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Sudanese Forced Migration to Libya after 2023: A Medical Geography Study on Patterns of Depression and Anxiety among Refugees

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Abstract:
This study, titled "Sudanese Forced Migration to Libya after 2023: A Medical Geography Study on Patterns of Depression and Anxiety among Refugees", aims to explore the psychological effects associated with asylum in remote geographical environments. It analyzes the prevalence of depression and anxiety symptoms among Sudanese refugees and examines their correlation with surrounding spatial and social factors. The research problem stems from the absence of studies linking geographic environments to the mental health of Sudanese refugees following the recent wave of displacement. The hypotheses focus on a positive correlation between poor spatial conditions—such as temporary housing and lack of access to healthcare—and the severity of psychological symptoms, alongside expected differences across gender and age groups. The study adopts a descriptive analytical approach, utilizing PHQ-9 and GAD-7 scales to measure indicators of depression and anxiety, along with qualitative analysis of open-ended responses to assess environmental and housing conditions. The sample included 100 Sudanese refugee participants. Findings revealed a significant prevalence of moderate to severe symptoms of depression and anxiety, with recurring pressures related to housing instability, lack of support, rising rent costs, and distant healthcare services. Open-ended responses showed a clear awareness of the impact of geographical location on psychological well-being, highlighting a need for material and social support more than direct psychological intervention. The study recommends integrating mental healthcare within local policies and values Libya's voluntary response, while emphasizing the need to expand it with more sustainable psycho-social dimensions.

Introduction:

Libya and Sudan share historical and geographical ties, reinforced by cross-border migration and tribal affiliations, particularly in southern Libya and western Sudan. For decades, Libya has been a destination for employment and temporary settlement for segments of the Sudanese population, within a context of social interaction and economic cooperation. However, developments after 2023—especially the armed conflict in Sudan—have led to a new wave of forced migration into Libyan territory, accompanied by complex humanitarian and psychological burdens in a regionally unstable environment with limited local capacity.

In this context, Sudanese refugees in Libya emerge as a population highly exposed to psychological distress due to sudden displacement, unstable living conditions, and social isolation, compounded by the sensitivity of their presence in a country already facing economic and social challenges. While national and international efforts provide basic aid, mental health issues, especially depression and anxiety disorders, remain rarely addressed in the literature from a geographical perspective linking spatial conditions to mental health. This study seeks to understand the patterns of depression and anxiety among Sudanese refugees in Libya and to analyze their association with geographic variables such as type of housing, access to healthcare services, and population density, while also considering gender and age group differences. It offers a scientific perspective that balances the humanitarian nature of the crisis with the spatial realities that exacerbate or alleviate it. The significance of this study lies in addressing a genuine research gap within the literature on medical geography and forced migration, particularly in the Libyan context. It also provides a knowledge base that can guide the design of more effective humanitarian interventions responsive to the psychological needs of refugees.

Research Problem:

Following 2023, Libya has seen a growing number of Sudanese refugees due to armed conflict in Sudan. This phenomenon has created socio-economic and living challenges related to resource

constraints, as well as cultural and behavioral differences affecting coexistence with local populations. In this context, it becomes essential to study the psychological impact of forced migration on refugees and how geographical factors contribute to rates of depression and anxiety.

Research Questions:

a. What is the prevalence of depression and anxiety among Sudanese refugees in Libya after 2023?

b. How do geographical environments affect mental health?

c. What are the most influential spatial and social factors linked to depression and anxiety?

d. What gender and age differences exist in exposure to psychological disorders among refugees?

Research Objectives:

Main Objective:

To analyze the impact of forced migration on the mental health of Sudanese refugees in Libya in light of spatial determinants.

Sub-objectives:

a. Measure levels of depression and anxiety using standardized tools (PHQ-9, GAD-7).
b. Analyze the relationship between geographical characteristics and the prevalence of mental disorders.
c. Examine gender and age group differences.
d. Provide evidence-based recommendations to policymakers and humanitarian organizations.

Research Hypotheses:

Main Hypotheses:

a. There is a positive correlation between poor spatial conditions (such as overcrowding and distance from healthcare centers) and elevated rates of anxiety and depression.
b. Refugees in remote areas are more likely to experience psychological disorders compared to those in urban settings.

Secondary Hypotheses:

a. Female refugees are more susceptible to depression due to limited safety and social support.
b. Refugees who experienced direct violence exhibit higher levels of chronic anxiety.

Research Methodology:

Type of Study: A descriptive analytical study employing a case-study approach focused on Sudanese refugees in Libya.

Data Collection Tools:

An electronic questionnaire including:

a. Demographic data (age, gender, location, housing type).
b. Standardized depression and anxiety scales (PHQ-9 and GAD-7).
c. Open-ended questions on environmental and psychological challenges.

Sample:

Given the field challenges related to Sudanese refugee conditions in Libya and the absence of a comprehensive sampling frame or official databases, a non-probability convenient sampling method was used. The questionnaire was distributed electronically through community-based groups such as university professors and the Sudanese community association in Kufra.

Field Challenges Included:

a. Dispersed residential locations and absence of centralized refugee shelters.
b. Hesitation from some individuals, especially those with limited education, to participate in mental health-related surveys.

Thus, the sample does not claim general statistical representation but provides exploratory indicators based on standardized tools and qualitative analysis.

Data Analysis: Descriptive quantitative analysis was used to evaluate PHQ-9 and GAD-7 responses, calculating means and percentages for each item to assess symptom severity. Results were interpreted using each scale's reference criteria. Due to the non-probability sample and limited size, no inferential statistical tests (e.g., t-tests, ANOVA) were conducted. The analysis remained exploratory and descriptive.

Definitions of Key Terms:

a. Forced Migration: Involuntary movement due to armed conflict, disasters, or persecution. It intersects with geography, health, identity, and social integration (UNHCR, 2023).
b. Refugee: A person who flees their country due to fear of persecution and is unable to return due to threats to their life or freedom.

Refugees often face compounded psychological and physical challenges (WHO, 2022).

c. Mental Health: A state of equilibrium enabling individuals to cope with stress, work productively, and contribute to society. Depression and anxiety are among the most common disorders associated with refugee experiences (APA, 2022).
d. Medical Geography: A subfield of geography analyzing the spatial distribution of disease in relation to environmental and social conditions. It is essential for understanding geographic disparities in mental health, particularly among displaced populations (Meade & Emch, 2010).

Theoretical Framework:

This study falls within human geography, specifically medical geography, which investigates the spatial distribution of disease and health-related conditions across individuals and communities. Medical geography has evolved to incorporate interdisciplinary concepts and methods, combining environmental, societal, and health perspectives, making it a suitable framework to explore spatial inequalities in mental health, especially among vulnerable groups like refugees (Meade & Emch, 2010). In this context, medical geography offers both theoretical and methodological tools to assess how environmental and social conditions in the Libyan space affect the mental health of Sudanese refugees—considering their residence, camp conditions, healthcare proximity, and social integration. It also provides a lens for understanding how spatial and social factors contribute to psychological distress. This perspective allows for an integrated analysis of mental health determinants beyond the individual, examining crowding, isolation, poverty, and support system availability, thereby aligning the researcher's disciplinary background (human geography) with the study focus (refugee mental health).

Theoretical Foundations for Understanding Mental Health in Geographical Contexts:

This study is grounded in a multidisciplinary theoretical framework within the field of medical geography, which examines how spatial and environmental factors influence health and illness patterns. In the case of refugees, suffering is not limited to the psychological trauma caused by war or forced displacement, but is further intensified by the new geographical realities they encounter after migration, including resource scarcity, isolation, overcrowding, and limited access to healthcare services. To understand the complex relationship between geographic location and refugees' psychological conditions, the study draws on three interrelated theories that help explain how spatial and social environments shape refugee mental health. These provide an integrated analytical framework within the scope of medical geography:

Environmental Stress Theory

This theory posits that unfavorable environment—such as overcrowding, poor housing, and lack of services—generate high levels of psychological stress and lead to disorders such as anxiety and depression. This aligns with the hypothesis that refugees in remote areas suffer psychologically more than their counterparts in urban areas (Evans & Cohen, 1987).

Social Buffer Model

This model emphasizes the critical role of social support networks in mitigating psychological stress. Geographic and social isolation intensifies tension, especially among refugees who lack local connections. This supports the secondary hypothesis that females are more affected due to weaker social safety networks (Thoits, 2011).

Biopsychosocial Approach

Proposed by psychiatrist George Engel (1977), this approach offers a comprehensive framework for analyzing mental disorders as the result of interaction among biological, psychological, and social factors. This study applies the model to understand Sudanese refugees' psychological experiences in Libya within their surrounding geographical context.

According to this model, mental disorders are shaped by:

a. Biological factors: such as neurological changes resulting from acute or prolonged trauma.
b. Psychological factors: including feelings of fear, sadness, grief, or loss of control.

c. Social-geographical factors: including social isolation, poverty, overcrowding, distance from services, or spatial instability.

This model is particularly suited for analyzing the study's data, as it allows for a multidimensional understanding of the psychological impact of forced migration amid overlapping health, social, and geographic conditions.

Linking the Theoretical Framework to the Study Problem and Hypotheses

The research problem stems from a lack of sufficient understanding of how the geographical environment affects the mental health of Sudanese refugees in Libya, especially under the increased burdens of displacement after 2023. The theoretical framework supports this investigation through the following points:

a. Environmental stress theory explains the hypothesized positive correlation between poor spatial conditions (e.g., overcrowding and distance from health centers) and higher rates of anxiety and depression.
b. Social buffer model supports the hypothesis that females and socially isolated individuals are more vulnerable to mental disorders.
c. The biopsychosocial approach enables a multidimensional analysis of psychological factors stemming from the spatial and social environments of refugees.

Host Country's Geographical and Human Context and Its Impact on Refugees

The geographical and human environment of the host country plays a decisive role in shaping the psychological and social experience of refugees. In Libya's case, vast geographic space intersects with limited infrastructure, and economic and social challenges are compounded by political complexities, creating pressure not only on local populations but also on refugee communities.

Refugees' mental health is significantly influenced by the environment they encounter after displacement—whether in terms of the spatial distribution of the population and services or the institutional capacity to meet medical and psychological needs. In the absence of clear national policies for refugee integration or conflict mitigation, Libya's geography—with its urban and demographic disparities—functions not only as a spatial frame but also as either a facilitator or barrier to mental wellbeing, underscoring the need to analyze it to better understand the psychological suffering of Sudanese refugees in Libya.

Geographic Distribution of Population and Services

Libya spans approximately 1.76 million square kilometers, but its population is unevenly distributed. Population density is concentrated along the coastal strip, particularly in Tripoli, Benghazi, and Misrata, while inland regions suffer from weak infrastructure and a lack of basic services, making them less capable of accommodating waves of displacement and asylum (UNDP, 2020).

Fragility of Health and Mental Health Infrastructure

Libya suffers from a decline in healthcare services due to ongoing political and security instability. It lacks clear programs for mental health, particularly in areas receiving refugees. This weakness creates a care gap that exacerbates trauma-related symptoms among refugees (WHO, 2022).

Economic and Social Pressures

The Libyan economy heavily depends on oil exports, with diminished operational capacity and weak social protection policies. This places additional pressure on society when receiving large numbers of refugees, sometimes leading to silent or overt competition for jobs and aid (IOM, 2021).

Behavioral and Cultural Tensions

Despite the shared history between Libyans and the Sudanese community, the absence of integration and community awareness programs can lead to cultural and behavioral friction, affecting refugee mental health and reducing integration opportunities—particularly in communities already under internal pressure (Altai Consulting & UNHCR, 2019).

Fears of Prolonged Stay

There are growing public concerns about refugees' long-term settlement, which produces mixed social reactions—some of which are unwelcoming or call for refugee repatriation. This creates an unstable psychological environment for refugees (MMC, 2023).

Previous Studies:

A number of studies have addressed the psychological, social, and spatial-psychological effects on refugees and conflict-affected communities, especially in Libya or similar settings.

a. Derluyn et al. (2023) conducted a study titled "The impact of trauma and daily hardships on the mental health of unaccompanied refugee minors detained in Libya", which analyzed the link between trauma, daily challenges, and refugee mental health. It focused on a sample of 99 minors (mostly male) in four detention centers near Tripoli, using standardized tools like PHQ-9 and GAD-7, as well as structural equation modeling to assess cumulative trauma effects. The study found that unmet daily needs such as food shortages and social isolation were strongly associated with anxiety symptoms ($\beta = 0.59$, $p = 0.028$), while prior trauma was linked to depression symptoms ($\beta = 0.16$, $p = 0.017$).
b. Charlson et al. (2012) attempted to estimate the psychological burden from the 2011 armed conflict in Libya in their study titled "Predicting the impact of the 2011 conflict in Libya on population mental health: PTSD and depression prevalence and mental health service requirements." The researchers used a predictive model based on systematic reviews of PTSD and depression prevalence in conflict zones, and Libyan population estimates. They projected that 12.4% of the population would suffer from PTSD and 19.8% from depression, with a 50% overlap between the two. The study recommended hiring 154 full-time mental health professionals to meet emergency needs. Although the study focused on citizens, it offers comparative insight into refugee suffering in the same setting.
c. Abuhadra, Doi, & Fujiwara (2023) presented a systematic review titled "The prevalence of post-traumatic stress disorder, depression, and anxiety in Libya", analyzing mental disorder trends in Libya post-conflict. The review covered 33 studies between 2011 and 2023 with samples ranging from 19 to over 31,000 participants. It found average PTSD prevalence at 25.2%, depression at 23.7%, and anxiety at 14.9%, with the most affected groups being youth, women, the unemployed, and internally displaced persons. The study emphasized the need for more research on environmental and social factors affecting mental health in Libya.
d. In a European context, Hornfeck et al. (2023) investigated the impact of housing, social support, and spatial stability on the mental health of unaccompanied minors in Germany. Using tools like PHQ-9 and GAD-7, the study concluded that lack of stable housing, overcrowded conditions, and weak support networks were associated with increased symptoms of anxiety and depression. This underscores the importance of spatial and social factors in explaining refugee mental health deterioration.

Discussion of Previous Studies:

These studies demonstrate shared themes and complementary insights that inform the current research. For instance, Derluyn highlighted the role of daily hardships and trauma, while Charlson and Abuhadra quantified Libya's broader psychological burden. Hornfeck emphasized spatial and social conditions in more organized host environments.

However, a research gap remains—namely, the lack of field studies that combine standardized mental health assessment tools (e.g., PHQ-9, GAD-7) with spatial-geographical analysis of refugee backgrounds, housing, and services. Previous studies have focused on minors, local populations, or European contexts without integrating spatial, environmental, and societal dimensions in an unstable host country like Libya—particularly in Kufra, which hosts many refugees and has unique geographical and social characteristics.

This study addresses that gap by examining the relationship between geographical (spatial and human) environments and the mental health of Sudanese refugees in Libya. It relies on standardized tools and spatial analysis while accounting for trauma history, housing conditions, and social integration—making it both academically and practically significant.

Analysis of Field Study Results

The results of the field survey form the cornerstone for understanding the relationship between mental health and the geographical and environmental

conditions experienced by Sudanese refugees in Libya. This part of the study relied on a quantitative tool that incorporated standardized scales—PHQ-9 for assessing depression indicators and GAD-7 for anxiety indicators—along with demographic and spatial questions and open-ended prompts allowing participants to freely express their experiences.

A total of 100 respondents participated in the online questionnaire (Google Form). The results were analyzed using means and, when necessary, the Chi-square test, providing an initial understanding of emerging trends while linking them to the study's objectives and hypotheses.

Analysis of Participants' Basic Information

Preliminary data indicates that the majority of the sample were male, comprising 81.2%, while females accounted for only 18.8%. This gender disparity reflects the actual structure of the refugee community, particularly in the early stages of displacement, where males are more likely to migrate first to secure employment or housing before their families join them, if possible. This gender imbalance leads to differing psychological consequences, especially regarding adaptation, economic burdens, and lack of protection. In terms of age groups, 72.8% of participants were aged 45 years and above—a demographic often subject to dual pressures such as declining physical energy, greater family obligations, and loss of previous social roles. Meanwhile, 27.3% of the participants were youth aged 19–29, representing a generation still establishing itself professionally and socially, making it more susceptible to adjustment disorders. The 30–44 age group constituted 9.1%, which may reflect challenges in accessing the survey or involvement in other family roles. Regarding educational attainment, more than half of the participants (54.5%) held a university degree or higher, while 45.5% had completed secondary education or less. This distribution indicates a diverse sample in terms of cognitive ability to understand and interpret the psychological assessment indicators, enriching the analysis and allowing for correlation between educational background and psychological responses to the new environment.As for housing, 90.9% of participants reported living in temporary (rented) accommodations, while 9.1% shared homes with multiple families. This reflects the informal nature of urban asylum in Libya, where no official refugee camps exist and individuals rely on personal resources to secure temporary shelter. This form of housing contributes to psychological instability due to its transience, high cost, and the risks of eviction or conflict with landlords. All participants stated they had resided in Libya for more than six months, indicating that their responses reflect prolonged suffering rather than immediate trauma from recent displacement. This highlights the chronic nature of psychological distress in unstable environments. In terms of access to healthcare and mental health services, 63.6% reported a lack of such services near their residences. Meanwhile, 18.2% confirmed the availability of services, and another 18.2% responded with "Don't know," indicating either a clear service gap or a lack of awareness about available support systems—both concerning indicators in an environment where mental healthcare should be a priority for refugees.

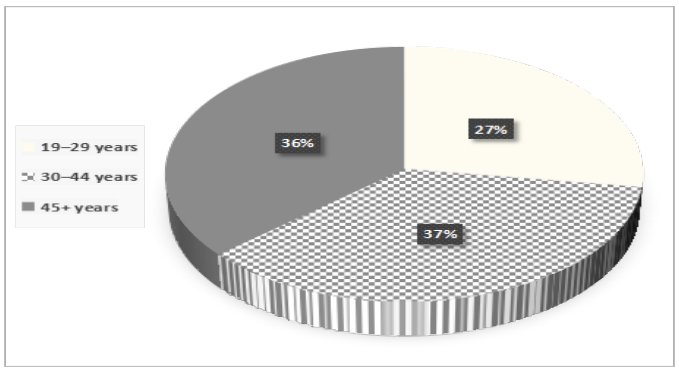

Figure 1: Age Distribution among Sudanese Refugees

General Analysis

The sample reflects a state of social and geographical vulnerability, characterized by male predominance, a majority aged over 45, lack of stable housing, and clear gaps in access to healthcare and mental health services. These combined features provide fertile ground for the emergence of anxiety and depression symptoms, supporting the study's hypotheses linking spatial environments to psychological distress among Sudanese refugees in Libya. Furthermore, the

disparity between high educational attainment and harsh living conditions may result in chronic psychological frustration due to the mismatch between refugees' capabilities and their lived realities.

Analysis of Depression Indicators (PHQ-9)

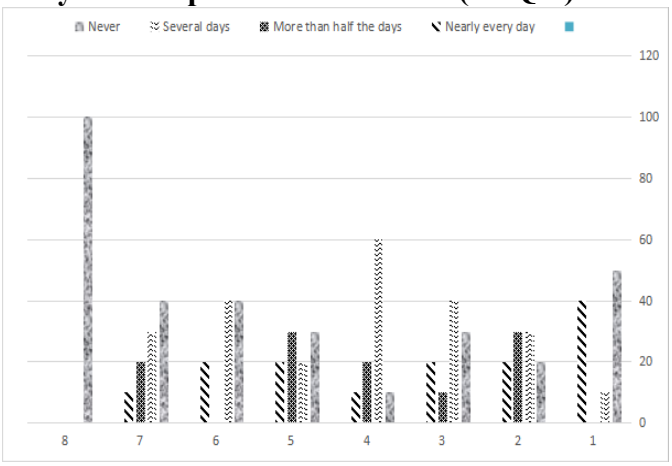

Figure 2: Results of Depression Indicators Based on the PHQ-9 Scale

Loss of Pleasure or Interest in Activities

The mean response for this item was 2.3 out of 3, the highest among the nine indicators. This suggests that the vast majority of participants suffer acutely from this symptom; 40% reported experiencing it nearly every day, while 10% reported it on several days. This frequency reflects a severe mood disturbance that affects meaning and motivation, directly impacting one's ability to engage in daily activities, whether simple or essential. This symptom is closely related to the sample's geographical and social context-particularly in the presence of temporary or unstable housing, lack of recreational opportunities, and limited social interaction. The surrounding environment thus becomes a suppressive factor to motivation. This result reinforces the study's primary hypothesis regarding the relationship between spatial conditions and psychological disorders and supports the first objective concerning the prevalence of common depressive symptoms.

Feelings of Depression, Hopelessness, or Despair

This item recorded a mean of 1.4 out of 3, indicating a moderate level of depressive feelings. 30% of respondents experienced this symptom on several days, another 30% on more than half the days, and 20% nearly every day. This is a core symptom in diagnosing depression and aligns with the participants' context—loss of homeland, uncertainty about the future, and deteriorating socioeconomic conditions. These results also align with environmental stress theory, which posits that lack of control over one's environment leads to mood disorders.

Difficulty Sleeping or Oversleeping

The average response for this item was 1.7 out of 3, indicating that sleep disturbances occurred on several days or more each week. 40% of respondents experienced sleep issues on more than half the days, and 30% nearly every day. This symptom reflects the psychological and spatial pressures present, such as persistent stress, absence of a safe sleeping environment, or fear of nighttime emergencies. Temporary housing plays a key role here, as it often lacks the minimum comfort required for restful sleep, thereby affecting sleep quality and contributing to fatigue and a sense of lost control.

Feeling Tired or Low in Energy

The average was also 1.7 out of 3, suggesting a clear prevalence of this symptom. 60% of participants reported feeling tired on more than half the days, and 10% nearly every day, while the rest reported experiencing it on several days or rarely.

Although this may seem like a physical issue, fatigue in this context is largely the result of chronic psychological stress, particularly in the refugee setting. Mental and emotional exertion is compounded by the absence of social support. Fatigue may also stem from the multiple roles individuals are forced to assume in displacement environments, along with a lack of resources and hope.

Poor Appetite or Overeating

This item had a mean of 1.6 out of 3, indicating a moderate level of appetite disturbance. 20% reported appetite changes nearly every day, and 30% on more than half the days. Eating behavior in this context appears to be influenced by multiple factors, including psychological pressure, irregular meal patterns, and lack of food variety or sufficiency. Dependence on aid may also limit

access to balanced meals, thereby disrupting eating habits.

Feelings of Failure or Disappointment in Oneself

The mean response for this item was 2.2 out of 3, a high score indicating that 60% of participants frequently experienced this feeling, with 20% reporting it daily and 40% on several days.

This symptom reflects deterioration in self-image, particularly when individuals feel incapable of achieving goals, supporting their families, or when they feel marginalized in their new environment. This is considered one of the most dangerous indicators of depression due to its direct connection to self-esteem and its potential to lead to deeper psychological issues if left unaddressed.

Psychomotor Retardation or Agitation

This symptom recorded a mean of 2.0 out of 3, which is relatively high. 30% of participants reported experiencing it on several days, 20% on more than half the days, and 10% nearly every day.

This symptom is common to both anxiety and depression and may manifest as nervous agitation, slowed movement, or a feeling of internal restlessness. It is a clear sign of sustained nervous tension caused by a volatile and insecure environment.

Thoughts of Self-Harm or Death

All responses to this item indicated "never," suggesting the absence of overt suicidal ideation within the sample. This may be due to religious or cultural barriers that prevent such thoughts from being expressed, or a genuine lack of self-harm intent. However, caution must be exercised in interpreting this absence, as fear or stigma may lead respondents to conceal such thoughts, especially given the recent suicide case reported among Sudanese refugees in Kufra.

Summary of Depression Analysis

The nine indicators show that the sample suffers from moderate to high levels of depression, especially in emotional symptoms such as loss of pleasure, hopelessness, fatigue, guilt, and feelings of failure. Behavioral symptoms such as appetite changes, psychomotor disturbances, and suicidal ideation appear less intense.

Analysis of Anxiety Indicators (GAD-7)

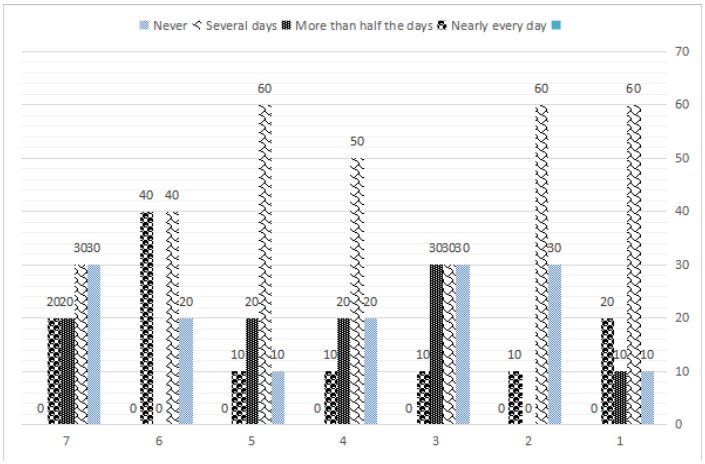

Figure 3: Results of Anxiety Indicators Based on the GAD-7 Scale

.3.1 Feeling Nervous or Tense

This item recorded a mean of 2.00 out of 3, indicating that most participants experienced nervous tension "more than half the days" or "nearly every day." Specifically, 30% reported feeling this way almost daily, while 60% experienced it several days a week. According to the GAD-7 scale, this is one of the core components of Generalized Anxiety Disorder (GAD). It reflects a state of chronic nervous arousal, often linked to fear of the unknown or environmental threats present in refugee settings.

Geographically, this symptom is exacerbated by remote housing, limited services, and the forced nature of displacement. It demonstrates a direct connection between spatial stress and psychological disturbance, in alignment with the study's hypotheses that link environmental conditions to emotional pressure.

Inability to Control Worry

This symptom had an average of 1.50 out of 3. 60% of participants reported experiencing it "several days a week," and 10% "nearly every day." This score indicates ongoing difficulty managing anxious thoughts—a condition known as mental rumination, where individuals persistently focus on threats without being able to stop. It is a core feature of anxiety disorders. This cognitive disruption reflects fragile self-security in a volatile geographic environment, where refugees perceive risks as exceeding their capacity to manage them. This

supports the hypothesis regarding the absence of psychosocial and spatial support systems.

Excessive Worrying About Various Things

This indicator had a mean of 2.00, making it one of the highest anxiety-related symptoms recorded. 30% reported experiencing it "more than half the days," and 10% "daily," reflecting a generalized anxiety pattern not tied to specific issues but rather affecting all aspects of daily life. In medical geography, such patterns of excessive worry are seen as a reflection of environments where individuals feel a loss of control and experience cumulative threats at both personal and collective levels—especially in the absence of support networks. This symptom supports the hypothesis regarding the impact of complex, multidimensional daily stressors on refugees' mental health and reinforces the role of "social-geographical factors" within the study's biopsychosocial framework.

Difficulty Relaxing

The average for this item was 1.33, indicating that participants struggle to calm their nervous systems and achieve states of rest. 20% reported experiencing this symptom "more than half the days," and 10% "almost daily." In asylum contexts where physical and psychological safety is lacking, relaxation becomes rare. This result highlights the influence of stressful environments—due to noise, crowding, or security concerns—on nervous system regulation. This indicator reflects underlying daily life tension among refugees and supports the study's objective of linking mental health to general lifestyle patterns in refugee environments.

Irritability or Quick Temper

This indicator had a mean of 1.66, with 30% of the sample experiencing acute irritability "more than half the days" or "nearly every day." Irritability is a defensive nervous system response and reflects a state of constant alertness to potential threats—typical of unstable environments. This symptom is associated with the daily stressors refugees face, such as fear of deportation or lack of care, further validating the study's hypothesis regarding fragile urban environments as sources of psychological and emotional distress.

Fear That Something Awful Might Happen

The average response for this item was 1.60. 40% of participants reported experiencing this fear "almost every day," and another 40% "several days a week."

This is a primary indicator of generalized anxiety disorder, reflecting constant anticipation of harm. For refugees, this fear often stems from traumatic experiences in their home country or instability in the host environment. This symptom expresses the absence of safety in housing environments and affirms a central concept in medical geography: that place is not neutral—it generates either fear or a sense of security.

Difficulty Concentrating or Sitting Still

This item recorded a mean of 1.66, with 20% experiencing the symptom "more than half the days" and another 20% "daily." This symptom reflects mental distraction and inner anxiety, common in unstable environments. Difficulty concentrating indicates that the brain is preoccupied with ongoing stimuli, lacking the opportunity for organized thinking or planning. This result supports the hypothesis that cognitive performance is affected by environmental pressure, as the setting itself becomes a barrier to psychological calm and mental focus.

Summary of Anxiety Indicators Analysis

The GAD-7 indicators reveal moderate to high levels of chronic anxiety among participants, manifesting in nervousness, persistent mental worry, irritability, and fear of the future. These symptoms stem not only from pre-asylum experiences but also from the current geographical environment, characterized by isolation, poor services, and lack of personal safety. The results confirm the anticipated relationship between spatial/environmental characteristics and psychological disorders, strongly supporting the hypotheses related to absence of support, remoteness of services, and decline in psychological stability. They also align with the theoretical framework—particularly the Environmental Stress Theory and the Biopsychosocial Approach.

Analysis of Open-Ended Questions

Difficulties in the Current Living Environment

Participants' responses reflected a set of interrelated challenges that can be categorized into three main dimensions:

A. Economic Challenges:

Phrases such as "fear of being unable to pay rent," "high rental rates," and "difficulty paying rent due to lack of work" were repeated frequently. These statements point to housing costs as a pressing and recurring source of anxiety that threatens residential stability—especially amid the absence of stable employment opportunities. This aligns with the GAD-7 findings, which revealed persistent anxiety among participants, and supports the hypothesis that links economic and spatial pressures to deteriorating mental health.

B. Environmental and Architectural Difficulties:

Statements like "uncomfortable and unfamiliar environment" and "noise" reflect a lack of familiarity with the current housing setup, possible architectural or environmental instability, or poor infrastructure in residential areas.

These types of difficulties intensify feelings of alienation and isolation, which aligns with the analysis of depression as resulting from a loss of environmental belonging.

C. Lack of Support and Social Interaction:

Some participants responded with "nothing" or "nothing specific," which may suggest either:

Forced psychological normalization of difficulties; or Defensive denial of psychological distress due to the absence of a culture that supports emotional expression in displacement contexts.

D. Gap in Employment Opportunities:

Phrases such as "there are no job opportunities to meet needs," "lack of communication," and "difficulty finding work" connect geographic location to the ability to earn a living. This illustrates that housing is not just a shelter but also a disrupted productive environment, which clearly impacts psychological well-being.

Does Your Place of Residence Affect Your Mental Health? How?

Participants' responses showed variation in the perception of how housing affects mental health, though most leaned toward affirming such an impact.

A. Clear Affirmation: "Definitely," "Yes," "Yes, due to constant anxiety," "Worry about emergencies," "To some extent," etc. These responses confirm that participants perceive geographic location as a source of psychological stress—whether due to remoteness from urban areas, lack of services, or the fear of being isolated during emergencies.

B. Denial or Minimization:

"No," "I'm fine." These responses may reflect defensive denial, forced adaptation to the environment, or individual differences in psychological resilience.

General Analysis:

The majority of respondents acknowledged a relationship between place and anxiety, which aligns with the quantitative analysis—especially concerning chronic fear and persistent tension—and supports the study's core hypothesis about the impact of geographic factors on mental health.

4.4.3 What Type of Support Do You Need to Improve Your Mental Health?

Responses varied but generally fell into three main categories:

A. Financial Support: Responses such as "financial support," "money," "just financial help," "providing housing and employment," and "receiving salaries on time." These reflect the centrality of financial stability in psychological well-being, where distress is tied to lack of income and financial insecurity—thus increasing fear and hopelessness.

B. Indirect Social and Psychological Support: Responses like "a sense of safety and security" and "social gatherings and entertainment" express a psychological need for belonging and social security. These forms of support are essential for mental well-being without necessarily requiring direct therapeutic intervention.

C. Absence of Requests for Direct Mental Health Treatment: There were no explicit mentions of needing professional psychological therapy. This may indicate limited awareness of mental health services or social stigma surrounding mental health discussions—consistent with literature on mental health culture in East African refugee communities.

Summary of Open-Ended Questions Analysis

The open-ended responses reveal a clear triad of pressures shaping the Sudanese refugee experience in Libya:

A. Economic: (income/rent)

B. Spatial: (housing, remoteness, instability)

C. Psychosocial: (fear, loneliness, insecurity)

These results are strongly aligned with the study's objectives and support hypotheses linking geographic location and housing conditions to increased indicators of anxiety and depression.

Additionally, the tendency of participants to request non-clinical forms of support underscores the importance of tailoring mental health interventions to emphasize comprehensive, humanitarian approaches rather than traditional clinical models alone.

5. Discussion of Results in Light of Research Questions and Hypotheses. Discussing the results in light of the study's questions and hypotheses is essential to evaluating the achievement of its objectives and uncovering the relationship between the psychological phenomena examined and the surrounding geographical and social factors. Through an analytical connection between the quantitative and qualitative data collected, the study reveals that the experience of Sudanese refugees in Libya goes beyond conventional humanitarian dimensions. It highlights a clear impact of spatial environment in shaping patterns of depression and anxiety. The following section presents a detailed discussion of the findings in relation to the core research questions, followed by an evaluation of the theoretical hypotheses that framed the study.

5.1 Discussion of Results in Light of the Research Questions

First Question: What is the prevalence of depression and anxiety among Sudanese refugees in Libya after 2023?. The results from the PHQ-9 and GAD-7 scales indicate that a significant portion of the refugee population experiences moderate to high levels of depression and anxiety. Recurrent symptoms included loss of interest and pleasure (mean = 2.00), feelings of sadness and hopelessness (1.83), as well as anxiety indicators such as nervousness (2.00) and persistent worry (1.66). Additional symptoms involved low energy, sleep disturbances, and general distress. These findings are supported by responses to the open-ended questions, where refugees expressed ongoing fears related to financial insecurity, unstable housing, and lack of spatial safety. This suggests that psychological disorders are not isolated incidents but rather collective responses to prolonged living conditions shaped by environmental and social structures.

2. How do geographical environments (rural, urban, camps) affect mental health?

The study confirms that the type of geographical environment—location, distance from services, and housing quality—is a key determinant of anxiety and depression levels. While the sample does not cover all environment types, findings from participants in Kufra, a relatively remote area, revealed stressors related to the lack of healthcare access, poor infrastructure, and unfamiliar living conditions. Participants mentioned fear of emergencies, difficulty obtaining help, and a sense of disconnection. This spatial impact aligns with the Environmental Stress Theory, which posits that greater discrepancies between individual needs and environmental resources increase psychological stress.

3. What are the most significant geographical and social factors associated with depression and anxiety?

These can be summarized into three main areas:

Economic-Spatial Factors: Including high rent, employment difficulty, and financial strain—repeatedly mentioned in open responses as core drivers of anxiety and fear about the future.

Service-Related Spatial Factors: Highlighted by the absence or remoteness of medical and psychological care centers, leading to a sense of vulnerability in emergencies.

Socio-Psychological Factors: Such as unfamiliarity, isolation, and lack of safe social interaction. This was reflected in participants' requests for reassurance and recreational activities rather than formal psychological treatment.

These dimensions intersect to form a complex geo-social stress structure, where underserved, insecure environments produce stress levels that exceed individuals' adaptive capacities.

4. What are the gender and age-related differences in exposure to psychological disorders among refugees? Although the sample size did not allow for robust inferential statistics, qualitative trends suggested: Women reported higher indicators of sadness, anxiety, and fatigue. This aligns with previous studies in displacement settings, where women face heightened insecurity, social restrictions, and often lack emotional or financial support. Older participants (above 45) showed elevated fatigue levels, indicating the compounding effects of physical aging and occupational isolation in environments that lack productive opportunities.

These findings affirm the importance of differentiated mental health support tailored by age and gender, particularly when designing community-based interventions.

Discussion of the Hypotheses in Light of the Results

First Hypothesis: There is a positive correlation between poor spatial conditions and elevated rates of depression and anxiety. Fully supported — All psychological indicators were higher in contexts of spatial deprivation, service inaccessibility, and unstable housing.

Second Hypothesis: Refugees in remote areas are more vulnerable to psychological disorders than those in urban settings. Partially supported — While no direct comparison across regions was made, results from Kufra, a remote area, revealed heightened anxiety and fear of emergencies.

Third Hypothesis: Female refugees are more prone to depression than males. Partially supported — Women exhibited higher scores in hopelessness and fatigue, reflecting their increased vulnerability in displacement settings.

Fourth Hypothesis: Refugees exposed to direct violence display higher levels of anxiety.

Not tested — The current study tools did not include direct measures for past trauma (e.g., conflict exposure, loss of relatives, detention), despite its relevance as a determinant of anxiety and depression in forced migration contexts. Due to the sensitivity of the topic and a desire to avoid retraumatization or distress among participants, this dimension was excluded. The study thus recommends further in-depth research into the traumatic histories of Sudanese refugees, using culturally sensitive tools within safe research environments.

Recommendations

Based on the findings of this study regarding the mental health of Sudanese refugees in Libya post-2023 and the demonstrated link between geographical, economic, and social factors and the prevalence of depression and anxiety- it is recommended that concerned institutions, particularly Libyan bodies involved in refugee and community care, consider the following:

A. Strengthen field-based psychosocial support programs through community teams or local centers that respect the cultural and social specificities of refugees and offer services in a simple, accessible manner.

B. Integrate mental health support with livelihood and service-related aid, especially reducing housing burdens and providing minimum employment opportunities, given their direct effect on psychological stability.

C. Foster supportive social environments for refugees through initiatives that promote integration and interaction, such as recreational, educational, and group activities to reduce isolation and stress.

D. Train local staff from both refugee and host communities in principles of basic psychosocial support to serve as accessible contact points, reducing cultural or psychological barriers to care.

E. Encourage national studies focusing on refugee mental health, especially in peripheral areas with unique geographical challenges, to generate accurate data for effective intervention planning.

F. Develop national policies that incorporate psychological and social dimensions into refugee response strategies—balancing state responsibilities with the humanitarian needs of these vulnerable groups.

Conclusion

This study offers a scientific contribution to understanding the relationship between geographical environment and mental health among Sudanese refugees in Libya, following the displacement wave after 2023. Using standardized tools (PHQ-9 and GAD-7) and analyzing open-ended responses, the results revealed a notable

prevalence of depression and anxiety indicators—often tied to temporary housing conditions, economic pressures, and distance from essential services. The study emphasized that the psychological challenges faced by refugees are not isolated from their living and spatial context. On the contrary, peripheral environments and high living costs generate a state of chronic psychological pressure, manifesting in anxiety, sleep disturbances, and persistent fatigue. Although most participants did not explicitly request professional psychological treatment, their appeals focused on financial and social support—indicating the importance of integrating mental health support within broader community and economic care systems. Libya's voluntary response to refugee needs under challenging national circumstances deserves recognition. However, the study recommends that this response evolve to include more structured psychosocial components—enhancing both the effectiveness and sustainability of care services.

In conclusion, the study stresses the need to adopt a comprehensive and integrated approach to refugee mental health—one that is inseparable from spatial context and rooted in the interplay between geographic, social, and economic factors. It also opens the door for further research grounded in detailed field data, contributing to the development of evidence-based policies that serve this vulnerable population with dignity, resilience, and a path toward stability.

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