Changes in prevalence of mental disorders among internally displaced persons in central

Sudan – a longitudinal Study

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ABSTRACT

Background

World-wide, there are 27.5 million internally displaced persons. Sudan has the largest internally displaced population in the world, estimated at five million. The immediate cause of displacement was the civil war. This study aimed at investigating the impact of prolonged forced displacement on mental health of internally displaced persons (IDP) in squatter settlements in Sudan. The objective of this study was to identify the changes of prevalence in mental disorders among the IDPs over a period of one year.

Method: A one-year follow up community-based study was conducted in 2011 among internally displaced adults living in central Sudan. Two locations and a total of 1549 persons were randomly sampled. The same standardized tools were used in each of the two study phases – specifically, the General Health Questionnaire (GHQ) and the International Neuropsychiatric Interview (MINI) – and the same socio-demographic information was collected. The data was collected by clinical psychologists using interviews and a house-to-house sampling procedure.

Results: Relatively small but significant increases in the number of new cases of common mental disorders were observed. Major depression increased by 1.4%, generalized anxiety by 2.8%, social phobia by 1.4%, and post-traumatic stress (PTSD) by 0.8%. The odds for major depression was 25% lower in the age group 30 – 39 compared to those below 30 years. Residing in the rural areas [OR: 2.34, 95% CI (1.77, 3.10)] and having elementary education [OR: 1.46, 95% CI (1.00, 2.16)] were associated with higher odds for social phobia. The risk for PTSD increased with age and higher levels of education. However, lower risks for PTSD were observed in the rural areas as compared to the urban location [OR: 0.65, 95% CI (0.48, 0.89)], and longer duration of stay in an area was associated with a 4% decrease in the likelihood for PTSD. Employment, whether on a temporary or permanent basis, was associated with increased odds for distress (GHQ).

Conclusion: The study provides evidence of a negative impact of prolonged displacement on mental well-being, calling for greater attention to and protection for IDPs for the sake of improving their mental health.

BACKGROUND

Contrary to forced external migrants or refugees, forced internally displaced are not protected by international refugee laws [1, 2]. This may prevent IDPs in receiving aid and services, thereby increasing their vulnerability [2]. The International Displacement Monitoring Centre (IDMC) estimated that, globally the number of internally displaced persons (IDPs) has steadily increased from around 17 million in 1998 to 27.5 million in 2010[3]. Most IDPs live in low-income, conflict-affected countries. Attention to their health and in particular their psychosocial health has not been well addressed [4].

Sudan is considered as a country with the largest population of internally displaced in the world [5]. That is, Sudan has endured many tribulations, including drought, famine and civil war. The immediate case of displacement was the civil war which forced a large number to flee from their homes [6]. The first civil war in Sudan between the southerners and the Sudanese state began with colonial independence in 1956 [7]. The civil war has persisted for many decades in the south, and is presently ongoing in the south as well as in Darfur. Most causes of conflict in Sudan are due to deep-rooted tensions between the central and peripheral regions, a highly inequitable division of power and wealth, and a government unwilling to acknowledge the country's ethnic, linguistic and religious diversity [6]. Estimates of the numbers of IDPs have remained inexact. While a large segment of the population has been internally displaced in recent decades [8], estimated in 2010 to between 4.5 and 5.2 million in areas where estimates had been made: in the western region of Darfur, in and around Khartoum, in the state of Southern Kordofan, and in Southern Sudan. In addition, there were unknown numbers of IDPs in the other northern and eastern states [6].

IDPs face many impediments and unique problems that require specific attention [9]. Women and children are especially at risk in times of war and environmental adversity. Additionally, IDPs may differ from the rest of the population with regard to the type and severity of mental illnesses suffered [10] [11]. It is thought that IDPs with mental illness may struggle to access adequate health care, which, consequently, may lead to further complications and inequalities [12]. The lack of necessary knowledge for identifying, diagnosing, and treating mental illness at the primary health care level is a fundamental aspect of the inadequacy of mental illness care in Sudan as in many low-income countries.

A few recent studies have contributed in shedding some light on the mental health status of IDPs in Sudan. Thus, a study in one of the IDP camps in Darfur reported that 31% were suffering from major depression, 61% from

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symptoms of depression, and 5% from suicidal ideation. Moreover, there were 21 suicides in a population of 9000 within one year, which is 10 times the suicide rate of the general population [13]. A study among IDPs in two settlement areas in central Sudan revealed high prevalence rates of mental disorders like major depression (24%), generalized anxiety (23.6%), social phobia (14.2%), and posttraumatic stress (12.3%) and forms the basis of the present longitudinal study [14].

In a study from a post-conflict setting in South Sudan, the association of exposure to traumatic events with generalized anxiety disorder (GAD) was analysed [15]. The main finding was that exposure to traumatic events and socio-economic disadvantage were significantly associated with having one or more anxiety diagnoses.

Aside from these few published studies among IDPs in Sudan, and a few studies among recently displaced from Sudan to neighboring countries demonstrating high rates of psychopathology, particularly post-traumatic stress disorder and depression [5], a gap in knowledge about mental health among IDPs in Sudan indicates that more research is urgently needed. From the few studies that we have in Sudan, and similar studies in other IDP settings, there is evidence supporting high incidence of mental health problems among internally displaced. This raises the question to what extent mental health problems among IDPs can in fact be attributed to the IDP experience and further whether particular types of IDP experience is more important than others as possible causes of mental health problems. The present study aimed at investigating the impact of prolonged forced displacement on IDP mental health in squatter settlements in Sudan. This was done by identifying new and recovered cases of mental disorders and changes in levels of related distress over the course of one year and to investigate to what extent the changes could be attributed to prolonged forced displacement by controlling for a range of socio-demographic variables.

METHODS

Objectives: To study changes in prevalence over time among IDPs in two geographical areas in Sudan.

 Design and Setting: A one year follow up community-based study was carried out among adult internally displaced persons in two settlement areas in Khartoum and Gezeira in Central Sudan, 2011. The two study areas were randomly selected from a list of all IDP areas in the first phase of the study, stratified by urban and rural. Mayo, in Khartoum state, represents an urban setting. Moby is a rural area in the south of Gezira state, about 25 km from the state capital, Wad-Madani.

The populations of the two study areas were displaced from different parts of Sudan from the outbreak of the civil war in 1983 and during the 1983, 1984, and 1985 droughts and famines that affected the Darfur and Kordofan regions. All inhabitants in the IDP areas share a common experience of being disbplaced and living in a community of IDPs. The population is from different ethnic groups, speaking different mother tongues, but Arabic is the most common language. They live in unsanitary and overpopulated areas that lack essential services like safe water, electricity, and health services. There is a rural hospital near Mayo and a health centre for the Mobi area. The target population included all adults aged 18 and above living in the study areas.

Participants: We excluded persons who were not fluent in Arabic or declined to give informed consent. During October 2011 (Time 1), a total sample of 1876 subjects were included, of which 1549 (Time 2) were re-interviewed after one year, giving a response rate of 82.6 %.

Data Collection: The data were collected by 20 well-trained clinical psychologists who were equally divided into two groups (for Gezira and Khartoum), and with an equal gender representation. All members of the research team underwent a one-week intensive training programme in research interview techniques in order to enhance their ability to properly utilize the research instruments and appropriately approach the community. They also conducted a pilot testing of the interview protocol and were supervised by a research team from the University of Oslo and the University of Khartoum. Community guides were involved to facilitate a positive community response. Each data collection team consisted of three members – two interviewers and one community guide or helper.

All household members above 18 years of age were interviewed. Written informed consent was obtained from all participants.

Measurements: The same instruments were used in both study phases – namely, the General Health Questionnaire (GHQ) and the Mini International Neuropsychiatric Interview (MINI). Information about the same socio-demographic variables – age, gender, education, marital status, occupation, and annual family income – was also obtained in both study phases. Arabic translations were used in the baseline study as well as at follow-up.

MINI International Neuropsychiatric Interview (MINI): The International Neuropsychiatric Interview (MINI) is a short and structured diagnostic interview, developed for determining the diagnosis of Diagnostic and Statistical Manual of Mental disorders Fourth Edition (DSM-IV) and ICD-10 psychiatric disorders [16[16]. The MINI enables diagnosis of a number of mental disorders, such as major depressive episode, dysthymia, hypomania, panic disorder,

agoraphobia, social phobia, obsessive-compulsive disorder, PTSD, alcohol and substance abuse, psychotic disorders, generalized anxiety disorder, and antisocial personality disorder. Studies have shown that MINI is a valid and reliable diagnostic tool, which has been widely used in different cultural settings. Validation and reliability studies have compared MINI to the Structured Clinical Interview for DSM-IV disorders (SCID) and the Composite International Diagnostic Interview (CIDI), the two most widely used instruments. MINI has acceptably high validity and reliability scores, and it can be administered in a short amount of time (M = 18.7 minutes (SD = 11.6)), compared to the one to two hours required by other instruments.

The General Health Questionnaire (GHQ 28): Since its introduction in 1978, the GHQ (Goldberg 1978) [17] has been translated into many different languages, including Arabic. It is a measure of psychological distress. it has been used in various settings and cultures including Sudan[18]. The GHQ-28 has been divided into four subscales with Likert items: somatic symptoms (items 1–7); anxiety/insomnia (items 8–14); social dysfunction (items 15–21), and severe depression (items 22–28). It takes less than 5 minutes to complete. It asks whether the respondent has experienced a particular symptom or behaviour recently. The GHQ-28 is the most well-known and popular version of the GHQ. Using the Likert scoring (0- 0- 1- 1), a cut off score of 5 is most effective at separating cases from non-cases.

Statistical Analysis:

Descriptive statistics in the form of frequencies (n) and proportions (%) were used to describe the socio-demographic characteristics of the participants at baseline. Numerical variables were summarized using medians and the Mann-Whitney U test was used to compare median differences between Khartoum and Gezira. Associations between categorical variables at baseline were established from Chi-square tests of associations. The McNemar test was used to determine whether the prevalence of mental disorders at Time 1 had increased or decreased by Time 2.

Binary responses relating to whether or not a participant had a major mental disorder such as major depression, social phobia, PTSD and GAD were obtained at Time 1 and Time 2. Such repeated observations were assumed to be correlated within a participant. Therefore, these repeated binary responses were modelled using a binary logistic regression with generalized estimating equations (GEE) to handle the dependence/clustering of the data within participants. The exchangeable correlation structure was used for the GEE binary logistic regression models. All analyses were performed using StataSE 14 and IBM SPSS Statistics 24 and the significance level was set at $\alpha = 0.05$.

Missing data were multiple imputed and a sensitivity analysis carried out. There were no significant changes in parameter estimates that were observed, hence we report results based on the actual data.

RESULTS

Table 1 shows the socio-demographic characteristics of both study areas, Mayo in the northern part of Khartoum with a total of 849 respondents representing 54.8% of the total respondents, and the rural area of Mobi near Wad-Madani, the capital of Gezira state, with 700 (45.2%) respondents. Their median age was 29 years (range: 19-69) and the majority were women (58.0%). Most of the respondents were married (68.6%) and were originally from western Sudan (50.7%). About 13.4% had permanent jobs, 22.5% had temporary jobs, and more than half (64.1%) were unemployed. Economic status varied from extremely poor to poor, and 46.7% had an income of less than 200 SD per month. 18.9% had no formal education, 22.4% had received Islamic religious education (khalwa), 40.1% had attended elementary school, and 18.7% had university education. The large majority had been displaced due to war, The proportion of participants who were forced to migrate due to war was however significantly higher in Khartoum (96.1 %) than in Gezira (90.1 %). Median duration of stay in the two areas were 29 years (Karthoum) and 31 years (Gezira).

The prevalence of common mental disorders at both Time 1 and Time 2 in Khartoum and Gezira are presented in Figures 1 and 2 respectively. At both sites, the observed prevalence were higher at Time 2 than at Time 1 except for PTSD in Gezira, which remained constant at 10%. For example, major depression in Khartoum had a prevalence of 25.7% at Time 1 which increased to 27.8% at Time 2, while in Gezira the prevalence was 23.3% at Time 1 and 23.7% at T2.

The prevalence rates of the four most common MINI-assessed mental disorders in each of the two phases are presented in **Table 2**. An increase in new cases was found in all mental disorders. The most prevalent disorder at Time 1 was major depression, with an estimated prevalence of 24.6%, followed by generalized anxiety disorder (23.2%), social phobia (14.5%) and PTSD (12.2%). At Time 2, the prevalence of major depression and GAD increased to 26% whereas the prevalence of social phobia and PTSD increased to 15.9% and 13% respectively. Other disorders were less prevalent at Time 1, with prevalence rates that varied from 6.9% to 0.3%, such as psychotic disorders (1%) and

alcohol abuse (0.3%) (Not shown in Table 2). Generalized anxiety disorder was also associated with the highest proportion of new cases.

Adjusted odds ratios showing the associations between socio- demographic factors and the risk of common mental disorders are presented in Table 3. We have also presented the unadjusted odds ratios in Table S1. The results of the multiple regression analysis adjusted for socio-demographic factors showed that the risk for major depression was significantly lower by 25% among the participants in the age group 30 – 39 years compared to those in the age category 19 – 29 years. Participants from Gezira (rural area) were 2.34 times more likely to suffer from social phobia compared to participants from Khartoum (urban area) ($P < 0.01$). However, Gezira participants had a lower risk for post-traumatic distress (PTSD). The risk was 35% lower compared to Khartoum participants ($P = 0.01$). The odds of PTSD significantly increased by 79% among those aged ≥ 40 years compared with those who were in the age category 19 – 29 years. We also observed that the odds for elementary educated participants to suffer from social phobia increased significantly by 46% compared to illiterate participants. On the other hand, the risk for PTSD increased significantly by 69% among those with secondary or above education compared to the illiterate group. An additional year of stay in an area was significantly associated with a 4% decrease in the odds for PTSD [OR: 0.96 (0.94, 0.98)].

Socio-demographic factors associated with distress are presented in Table 4. In both the unadjusted and adjusted analysis, only employment status was significantly associated with distress. Having a temporary job significantly increased the odds of distress by 40% compared to being unemployed. The analysis also showed that participants with permanent jobs were 57% more likely to suffer distress compared to participants without jobs ($P = 0.01$) when adjusted for the other socio-demographics.

DISCUSSION

To our knowledge, this is the first longitudinal study among IDPs that addresses the impact of prolonged forced displacement on mental health. Our study involved a one-year follow-up in a sample of poor and long-term displaced people living in squatter settlements in rural and urban areas of Sudan. The findings revealed relatively small but significant increases in the most common mental disorders. While indicating relatively high incidence of major mental health disorders, other studies in similar contexts have shown higher incidence of both PTSD and depression.

At the time of follow-up, prevalence of major depression, generalized anxiety, social phobia and post-traumatic stress had all increased somewhat. This might be attributable to prolonged displacement and increased levels of daily stress. While there is limited previous evidence to support a negative mental health development due to prolonged forced displacement, this is nevertheless indicated in several cross-sectional studies [19-21]. With the current study, evidence for a negative impact of prolonged displacement has been strengthened.

The study found variation between age groups regarding major depression disorder and PTSD, which is in line with a previous study conducted among IDPs in Darfur [22]. While most socio-demographic variables were not associated with mental health disorders, the study found a positive association between level of education and PTSD, and a negative association between PTSD and long-time rural residency. Both findings find support in previous albeit limited research [23]. Rural participants showed higher incidence of social phobia, which may indicate the nature of the rural and somewhat isolated life in the rural area compared to the open life in the urban area near the capital Khartoum.[5] .

Also, higher exposure to distress was found among persons with permanent as compared to persons with temporal jobs, which is also in line with findings in previous studies [24-27] [28].

Strengths and Limitations

The strength of the study is its longitudinal design with a high response and follow-up rate. In addition, the random selection of study areas reduces selection bias and increases the strength of causal inferences but does not increase generalizability, especially since only 2 study sites in central Sudan were sampled. Strength is the use of diagnostic instruments and highly skilled psychologists. Thirdly, we knew the area and had cultural knowledge and experience. A limitation that should be noted is that a large number of statistical tests were performed while studying the association between socio-demographic variables and the change in mental disorders, which increases the likelihood of one or more false positives. Nevertheless, we have chosen not to adjust for multiple comparisons as correcting for type I errors cannot be done without inflating type II errors [29].

CONCLUSION

This one-year follow-up of internally displaced in two settlement area in central Sudan reveals continued high levels of psychiatric disorders. The study provides evidence of a negative impact of prolonged displacement on mental health and well-being, calling for greater attention to IDP's mental health.

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Abbreviations

IDPs: Internally Displaced Persons – GHQ: General Health Questionnaire – MINI: International Neuropsychiatric Interview – PTSD: Post- Traumatic Stress Disorder. IMDC: International Displaced Mentoring Centre – GAD: Generalized Anxiety Disorder – DSM-1V: Diagnostic and Statistical Manual of Mental disorders Fourth Edition – ICD-10: International Classification of Diseases, Tenth Revision - REK: Regional Committees of Medical Health Research Ethics - EEG: Generalized Estimating Equation.

DECLARATIONS

Ethics approval and consent to participants

The research protocol was approved by: (1) (Regional Committees for Medical Heath Research Ethics in Norway (REK). (2) Federal Ministry of Health Sudan.

Written inform of consent was obtained from all participant.

Consent for publication: 'Not applicable'

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest

The authors declared that they have no competing interest.

Authors' contributions

ZS and LL designed the study theoretical framework, performed the field work of data collection, data analysis, and took the lead in writing the manuscript; **IM and CB** assisted in statistical analysis and final write up.

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Table 1 Socio-demographic characteristics of the 1549 IDPs at baseline by place of residence in Sudan at T 2

Socio-demographic	Khartoum (n = 849)	Gezira (n = 700)	Total (N=1549)	*P*-value
Age in years, median (min, max)	29 (19, 66)	31 (19, 69)	29 (19, 69)	0.19
Family size, median (min, max)	6 (1, 15)	6 (1, 20)	6 (1, 20)	0.83
Length of stay, median (min, max)	18 (1, 55)	17 (1, 60)	17 (1, 60)	0.92
Gender, n (%)				
Male	339 (39.9)	311 (44.4)	650 (42.0)	0.12
Female	510 (60.1)	389 (55.6)	899 (58.0)	0.09
Marital status, n (%)				
Single	241 (28.4)	245 (35.0)	486 (31.4)	0.06
Married	608 (71.6)	455 (65.0)	1063 (68.6)	0.01
Level of education, n (%)				
Illiterate	139 (16.4)	153 (21.9)	292 (18.9)	0.12
Khalwa	220 (25.9)	127 (18.1)	347 (22.4)	0.05
Elementary	317 (37.3)	304 (43.4)	621 (40.1)	0.06
Secondary and above	173 (20.4)	116 (16.6)	289 (18.7)	0.21
Employment status, n (%)				
Unemployed	569 (67.0)	424 (60.6)	993 (64.1)	0.02
Temporary	173 (20.4)	175 (25.0)	348 (22.5)	0.15
Permanent	107 (12.6)	101 (14.4)	208 (13.4)	0.35
Household income, n (%)				
Less than 200 SD/ per month	376 (44.3)	348 (49.7)	724 (46.7)	0.07
More than 200 SD/ per month	473 (55.7)	352 (50.3)	825 (53.3)	0.06
Place of origin, n (%)				
North (Northern States, River Nile)	17 (2.0)	15 (2.1)	32 (2.1)	0.49
South Sudan	72 (8.5)	111 (15.9)	183 (11.8)	0.07
East (Red Sea, Kassala, Gadarif)	59 (6.9)	44 (6.3)	103 (6.6)	0.45
West (Kordofan, Darfur)	456 (53.7)	330 (47.1)	786 (50.7)	0.03
Middle (Khartoum, Gaziera, Sennar, Damazeen)	245 (28.9)	200 (28.6)	445 (28.7)	0.47
Reason for forced migration				
War	816 (96.1)	635 (90.7)	1451 (93.7)	< 0.01

		Time 1	Time 2	Change		
Famine and drought		33 (3,9)	65 (9.3)	98 (6.3)		0.34

Table 2 Prevalence and change of the common mental disorders in two phases (N=1549)

Mental disorders	Time 1	Time 2	Change		P-value
	n (%)	n (%)	Recovered cases	New cases	
Major depression	381 (24.6)	402 (26.0)	15 (0.10)	36 (2.3)	< 0.01
Social phobia	225 (14.5)	246 (15.9)	12 (0.8)	33 (2.1)	< 0.01
Post-traumatic stress disorder	189 (12.2)	201 (13.0)	7 (0.5)	19 (1.2)	0.03
Generalized anxiety disorder	360 (23.2)	403 (26.0)	14 (0.9)	57 (3.7)	< 0.01

Table 3 Associations between social demographics and common mental disorders using the adjusted GEE binary logistic regression

Covariates	Major Depression		Generalized anxiety disorder		Social Phobia		Post-Traumatic Distress (PTSD)	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Place (ref: Khartoum)								
Gezira	0.85 (0.68, 1.07)	0.18	0.83 (0.66, 1.04)	0.10	2.34 (1.77, 3.10)	**< 0.01**	0.65 (0.48, 0.89)	0.01
Gender (ref: Male)								
Female	1.09 (0.82, 1.44)	0.56	0.99 (0.75, 1.31)	0.93	1.39 (0.98, 1.97)	0.07	0.83 (0.58, 1.21)	0.34
Age (ref: 19 – 29)								
30 - 39	0.75 (0.57, 0.99)	**0.05**	0.93 (0.70, 1.23)	0.60	0.99 (0.72, 1.38)	0.98	1.15 (0.77, 1.72)	0.50
40 +	0.91 (0.66, 1.25)	0.55	0.95 (0.69, 1.31)	0.75	0.74 (0.50, 1.10)	0.14	1.79 (1.15, 2.76)	**0.01**
Marital status (ref: Single)								
Married	1.03 (0.78, 1.37)	0.82	1.01 (0.76, 1.33)	0.97	1.29 (0.91, 1.82)	0.16	1.08 (0.74, 1.57)	0.70
Education (ref: illiterate)								
Khalwa	0.98 (0.68, 1.40)	0.91	0.84 (0.59, 1.20)	0.35	1.29 (0.83, 2.00)	0.27	1.19 (0.74, 1.93)	0.48
Elementary	1.03 (0.75, 1.42)	0.86	1.02 (0.75, 1.40)	0.88	1.46 (1.00, 2.16)	**0.05**	1.14 (0.73, 1.78)	0.57
Secondary an above	1.05 (0.71, 1.55)	0.82	0.79 (0.53, 1.18)	0.25	0.91 (0.55, 1.53)	0.73	1.69 (1.01, 2.83)	**0.05**
Employment: (Unemployed)								
Temporary	1.08 (0.79, 1.47)	0.65	1.04 (0.76, 1.42)	0.79	1.18 (0.81, 173)	0.38	0.85 (0.56, 1.29)	0.43
Permanent	1.09 (0.75, 1.59)	0.66	0.98 (0.67, 1.43)	0.91	1.24 (0.78, 1.97)	0.36	0.94 (0.57, 1.53)	0.79
Income (ref: < 200)								
200 +	1.11 (0.89, 1.40)	0.35	0.87 (0.69, 1.09)	0.23	1.19 (0.90, 1.57)	0.22	0.84 (0.62, 1.14)	0.26
Duration of stay	1.00 (0.99, 1.01)	0.81	1.01 (0.99, 1.02)	0.30	1.01 (1.00, 1.03)	0.11	0.96 (0.94, 0.98)	**< 0.01**

Table 4 Unadjusted and adjusted **OR** obtained from the GEE binary logistic regression showing the associations between social demographics and GHQ

| Socio-demographics	Unadjusted		Adjusted model	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Place (ref: Khartoum)				
Gezira	1.13 (0.91, 1.41)	0.28	1.09 (0.87, 1.36)	0.46
Gender (ref: Male)				
Female	0.86 (0.69, 1.07)	0.17	1.08 (0.82, 1.42)	0.60
Age (ref: 19 – 29)				
30 - 39	1.12 (0.87, 1.45)	0.36	1.13 (0.86, 1.49)	0.38
40 +	1.12 (0.84, 1.50)	0.44	1.11 (0.81, 1.53)	0.52
Marital status (ref: Single)				
Married	0.91 (0.72, 1.15)	0.41	0.92 (0.70, 1.21)	0.55
Education (ref: illiterate)				
Khalwa	0.91 (0.65, 1.28)	0.58	0.94 (0.67, 1.33)	0.73
Elementary	0.87 (0.64, 1.18)	0.38	0.88 (0.64, 1.20)	0.40
Secondary and above	0.95 (0.67, 1.35)	0.78	0.92 (0.63, 1.35)	0.68
Employment: (Unemployed)				
Temporary	1.38 (1.06, 1.80)	0.02	1.40 (1.04, 1.90)	0.03
Permanent	1.55 (1.13, 2.13)	0.01	1.57 (1.10, 2.26)	0.01
Income (ref: < 200)				
200 +	1.11 (0.89, 1.38)	0.35	1.10 (0.88, 1.38)	0.41
Duration of stay (years)	0.99 (0.98, 1.01)	0.40	0.99 (0.98, 1.01)	0.25
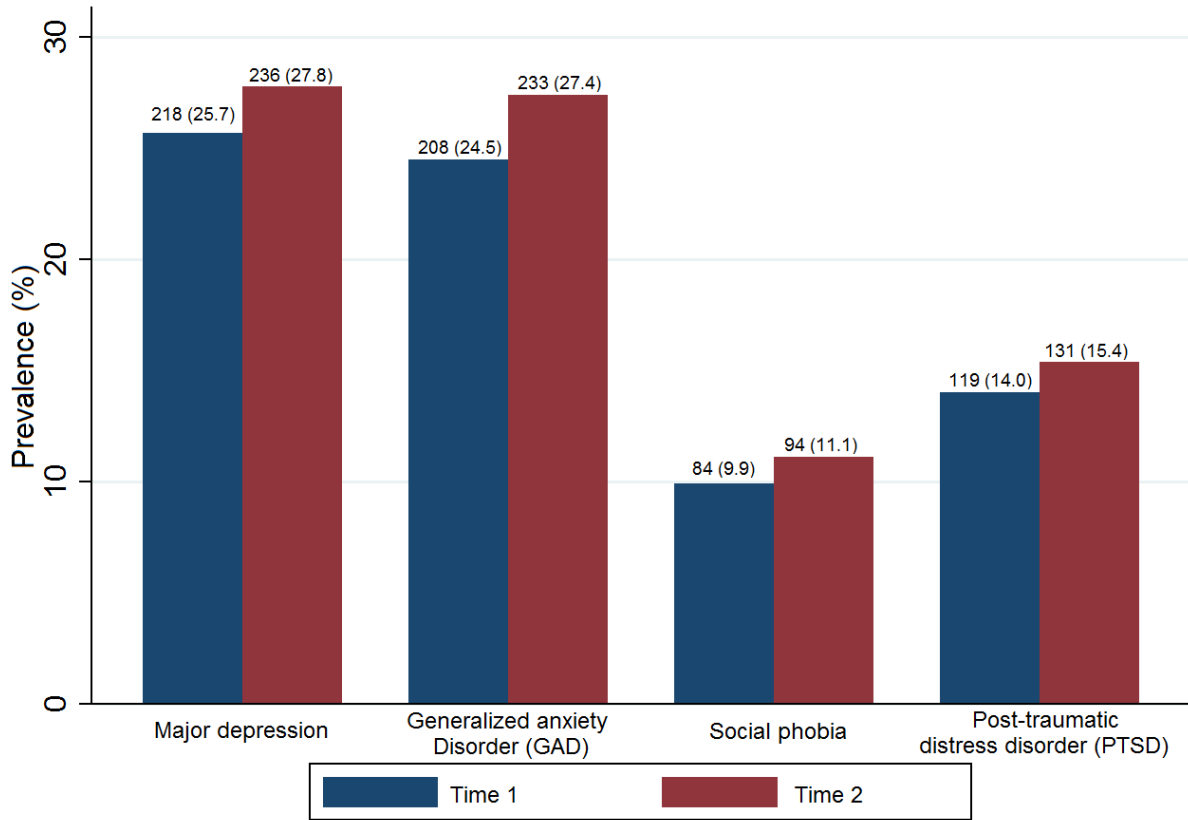
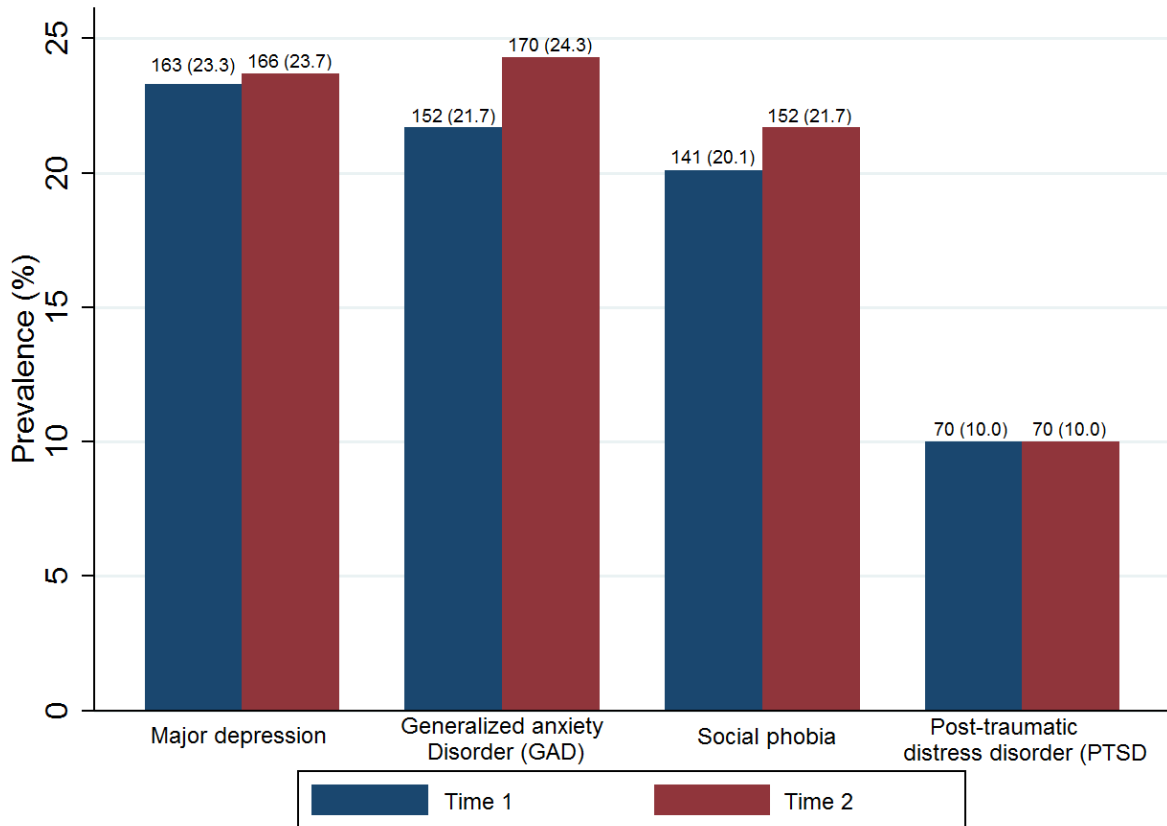Figure 1 Prevalence of mental disorders in Khartoum between Time 1 and Time 2

Figure 2 Prevalence of mental disorders in Gezira between Time 1 and Time 2

Table S1 Unadjusted OR obtained from the GEE binary logistic regression showing the associations between social demographics and major mental disorders

Covariates	Major Depression		Generalized anxiety disorder		Social Phobia		Post-Traumatic Distress (PTSD)	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Place (ref: Khartoum)								
Gezira	0.84 (0.67, 1.06)	0.14	0.85 (0.68, 1.07)	0.16	2.26 (1.72, 2.98)	**< 0.01**	0.64 (0.47, 0.87)	0.01
Gender (ref: Male)								
Female	1.04 (0.83, 1.31)	0.74	1.03 (0.82, 1.29)	0.80	1.32 (1.00, 1.75)	**0.05**	0.87 (0.65, 1.17)	0.37
Age (ref: 19 – 29)			A					
30 - 39	0.76 (0.58, 0.99)	**0.04**	0.93 (0.72, 1.21)	0.60	1.13 (0.83, 1.53)	0.43	0.90 (0.64, 1.28)	0.58
40 +	0.91 (0.67, 1.22)	0.52	0.95 (0.71, 1.28)	0.74	0.86 (0.59, 1.25)	0.44	1.16 (0.80, 1.69)	0.44
Marital status (ref: Single)								
Married	0.97 (0.77, 1.24)	0.83	1.02 (0.80, 1.30)	0.88	1.33 (0.98, 1.81)	0.06	0.98 (0.71, 1.34)	0.89
Education (ref: illiterate)								
Khalwa	1.09 (0.71, 1.44)	0.96	0.87 (0.61, 1.23)	0.43	1.11 (0.72, 1.72)	0.63	1.27 (0.79, 2.04)	0.32
Elementary	1.07 (0.78, 1.47)	0.67	1.03 (0.76, 1.41)	0.83	1.43 (0.98, 2.09)	0.07	1.10 (0.71, 1.70)	0.68
Secondary an above	1.12 (0.78, 1.62)	0.54	0.81 (0.56, 1.17)	0.26	0.77 (0.47, 1.25)	0.29	1.64 (1.02, 2.63)	**0.04**
Employment: (Unemployed)								
Temporary	1.00 (0.76, 1.31)	0.98	1.01 (0.77, 1.33)	0.92	1.00 (0.72, 1.39)	0.99	0.93 (0.65, 1.34)	0.71
Permanent	1.03 (0.73, 1.43)	0.88	0.94 (0.67, 1.2)	0.71	1.00 (0.66, 1.49)	0.98	1.05 (0.68, 1.62)	0.83
Income (ref: < 200)								
200 +	1.12 (0.90, 1.41)	0.31	0.86 (0.69, 1.08)	0.19	1.12 (0.85, 1.47)	0.42	0.91 (0.68, 1.23)	0.55
Duration of stay in years	1.00 (0.99, 1.01)	0.98	1.01 (0.99, 1.02)	0.32	1.01 (1.00, 1.03)	0.09	0.97 (0.95, 0.98)	< 0.01