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Prevalence of Non-Communicable Diseases and Access to Healthcare Among Internally Displaced People During the Armed Conflict, Northern State (Sudan)

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Background: Non-communicable diseases emerge as major public health challenges with increasing prevalence and mortality. The armed conflict in Sudan has resulted in the displacement of 6.8 million people, putting a significant strain on the health sector in the displacement areas. This study aimed to explore the prevalence of non-communicable diseases and access to healthcare services among internally displaced people in Northern Sudan.

Methods: A cross-sectional study was conducted among randomly selected internally displaced people in accommodation shelters at Dongola locality. Data were collected by face-to-face interviews using a questionnaire adapted from relevant studies. For data analysis descriptive statistics and chi-square tests were utilized using SPSS-27.

Results: 374 participated in the study with a 96.1% response rate. 70% of respondents were 18–49 years old. 70.9% of respondents were females, and 92.8% of them had no source of financial income. The prevalence of non-communicable diseases was 42.5%, with hypertension (44.7%), diabetes mellitus (24.7%), and thyroid disorders (15.2%) predominating. About 45.7% of patients interrupted their medication, and 38.6% could not access healthcare services, while 57.2% of respondents received free medical care. The study found a statistically significant association between the type of disease and age, gender, residence before displacement, and the Length of displacement.

Conclusion: 42.5% of the internally displaced suffer from non-communicable diseases, with hypertension, diabetes mellitus, and thyroid disorders predominating. About 45.3 and 38.6% of them respectively have interrupted their medications and lost regular follow up. The urgent need for improved healthcare services is recommended.

Keywords: internally displaced, non-communicable diseases, conflict, Sudan, Northern state

Introduction

Noncommunicable diseases (NCDs) have emerged as a public health challenge. They account for about 74% of deaths globally every year. Approximately 84% of all NCD-related deaths occur in low and middle-income countries. [1] In Sudan, NCDs account for 53.9% of all deaths, and the most prevalent NCDs are cardiovascular diseases, cancers, respiratory diseases, and diabetes mellitus.[2] Despite their global burden, NCDs have received little attention in humanitarian settings worldwide, particularly among the displaced population.[3]

The estimated number of internally displaced people (IDPs) around the world is 75.9 million, and 45% of them are in Sub-Saharan Africa.[4] Displaced people face many problems including lack of access to healthcare services, and many IDPs suffer from NCDs requiring costly and long-term treatment.[5]

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The ongoing armed conflict between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) has led to the displacement of 6.8 million people within the country, representing the largest number of IDPs internationally.[6] The number of IDPs in the Northern State is about 2.166 million,[7] hosted by local communities or allocated in shelters. The substantial influx of IDPs imposed a significant burden across various domains, notably exerting pronounced pressures on the health sector with constrained facilities.

In previous global studies, approximately 8% and 30% of Syrian IDPs and refugees present with complaints related to NCDs, respectively.[8] In Ukraine about 59.8% of IDPs had at least one NCD.[3] In Iraq, about 33% of IDPs had one or more NCDs, and 40% of them were not adhering to their prescribed medication regimen.[9] In Sudan the ongoing conflict causes a humanitarian crisis and serious impact on the health system. Implications of the war on the health system include the closure of health institutions, cessation of services, shortages of medication supply associated with massive displacement, and increased risk of epidemics, and hunger.[10,11] However, there is a scarcity of studies addressing the health status and needs of IDPs in different regions of Sudan.

The significant and persistent gaps in information and evidence make it challenging to recommend effective strategies to reach satisfactory NCD care among conflict-affected people with special emphasis on children and women.[12] Providing information about the availability of affordable health care services and medications is the first step to establish effective care for IDPs. Unfortunately, there is a lack of such data in Sudan, including Northern state. Bringing these issues into consideration, this study aimed to explore the prevalence of NCDs and access to healthcare services and medications among IDPs in Dongola locality, Northern State, Sudan.

Methodology

Study Design and Setting

A cross-sectional study design was employed, adhering to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The study was conducted in Dongola locality, which accommodates two million IDPs. Dongola is the capital of the Northern State, it is located on the west bank of the River Nile, about 450 km northwest of Khartoum. The study was conducted during the period from 10/09/2023 to 31/12/2023.

Study Population

The study population consisted of Sudanese adults of all ages displaced to the Dongola locality. The study included, males and females who were displaced to Dongola locality due to the armed conflict and living in accommodation shelters during the study period. Individuals who were unconscious, or could not speak were excluded.

Sampling Method and Sample Size Determination

The study participants were recruited by systematic random sampling using a list of IDPs in displacement shelters as a sample frame. Briefly, the sampling interval was calculated by dividing the population size by the sample size. The first was randomly selected using an Excel random number generator. Subsequent participants were then selected at regular intervals until the entire list for was covered.

The sample size was calculated using Raosoft Online Calculator (Raosoft Inc).,[13] with a margin of error of 5%, and a confidence interval of 95%. Based on the population size of 2054 individuals, the calculated minimum size was 324. By adding 20% to account for potential non-response rates, the study required a minimum sample size of 389 individuals.

Data Collection

The data were collected using a structured questionnaire, and filled by face-to-face interviews. Data collectors were volunteer medical students who were well-trained in sampling procedures and questionnaire administration. The questionnaire was adapted from a similar study conducted in Ukraine,[3] and it consisted of two sections (19 items). Section one contained six items about the socio-demographic information of respondents (age, gender, marital status, current source of income, residence before displacement, and duration of displacement). Section two contained 13 items about health information such as if the respondent had been diagnosed with NCD, followed by subsequent questions for

each reported diagnosis (type of NCD, date of diagnosis, interruptions in medical care, access to NCD medications, and encountered barriers).

To ensure content validity and clarity, the questionnaire was revised by three experienced researchers and was pretested among 34 individuals with similar characteristics to the participants. The pretest data were not incorporated in the study. The questionnaire was translated into the Arabic language, revised to improve phrasing and clarity, and back-translated to English language by two experts.

Data Analysis

Data were analyzed using statistical software (SPSS version 27, IBM). Descriptive statistics were utilized to summarize sociodemographic characteristics and health information, and presented as frequency and percentage tables. The chi-square test was used to test the association between sociodemographic variables of respondents and health information.

Ethical Considerations

Initially, the research proposal and research procedures including verbal informed consent were approved by the Research Ethics Committee, Ministry of Health, Northern State, Dongola city ((REC-MoH-NS-6-2023). Then verbal Informed consent was obtained from each participant separately, after being fully informed about the study objectives and procedures from data collection to publication. Participation in the study was entirely voluntary, and the participants had the option to withdraw from the study without penalty. The risks involved in the study are minimal, and participants were not compensated, but they could potentially benefit from the study's findings. The privacy and of participants and confidentiality of data were maintained.

Results

Socio-Demographic Characteristics of Respondents

A total of 374 IDPs participated in the study with a 96.1% response rate. Almost 70% of the respondents were within the age range of 18–49, and 70.9% of them were females. About 66% of respondents were married, and 92.8 of them had no current financial source, about 78.1 of them stated that their original home was Khartoum state, about 80% were displaced for more than 10 weeks. Details of the socio-demographic characteristics of respondents are given in Table 1.

Table 1 Sociodemographic Characteristics of Respondents (N: 374)

Response Items		Frequency	Percent
Age	18–29	98	26.2
	30 −39	76	20.3
	40 −49	89	23.8
	50–59	71	19.0
	60 and more	40	10.7
Gender	Male	109	29.1
	Female	265	70.9
Marital status	Married	247	66.0
	Single	58	15.5
	Divorced	26	7.0
	Widow	43	11.5

(*Continued*)

Table 1 (Continued).

Response Items		Frequency	Percent
Current source of income	Yes	27	7.2
	No	347	92.8
Residence before displacement	Khartoum	292	78.1
	Darfur	37	9.90
	Dongola	45	12.0
Length of displacement	Less than 10 weeks	76	20.3
	10–18 weeks	197	52.7
	More than 18 weeks	101	27.0

Prevalence of Noncommunicable Diseases

As shown in Table 2, the prevalence of NCDs in our study was 42.5%, with a high prevalence of hypertension (44.6%) followed by diabetes mellitus (23.9%) then thyroid disorders (16.3%), with a low prevalence of chronic respiratory disease (11.3%) and chronic kidney disease (3.9%). Furthermore, 62.2% of respondents with NCDs had been diagnosed with more than one NCD.

Interruptions in Medical Care and Access to Medications

As summarized in Table 3, out of the 159 (42.5%) respondents pre-diagnosed with NCDs, 132 (83%) were on long-term medications prescribed by their doctor, but only 54.7% of them used their prescribed medications regularly. Respondents showed that the reasons for interruption in medication use were financial constraints (28.7%), non-availability of their medications in pharmacies (12.5%), lack of motivation to take their medications (3.78%), or difficulty in reaching the pharmacies (1.89%). Furthermore, 61.4% of respondents with NCDs regularly visited a doctor since the displacement. The visits were at the accommodation shelter clinic (29.5%), a governmental public hospital (25.8%), or a private clinic (9.1%). However, 38.6% of respondents were unable to visit a doctor at any point during their stay in the displacement shelter. The reported reasons for not visiting their doctor were financial issues (20%), unavailability of co-patients (10.1%), difficulty in transport (6.9%), or unavailability of their preferred specialist doctor (1.7%).

As shown in Table 4, only 57.2% of respondents received free medical assistance; provided as free examination (25.4%), free investigation (16.8%), or free medication (15.0%).

Table 2 Prevalence and Duration of Non-Communicable Diseases Among Respondents (N: 374)

Non communicable Diseases		Duration (Years)/ frequency (percent%)			
		Less than 5	5 to 15	More than 15	Total
Yes	Hypertension	25 (15.7%)	24(15.1%)	22(13.8%)	71 (44.6%)
	Diabetes Mellitus	13(8.2%)	13(8.2%(	12(7.5%)	38 (23.9%)
	Chronic kidney disease	02(1.3%)	02(1.3%)	02(1.3%)	06)3.9%)
	COPD* and Asthma	07(4.4%)	06(3.8%)	05(3.1%)	18 (11.3%)
	Thyroid disease	10(6.3%)	09(5.7%)	07(4.4%)	26 (16.3%)
No		215 (57.5%)			

Abbreviation: *COPD, Chronic obstructive pulmonary disease.

Table 3 Interruptions in Medical Care and Access to Medications Among Respondents with Non-Communicable Diseases (N: 159)

Response Items				Frequency	percent
Doctor Visiting	Yes, (Then where You visit him)	At the accommodation shelter clinic		47	28.2%
		At governmental hospital		41	25.1%
		At private clinic		14	8.1%
	No, (Then why you Did not visit him)	Financial issues		27	20.0%
		My favorite specialist is not available		03	1.70%
		No co-patient available		16	10.1%
		Difficulty in transport		11	6.90%
Access and regular use of medications	Yes, (doctor Prescribe Medication for me)	Yes (I take my medication regularly)		87	54.7%
		No, (I did not Take them Regularly)	Medication not available	16	10.1%
			Financial issues	20	12.5%
			Difficulties in reaching pharmacies	03	1.89%
			No motivation to take medication	06	3.78%
	No (the doctor did not prescribe medication for me)			27	17.0%
Medication Changes	Yes, (Why doctor Change them?)	Old medication not available in a pharmacy		06	5.80%
		Cannot know the old medication		02	2.00%
		Not reaching the desired response		19	18.7%
	No			75	73.5%

Table 4 Access to Free Medical Services Among Respondents (=374)

Medical service		Frequency	Percent
Yes	Free examination	95	25.4
	Free investigation	63	16.8
	Free medication	56	15.0
No		160	42.8

Association between sociodemographic characteristics of respondents and NCDs and access to health care services

Data analysis revealed statistically significant associations of the type of disease with the age (p-value: < 0.001), gender (p-value: < 0.001), residence before displacement (p-value: 0.031), and Length of displacement (p-value: 0.018). (Table 5). On the other hand, there is no significant association between type of disease and doctor visiting (Table 6). Additionally, the chi-square test showed a significant association between the duration of disease and doctor visits (p-value:< 0.001) (Table 7).

Table 5 Association Between Sociodemographic Characteristics of Respondents and Type of Non-Communicable Diseases (N: 159)

Response Items		Type of Diseases					P- value
		HTN*	DM	CKD	COPDA	TD	
Age	18–29	19	10	01	05	06	< 0.001
	30 −39	14	08	01	04	05	
	40–49	17	09	02	04	07	
	50–59	13	07	01	03	05	
	60 and more	8	04	01	02	03	
Gender	Male	21	11	02	05	08	< 0.001
	Female	50	27	04	13	18	
Marital status	Married	47	25	04	12	16	0.773
	Single	11	06	01	03	04	
	Divorced	05	03	00	01	03	
	Widow	08	04	01	02	03	
Financial source	Yes	05	03	00	01	02	0.503
	No	66	35	06	17	24	
Original residence	Khartoum	55	29	04	14	19	0.031
	Darfur	08	04	01	02	04	
	Dongola	08	05	01	02	03	
Length of displacement	Less than 10 weeks	14	08	01	04	06	0.018
	Between 10 and 18 weeks	38	19	03	10	13	
	More than 18 weeks	19	11	02	04	07	

Abbreviations: *HTN: Hypertension, DM: Diabetes Mellitus, CKD: Chronic Kidney Disease, COPDA: Chronic Obstructive Pulmonary Disease & Asthma, TD: Thyroid Disease.

Table 6 The Association Between Type of Disease and Doctor Visiting

Response Items		Type of Diseases					P- value
		HTN*	DM	CKD	COPDA	TD	
Doctor Visiting	Yes	46	16	04	12	24	0.137
	No	25	22	02	06	02	

Abbreviations: *HTN: Hypertension, DM: Diabetes Mellitus, CKD: Chronic Kidney Disease, COPDA: Chronic Obstructive Pulmonary Disease & Asthma, TD: Thyroid Disease.

Table 7 The Association Between the Duration of Disease and Doctor Visits

Response Items		Duration of Disease			P- value
		Less than 5 years	5 to 15 years	More than 15 years	
Doctor Visiting	Yes	37	35	30	0.000
	No	20	19	18	

Discussion

The management of NCDs is a global health challenge, particularly in developing countries with limited resources and populations in armed conflict settings[12] NCDs constitute a major health threat for IDPs, and they are at increasing risk of deteriorating health status because NCDs require costly and long-term management.[8]

Our study revealed a high prevalence of NCDs among respondents, 42.5% of them had been diagnosed with at least one NCD, with hypertension being the most prevalent condition (44.6%), followed by diabetes mellitus (23.9%) and thyroid disorders (16.3%). Moreover, data showed a high prevalence of NCDs comorbidities among respondents (62.2%), which underscores the compounded health burdens faced by this population. This high prevalence aligns with findings from other conflict-affected regions such as Ukraine[3] and Iraq,[9] where more than one-third of participants reported having at least one NCD. However, in our study, the prevalence of hypertension and diabetes were higher than those reported among Syrian refugees in Jordan,[14] where hypertension was reported among 28.4% of them. This disparity could be attributed to variations in participant characteristics such as genetic factors and socioeconomic status. The high prevalence of NCDs among IDPs could be attributed to the destruction of healthcare facilities in conflict regions. The ongoing war has severely damaged healthcare infrastructure, with 60 attacks on medical facilities reported. Many health facilities have been occupied by warring factions or are facing shortages and safety issues. This has led to the closure of 75% of medical centers and violence against over 200 healthcare workers.[15] Similarly in Syria, the conflict has resulted in the deaths of an estimated 782 healthcare workers, with doctors accounting for a third of the fatalities. Many medical facilities operate critically low, with some functioning at less than 1%.[16] Efforts should be focused on protecting healthcare facilities and workers from humanitarian violations to ensure a safe and effective working environment and minimize displacement and its associated burdens.

Regarding access to health care services, out of 83% of respondents on long-term medications for NCDs, only 54.7% of them adhered to their regimen. Financial constraints, unavailability of medications, lack of motivation, and difficulty accessing pharmacies were the main reported barriers. Moreover, 38.6% of respondents with NCDs reported interruptions in doctor visits due to similar barriers. These findings are consistent with previous studies indicating that financial and logistical challenges are major obstacles to healthcare access among IDPs in Iraq,[9] Syrian refugees in Jordan[14,17] and Ghanaians.[18] Since healthcare services and medications are crucial to control and prevent complications of NCDs, there is an urgent need for active coordination between the Ministry of Health and non-governmental organizations to overcome barriers to accessing healthcare services. A recent project launched during the Tigray war crisis provided practical evidence for delivering health services to IDPs. In collaboration with community partners, Mekelle University established eleven clinics using local resources. These clinics offered a comprehensive range of healthcare services, including acute care, preventive measures (such as prenatal care and family planning), referrals to specialists, and public health surveillance.[19]

The analysis revealed significant associations between the type of NCD and socio-demographic characteristics of respondents (age, gender, and residence before displacement). Older age groups, females, and individuals originally from Khartoum were more likely to report NCDs. Similarly, a recent study reported high prevalence of NCDs among elderly people in Saudi Arabia.[19,20] These findings suggest that tailored evidence based interventions considering these demographic variables are crucial. The chronic disease self-management program has proven effective in many countries, including Saudi Arabia. It empowers individuals to develop essential skills and boost their confidence in managing their NCDs.[20]

The significant association between disease duration and regular doctor visits further emphasizes the need for continuous and accessible healthcare services for long-term management.

Limitations

The study has some limitations, one of the limitations is that the study was conducted among IDP accommodated in displacement shelters in the Dongola locality, so it may not reflect the status of the displaced individuals who are not living in shelters. Secondly, the prevalence of NCDs was estimated based on self-reported data without further verification of medical records or diagnosis. Thus, undiagnosed patients and new cases are not covered. Additionally, the study was a cross-sectional design conducted at a single point in time, it only identifies associations between variables, not establish causation or the direction of the relationship.

Conclusion and Future Directions

This study is pioneering in its scope within Northern Sudan and provides essential baseline data for future research. About 42.5% of the IDPs in this study suffer from NCDs, with hypertension (44.6%), diabetes mellitus (23.9%), and thyroid disorders (16.3%) predominating. 45.3 and 38.6% of IDPs with NCDs respectively have interrupted their medications and lost regular follow for many reasons including financial constraints, lack of medications lack of access to healthcare services, and lack of motivation.

Our study underscores the urgent need for improved healthcare access and management of NCDs among IDPs. Potential solutions include implementing mobile clinics, establishing primary healthcare centers within accommodation shelters. Addressing the healthcare needs of IDPs with NCDs requires a multifaceted approach, including policy changes, resource allocation, and community-based interventions. Further research should focus on longitudinal studies to monitor health outcomes and the effectiveness of implemented interventions.

Author Contributions

'All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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