure was associated with increased odds of lifetime MDD. This finding is in line with a large systematic review and meta-analysis which reported MDD to be a risk factor high blood pressure (49). This association has been demonstrated to be bidirectional by a large prospective study among young and middle-aged adults (50). Depressive symptoms were associated with incident hypertension and higher blood pressure levels associated with a decreased risk for developing depressive symptoms (49, 50). Mechanisms that underlie the association between high blood pressure and MDD are yet to be elucidated. High blood pressure was also a risk factor for ADHD. This finding is also in line with findings from a large prospective Swedish cohort study which reported ADHD to be associated with high risk of developing hypertension (51). It has been proposed that ADHD-associated deficits in delayed discounting and reinforcement sensitivity could impair the future-oriented activities needed to promote good health and thus lead to the development of metabolic disorders like hypertension and type-2 diabetes mellitus (51, 52, 53).

Smoking tobacco was a risk factor for alcohol abuse. This is consistent with findings from a previous multi-site study which has reported a high correlation between alcohol consumption and tobacco use in Uganda (54) and sub-Saharan Africa in general (55).

Past MDD is a predictor of current (recurrent MDD), thus a significant positive correlation observed between current and past MDD. This is due to the high relapse rates reported in MDD (56). The high relapse rates could be due to variability in response to treatments. A recent meta-analysis of 87 randomized clinical trials (N=17,540) has indeed reported 14% more variability in response to antidepressants as compared to placebo (57). Differences among patients or biological heterogeneity within MDD have been proposed as mechanisms that could explain this variability (57, 58). The significant positive association between suicidality and MDD is due to the high prevalence of suicidality, which has been reported in MDD (59). The significant positive association between GAD and MDD, suicidality and PTSD, respectively is also due to the high prevalence of GAD in these disorders. For example, prevalence of GAD as high as 71.7% in the MDD (60), 51.9% in suicidality (61) and 27.6% in PTSD (62) have been reported.

Conclusions

Common mental disorders are quite prevalent among people who comprise the Uganda Genome Resource with current MDD being the most prevalent disorder and PTSD being the least prevalent disorder.

As participants of the Uganda Genome Resource were drawn from an open general population cohort and can still be traced, there is an opportunity for psychiatric genetics research where participants can be traced, and assessed for mental disorders, and the mental disorders data can then be linked with the existing genetics data to allow performance of psychiatric genetics studies. There is currently no representation of people from Africa in global psychiatric genetics databases and performing genetics studies in this cohort will

contribute to efforts towards addressing the underrepresentation of people from Africa in global psychiatric genetics databases.

Author Contributions

Conceptualization, A.K., S.F., E.K., D.H.A; Data collection, A.K., S.F., R.S.M., E.K., T.O., K.F., P.A., A.K, J.M., M.N.; B.K.; Data analysis, A.K., W.S.; writing – original draft, A.K.; resources, S.F., P.K., M.N., J.M., and R.M.; critical review, all authors.

Acknowledgements

We thank all of the Uganda Genome Resource participants who agreed to participate in this study. We also thank the research assistants who collected the data.

Conflict of interest

The authors declare no competing interests.

Funding

Allan Kalungi is a Wellcome Early Career Fellow (227053/Z/23/Z). Segun Fatumo is supported by the Wellcome Trust [grant number: 220740/Z/20/Z]. This work was supported by the UK Medical Research Council (MRC) and the UK Department for International Development (DFID) under the MRC/DFID Concordat agreement, through core funding to the MRC/UVRI and LSHTM Uganda Research Unit. Funding sources had no role in the conduct or reporting of the research.

References

1. GBD Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet Psychiatry. 2022;9(2):137-50.
2. World Health Organization. Mental disorders Key facts 2022 [cited 2023 23 April]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-disorders.
3. Rathod S, Pinninti N, Irfan M, Gorczynski P, Rathod P, Gega L, et al. Mental health service provision in low-and middle-income countries. Health services insights. 2017;10:1178632917694350.
4. Patel V, Maj M, Flisher AJ, De Silva MJ, Koschorke M, Prince M, et al. Reducing the treatment gap for mental disorders: a WPA survey. World Psychiatry. 2010;9(3):169-76.
5. Opio JN, Munn Z, Aromataris E. Prevalence of mental disorders in Uganda: A systematic review and meta-analysis. Psychiatric Quarterly. 2022;93(1):199-226.
6. Kaggwa MM, Najjuka SM, Bongomin F, Mamun MA, Griffiths MD. Prevalence of depression in Uganda: A systematic review and meta-analysis. Plos one. 2022;17(10):e0276552.
7. Bolton P, Wilk CM, Ndogoni L. Assessment of depression prevalence in rural Uganda using symptom and function criteria. Social psychiatry and psychiatric epidemiology. 2004;39(6):442.

8. Kinyanda E, Woodburn P, Tugumisirize J, Kagugube J, Ndyanabangi S, Patel V. Poverty, life events and the risk for depression in Uganda. Social psychiatry and psychiatric epidemiology. 2011;46:35-44.
9. Perkins JM, Nyakato VN, Kakuhikire B, Tsai AC, Subramanian S, Bangsberg DR, et al. Food insecurity, social networks and symptoms of depression among men and women in rural Uganda: a cross-sectional, population-based study. Public health nutrition. 2018;21(5):838-48.
10. Rathod SD, Roberts T, Medhin G, Murhar V, Samudre S, Luitel NP, et al. Detection and treatment initiation for depression and alcohol use disorders: facility-based cross-sectional studies in five low-income and middle-income country districts. BMJ open. 2018;8(10):e023421.
11. Smith ML, Kakuhikire B, Baguma C, Rasmussen JD, Perkins JM, Cooper-Vince C, et al. Relative wealth, subjective social status, and their associations with depression: Cross-sectional, population-based study in rural Uganda. SSM-population health. 2019;8:100448.
12. Pettersson E, Lichtenstein P, Larsson H, Song J, Agrawal A, Børglum A, et al. Genetic influences on eight psychiatric disorders based on family data of 4 408 646 full and half-siblings, and genetic data of 333 748 cases and controls. Psychological medicine. 2019;49(7):1166-73.
13. Levey DF, Stein MB, Wendt FR, Pathak GA, Zhou H, Aslan M, et al. Bi-ancestral depression GWAS in the Million Veteran Program and meta-analysis in> 1.2 million individuals highlight new therapeutic directions. Nature neuroscience. 2021;24(7):954-63.
14. Mullins N, Kang J, Campos AI, Coleman JR, Edwards AC, Galfalvy H, et al. Dissecting the shared genetic architecture of suicide attempt, psychiatric disorders, and known risk factors. Biological psychiatry. 2022;91(3):313-27.
15. Nievergelt CM, Maihofer AX, Klengel T, Atkinson EG, Chen C-Y, Choi KW, et al. International meta-analysis of PTSD genome-wide association studies identifies sex-and ancestry-specific genetic risk loci. Nature communications. 2019;10(1):4558.
16. Lam M, Chen C-Y, Li Z, Martin AR, Bryois J, Ma X, et al. Comparative genetic architectures of schizophrenia in East Asian and European populations. Nature genetics. 2019;51(12):1670-8.
17. Walters RK, Polimanti R, Johnson EC, McClintick JN, Adams MJ, Adkins AE, et al. Transancestral GWAS of alcohol dependence reveals common genetic underpinnings with psychiatric disorders. Nature neuroscience. 2018;21(12):1656-69.
18. Davies MN, Verdi S, Burri A, Trzaskowski M, Lee M, Hettema JM, et al. Generalised anxiety disorder–a twin study of genetic architecture, genome-wide association and differential gene expression. PLoS One. 2015;10(8):e0134865.
19. Demontis D, Walters RK, Martin J, Mattheisen M, Als TD, Agerbo E, et al. Discovery of the first genome-wide significant risk loci for attention deficit/hyperactivity disorder. Nature genetics. 2019;51(1):63-75.
20. Fatumo S, Mugisha J, Soremekun OS, Kalungi A, Mayanja R, Kintu C, et al. Uganda Genome Resource: A rich research database for genomic studies of communicable and non-communicable diseases in Africa. Cell Genomics. 2022;2(11):100209.
21. Asiki G, Murphy G, Nakiyingi-Miiro J, Seeley J, Nsubuga RN, Karabarinde A, et al. The general population cohort in rural south-western Uganda: a platform for communicable and non-communicable disease studies. International journal of epidemiology. 2013;42(1):129-41.

22. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, et al. The Mini-International Neuropsychiatric Interview (MINI): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Journal of clinical psychiatry. 1998;59(20):22-33.
23. Kinyanda E, Hoskins S, Nakku J, Nawaz S, Patel V. Prevalence and risk factors of major depressive disorder in HIV/AIDS as seen in semi-urban Entebbe district, Uganda. BMC psychiatry. 2011;11(1):1-9.
24. Adler L, Kessler RC, Spencer T. Adult ADHD self-report scale-v1. 1 (ASRS-v1. 1) symptom checklist. New York, NY: World Health Organization. 2003.
25. Mugisha J, Muyinda H, Wandiembe P, Kinyanda E. Prevalence and factors associated with Posttraumatic Stress Disorder seven years after the conflict in three districts in northern Uganda (The Wayo-Nero Study). BMC Psychiatry. 2015;15:170.
26. Koenen K, Ratanatharathorn A, Ng L, McLaughlin K, Bromet E, Stein D, et al. Posttraumatic stress disorder in the world mental health surveys. Psychological medicine. 2017;47(13):2260-74.
27. Bifftu BB, Tiruneh BT, Dachew BA, Guracho YD. Prevalence of suicidal ideation and attempted suicide in the general population of Ethiopia: a systematic review and meta-analysis. International journal of mental health systems. 2021;15(1):1-12.
28. Mugisha J, Muyinda H, Kagee A, Wandiembe P, Kiwuwa SM, Vancampfort D, et al. Prevalence of suicidal ideation and attempt: associations with psychiatric disorders and HIV/AIDS in post-conflict Northern Uganda. African health sciences. 2016;16(4):1027-35.
29. Glantz MD, Bharat C, Degenhardt L, Sampson NA, Scott KM, Lim CC, et al. The epidemiology of alcohol use disorders cross-nationally: Findings from the World Mental Health Surveys. Addictive behaviors. 2020;102:106128.
30. Kabwama SN, Ndyanabangi S, Mutungi G, Wesonga R, Bahendeka SK, Guwatudde D. Alcohol use among adults in Uganda: findings from the countrywide non-communicable diseases risk factor cross-sectional survey. Global health action. 2016;9(1):31302.
31. Kessler RC, Petukhova M, Sampson NA, Zaslavsky AM, Wittchen HU. Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. International journal of methods in psychiatric research. 2012;21(3):169-84.
32. Mugisha J, Byansi PK, Kinyanda E, Bbosa RS, Damme TV, Vancampfort D. Moderate to severe generalized anxiety disorder symptoms are associated with physical inactivity in people with HIV/AIDS: a study from Uganda. International Journal of STD & AIDS. 2020;32(2):170-5.
33. Adeoti AO, Dada M, Elebiyo T, Fadare J, Ojo O. Survey of antiretroviral therapy adherence and predictors of poor adherence among HIV patients in a tertiary institution in Nigeria. The Pan African medical journal. 2019;33.
34. Wamulugwa J, Kakooza A, Kitaka SB, Nalugya J, Kaddumukasa M, Moore S, et al. Prevalence and associated factors of attention deficit hyperactivity disorder (ADHD) among Ugandan children; a cross-sectional study. Child and adolescent psychiatry and mental health. 2017;11:1-7.
35. Kivumbi A. Prevalence and factors associated with attention deficit/hyperactivity disorder among patients with substance use disorders attending Butabika Hospital, Kampala: Makerere University; 2022.
36. Organization WH. Global status report on alcohol and health 2018: World Health Organization; 2019.

37. Wagman JA, Nabukalu D, Miller AP, Wawer MJ, Ssekubugu R, Nakowooya H, et al. Prevalence and correlates of men's and women's alcohol use in agrarian, trading and fishing communities in Rakai, Uganda. PLoS One. 2020;15(10):e0240796.
38. Gum AM, King-Kallimanis B, Kohn R. Prevalence of mood, anxiety, and substance-abuse disorders for older Americans in the national comorbidity survey-replication. The American Journal of Geriatric Psychiatry. 2009;17(9):769-81.
39. Beesdo K, Pine DS, Lieb R, Wittchen H-U. Incidence and risk patterns of anxiety and depressive disorders and categorization of generalized anxiety disorder. Archives of general psychiatry. 2010;67(1):47-57.
40. McLean CP, Asnaani A, Litz BT, Hofmann SG. Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. Journal of psychiatric research. 2011;45(8):1027-35.
41. Jalnapurkar I, Allen M, Pigott T. Sex differences in anxiety disorders: A review. J Psychiatry Depress Anxiety. 2018;4(12):3-16.
42. Amiri S, Behnezhad S. Body mass index and risk of suicide: A systematic review and meta-analysis. Journal of affective disorders. 2018;238:615-25.
43. Zhang J, Yan F, Li Y, McKeown RE. Body mass index and suicidal behaviors: a critical review of epidemiological evidence. Journal of affective disorders. 2013;148(2-3):147-60.
44. Gearhardt AN, Waller R, Jester JM, Hyde LW, Zucker RA. Body mass index across adolescence and substance use problems in early adulthood. Psychology of Addictive Behaviors. 2018;32(3):309.
45. Cummings JR, Ray LA, Tomiyama AJ. Food–alcohol competition: As young females eat more food, do they drink less alcohol? Journal of health psychology. 2017;22(5):674-83.
46. Tantawy S, Karamat NI, Al Gannas RS, Khadem SA, Kamel DM. Exploring the relationship between body mass index and anxiety status among Ahlia University Students. Open Access Macedonian Journal of Medical Sciences. 2020;8(B):20-5.
47. Gariepy G, Nitka D, Schmitz N. The association between obesity and anxiety disorders in the population: a systematic review and meta-analysis. International journal of obesity. 2010;34(3):407-19.
48. de Wit L, Have Mt, Cuijpers P, de Graaf R. Body Mass Index and risk for onset of mood and anxiety disorders in the general population: Results from the Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2). BMC psychiatry. 2022;22(1):1-11.
49. Prigge R, Jackson C. P43 The association between depression and subsequent hypertension–a systematic review and meta-analysis. BMJ Publishing Group Ltd; 2017.
50. Jeon SW, Chang Y, Lim S-W, Cho J, Kim H-N, Kim K-B, et al. Bidirectional association between blood pressure and depressive symptoms in young and middle-age adults: a cohort study. Epidemiology and psychiatric sciences. 2020;29:e142.
51. Chen Q, Hartman CA, Haavik J, Harro J, Klungsøyr K, Hegvik T-A, et al. Common psychiatric and metabolic comorbidity of adult attention-deficit/hyperactivity disorder: A population-based cross-sectional study. PloS one. 2018;13(9):e0204516.
52. Paloyelis Y, Asherson P, Mehta MA, Faraone SV, Kuntsi J. DAT1 and COMT effects on delay discounting and trait impulsivity in male adolescents with attention deficit/hyperactivity disorder and healthy controls. Neuropsychopharmacology. 2010;35(12):2414-26.
53. Luman M, Tripp G, Scheres A. Testing hypotheses of altered reinforcement sensitivity in ADHD: a research agenda. European Child & Adolescent Psychiatry. 2010;19.

54. Mdege ND, Makumbi FE, Ssenyonga R, Thirlway F, Matovu JK, Ratschen E, et al. Tobacco smoking and associated factors among people living with HIV in Uganda. Nicotine and tobacco research. 2021;23(7):1208-16.
55. Boua PR, Soo CC, Debpuur C, Maposa I, Nkoana S, Mohamed SF, et al. Prevalence and socio-demographic correlates of tobacco and alcohol use in four sub-Saharan African countries: a cross-sectional study of middle-aged adults. BMC Public Health. 2021;21(1):1126.
56. Hardeveld F, Spijker J, De Graaf R, Nolen W, Beekman A. Prevalence and predictors of recurrence of major depressive disorder in the adult population. Acta Psychiatrica Scandinavica. 2010;122(3):184-91.
57. Maslej MM, Furukawa TA, Cipriani A, Andrews PW, Mulsant BH. Individual differences in response to antidepressants: a meta-analysis of placebo-controlled randomized clinical trials. JAMA psychiatry. 2020;77(6):607-17.
58. Drevets WC, Wittenberg GM, Bullmore ET, Manji HK. Immune targets for therapeutic development in depression: towards precision medicine. Nature Reviews Drug Discovery. 2022;21(3):224-44.
59. Cai H, Xie X-M, Zhang Q, Cui X, Lin J-X, Sim K, et al. Prevalence of suicidality in major depressive disorder: a systematic review and meta-analysis of comparative studies. Frontiers in psychiatry. 2021;12:690130.
60. Zhou Y, Cao Z, Yang M, Xi X, Guo Y, Fang M, et al. Comorbid generalized anxiety disorder and its association with quality of life in patients with major depressive disorder. Scientific Reports. 2017;7(1):40511.
61. Cho S-J, Hong JP, Lee J-Y, Im JS, Na K-S, Park JE, et al. association between DSM-IV anxiety disorders and suicidal behaviors in a community sample of South Korean adults. Psychiatry investigation. 2016;13(6):595.
62. Kar N, Bastia BK. Post-traumatic stress disorder, depression and generalised anxiety disorder in adolescents after a natural disaster: a study of comorbidity. Clinical Practice and Epidemiology in Mental Health. 2006;2(1):1-7.

Factor	Frequency (%) n=985
Sex	
Male	366 (37.2%)
Female	592 (60.1%)
Missing	27 (2.7%)
Age	
Mean (standard deviation)	40.6 (14.7)
Missing	27 (2.7%)
Ever been married	
Yes	826 (83.9%)
No	132 (13.4%)
Not reported	27(2.7%)
Age first got married	
Mean (standard deviation)	19.7 (3.9)
Missing	159
Smoking tobacco	
Yes	84 (8.5%)
No	874 (88.7%)
Missing	27 (2.7%)
Consumed alcohol in the last 12 months	357 (36.2%)
Yes	80 (8.1%)
No	548 (55.6%)
Missing	
Ever had high blood pressure	
Yes	76 (7.7%)
No	882 (89.5%)
Missing	27 (2.7%)
Ever had raised blood sugar	
Yes	15 (1.5%)
No	943 (95.7%)
Missing	27 (2.7%)
Body mass index	
Median (interquartile range)	22.1 (19.6, 23.8)

Table 1: *description of the socio-demographic characteristics and clinical variables of the study participants.*

Mental disorder	Prevalence	Prevalence Per 100 (95% CI)
Current MDD	190/984	19.3 (16.9, 21.9)
Life-time MDD	229/984	23.3 (20.7, 25.9)
Suicidality	104/984	10.6 (8.7, 12.6)
PTSD	12/384*	3.1 (1.8, 5.4)
Alcohol abuse	56/984	5.7 (4.4, 7.3)
GAD	127/984	12.9 (10.9, 15.2)
Probable ADHD	91/985	9.2 (7.5, 11.2)

Table 2: *Prevalence of mental disorders and alcohol abuse among the study participants. MDD = major depressive disorder, PTSD = post-traumatic stress disorder, GAD = generalised anxiety disorder, ADHD = attention-deficit hyperactivity disorder, CI = confidence interval. *data collection for PTSD started late hence the lower numbers.*

	Life-time MDD	Current MDD	Suicidality	PTSD	Alcohol abuse	GAD	ADHD
Life-time MDD	1.0000						
Current MDD	0.8883*	1.0000					
Suicidality	0.3247*	0.3532*	1.0000				
PTSD	0.0553	0.0694	0.0072	1.0000			
Alcohol abuse	0.0477	0.0993	0.0228	-0.0278	1.0000		
GAD	0.2311*	0.2561*	0.2868*	0.1289*	0.0560	1.0000	
Probable ADHD	-0.0362	0.0251	-0.0357	-0.0268	0.0268	0.0052	1.0000

Table 3: *Correlation matrix for correlations among the different mental disorders and alcohol abuse. MDD = major depressive disorder, PTSD = post-traumatic stress disorder, GAD = generalised anxiety disorder, ADHD = attention-deficit hyperactivity disorder*, * = $p < 0.05$.

a) Suicidality

Variable	Level	Adjusted odds ratios (95%CI)	P value
Sex	Male	1	
	Female	2.14 (0.77, 5.90)	0.143
Age in years	Per year increase	1.01 (0.98, 1.04)	0.503
Ever been married	No	1	
	Yes	1.16 (0.21, 6.46)	0.862
Smoke tobacco	No	1	
	Yes	2.46 (0.40, 15.07)	0.329
Drink alcohol	No	1	

	Yes	1.03 (0.20, 5.21)	0.970
High blood pressure	No	1	
	Yes	0.39 (0.05, 3.31)	0.388
Raised blood sugar	No	1	
	Positive	1.53 (0.38, 6.06)	0.546
Age first got married	Per year increase	0.95 (0.89, 1.02)	0.583
Body mass index	Per unit increase	0.85 (0.73, 0.99)	0.041

b) Alcohol abuse

Sex	Male	1	
	Female	0.26 (0.14, 0.45)	P<0.001
Age in years	Per year increase	0.99 (0.97, 1.01)	0.185
Ever been married	No	1	
	Yes	2.5 (0.97, 6.45)	0.058
Smoke tobacco	No	1	
	Yes	3.2 (1.56, 6.67)	0.002
Drink alcohol	No	1	
	Yes	9.01 (1.21, 67.11)	0.032
High blood pressure	No	1	
	Yes	2.10 (0.81, 5.39)	0.124
HIV status	Negative	1	
	Positive	0.92 (0.32, 2.65)	0.876
Age first got married	Per year increase	1.00 (0.92, 1.09)	0.934
Body mass index	Per unit increase	0.86 (0.78, 0.94)	0.003

c) Generalised anxiety disorder

Sex	Male	1	
	Female	1.78 (1.09 - 2.49)	0.019
Age in years	Per year increase	0.99 (0.98, 1.00)	0.151
Ever been married	No	1	
	Yes	1.35 (0.79, 3.01)	0.209
Smoke tobacco	No	1	
	Yes	1.15 (0.52, 2.50)	0.724
Drink alcohol	No	1	
	Yes	0.79 (0.39, 1.61)	0.532
High blood pressure	No	1	
	Yes	0.82 (0.37, 1.78)	0.614
Raised blood sugar	No	1	
	Yes	0.60 (0.08, 4.67)	0.627
HIV status	Negative	1	

	Positive	1.42 (0.76, 2.68)	0.272
Age first got married	Per year increase	0.99 (0.94, 1.06)	0.933
Body mass index	Per unit increase	0.93 (0.87, 0.98)	0.008

d) Attention-deficit hyperactivity disorder

Sex	Male	1	
	Female	1.02 (0.65, 1.61)	0.345
Age in years	Per year increase	1.00 (0.99, 1.01)	0.657
Ever been married	No	1	
	Yes	2.12 (0.88, 5.14)	0.095
Smoke tobacco	No	1	
	Yes	1.67 (0.79, 3.53)	0.176
Drink alcohol	No	1	
	Yes	0.69 (0.32, 1.49)	0.350
High blood pressure	No	1	
	Yes	1.99 (1.00, 3.97)	0.050
Raised blood sugar	No	1	
	Yes	0.68 (0.09, 5.30)	0.715
HIV status	Negative	1	
	Positive	1.36 (0.65, 2.83)	0.409
Age first got married	Per year increase	1.03 (0.96, 1.10)	0.380
Body mass index	Per unit increase	0.96 (0.89, 1.02)	0.165

e) Life-time MDD

Sex	Male	1	
	Female	0.93 (0.53, 1.63)	0.799
Age in years	Per year increase	1.00 (0.98, 1.02)	0.939
Ever been married	No	1	
	Yes	2.13 (0.79, 5.66)	0.131
Smoke tobacco	No	1	
	Yes	0.33 (0.09, 1.26)	0.105
Drink alcohol	No	1	
	Yes	0.96 (0.30, 3.01)	0.942
High blood pressure	No	1	
	Yes	2.87 (1.08, 7.66)	0.035
Raised blood sugar	No	1	
	Yes	1.98 (0.38, 10.44)	0.419
HIV status	Negative	1	
	Positive	1.87 (0.73, 4.77)	0.189
Body mass index	Per unit increase	1.00 (0.93, 1.08)	0.966

Table 4: *Results of fitting multiple logistic regression models for factors associated with the different mental disorders and alcohol abuse. HIV = human immune deficiency syndrome.*

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryMaterialMolecularPSychiatry.pdf