Knowledge, attitudes and mental health of sub-Saharan African migrants living in Tunisia during COVID-19 pandemic

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Abstract

COVID-19 pandemic potentially impacted the mental health of migrants. Our objective was to measure the prevalence of psychological distress among a group of sub-Saharan African migrants living in Tunisia, and its association with knowledge about COVID-19. The Questionnaire of Knowledge towards COVID-19 (QK-COVID-19) was used to evaluate the level of Knowledge about COVID-19. The participants were asked about their attitudes for seeking information and healthcare services related to the pandemic using a multiple-choice questionnaire. The Hopkins Symptoms Checklist (HSCL-25)) was used to screen for anxiety and depression. A logistic regression was used to estimate the adjusted odds of having psychological distress across levels of QK-COVID-19 score. Among the 133 participants, 34.6% (95% CI: 26.5, 42.67) had psychological distress, 91% were unemployed and 96% uninsured. Of the respondents, 20% had low QK-COVID-19 score , and 44.36% had medium score. The adjusted odds of psychological distress for those with high and medium QK-COVID-19 scores were respectively 3.9 (95% CI: 1.08, 14.13) and 6.39 (95% CI: 1.79, 22.9) times that of those with low scores. Screening and early treatment of anxiety and depression among migrants during outbreaks is an imperative. Further investigations of the determinants of mental health of sub-Saharan African migrants are needed.

Keywords Migration · Mental Health · COVID-19 · Sub-saharan · Knowledge

Introduction

According to the International Organization for Migration, 65,000 to 120,000 sub-Saharan Africans enter the Maghreb yearly, of whom only 20 to 38% are estimated to eventually enter Europe (De Haas, 2008). In Tunisia, 7,524 sub-Saharan African migrants were officially censused in 2014 (Statistiques Tunisie, 2014), which corresponds to a 149.4% increase compared to 2004 (International Organization for Migration, 2018). There is no official estimation of the number of those in irregular status, but data from the gray literature suggest that more than 10,000 undocumented sub-Saharan African migrants reside in the country, which would represent a much larger migrant population than the documented one (Mercy Corps, 2018). However, the mental health of this important segment of the population of sub-Saharn African migrants is not well investigated in the Maghreb. In Europe, data from studies on the mental health of sub-Saharan migrants suggest a high risk of developing mental disorders compared to the general population of the host country given the high level of socioeconomic adversities (Pannetier et al., 2017; Tinghög et al., 2007). Other studies on the undocumented migrants in Europe found higher vulnerability to develop anxiety, depression and sleep disturbances than the general population; Identified risk factors include young age, exposure to social isolation, financial instability, sexual abuse, and discrimination (Fakhoury et al., 2021; Levecque & Van Rossem, 2015). These risk factors may have been amplified during the COVID-19 pandemic given the increased burden of socioeconomic adversities for the migrant populations worldwide, including the imposed lockdowns, the loss

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of employment and the limited access to healthcare (Kluge et al., 2020; Liem et al., 2020). The difficulty for many migrants in understanding the local language and the information relayed by the health authorities, along with their struggle to navigate the healthcare system were reported as barriers to accessing reliable information and services during the pandemic (Liem et al., 2020). Some authors examined the knowledge, attitudes, perceptions and practices towards COVID-19 in several sub-Saharan African populations and reported a predominantly good level of knowledge, positive attitudes, and good practice towards COVID-19 compared to eastern African countries (Nwagbara et al., 2021; Workneh et al., 2021). A study conducted during the pandemic to estimate the burden of psychological distress in sub-Saharan Africa found that 27.6% of participants reported significant psychological distress (Workneh et al., 2021). However, these results may not be applicable to the population of migrants from sub-Saharan Africa. The evaluation of the link between psychological distress and the level of knowledge towards COVID-19 was investigated in different populations (Guvenc et al., 2021; Kef, 2021; Liem et al., 2020; Santabárbara et al., 2021; Tee et al., 2020; Zhong et al., 2020), but to our knowledge, not specifically within the population of migrants.

The aim of this study was to determine the prevalence of psychological distress among undocumented sub-Saharan African migrants in Tunisia, evaluate potential risk factors, including sociodemographic characteristics, as well as the knowledge and attitudes towards COVID-19 during the early onset of COVID-19 pandemic.

Theoretical framework

In this study, we used an adapted version of (Porter et al., 2021) theoretical framework which was developed to study the impact of the COVID-19 pandemic on the mental health of youth in low and middle-income countries. The framework is composed of three channels, (1), (2) and (3), hypothesized to be the main routes through which mental health would be impacted during the pandemic (Fig. 1). (1) represents the channel through which the country level environment during the pandemic impacts mental health; (2) represents the channel trough which stressors related to COVID-19 operates, including changes in employment and economic status, level of knowledge about COVID-19 and attitudes in seeking healthcare; (3) represents the channel through which background characteristics impact mental health including age, gender, country of immigration, legal status of migration, marital and parental status.

Methods

Participants

The target population included all migrants seeking medical, social, or psychological assistance at Médecins du Monde (MdM) help centers for migrants in Tunisia, during the three months prior to the onset of the pandemic: January, February, and March 2020. Each individual was assigned a unique identifier. A simple random sample of 145 identifiers was selected using a computer-based random number generator (R programming software). The inclusion criteria included migrants from sub-Saharan African countries, older than 18 years old, who provided a phone number during their first consultation at the clinic and their informed consent to participate in the study. Those under 18 years and not providing a phone number during the first consultation at MdM were excluded.

Measures

Pre-COVID-19 pandemic background characteristics

Sociodemographic information was collected using a questionnaire including age, gender, nationality, matrimonial status, parental status, educational level, address in Tunisia, insurance status, immigration status. The variable address was dichotomized post hoc– north versus south- as the north represents the Greater Tunis and is more urban and economically advantaged than the south (Sadiki, 2019). Identification as potential victim of human trafficking was abstracted from the medical records of patients' MdM database.

COVID-19 pandemic stressors

The exposure of interest - knowledge about the clinical presentations of COVID-19 and routes of transmission and prevention, was assessed using the «Questionnaire of Knowledge towards COVID-19 (QK-COVID-19) ». The questionnaire was adapted from (Zhong et al., 2020) questionnaire, which included 12 questions. The answer options for each question could be: "true", "false", "I don't know". A correct answer was attributed 1 point and an incorrect or unknown answer was attributed zero. In this study, the questionnaire was in French as it is the language spoken by the study population. Nine additional questions were added to adapt to the local context and to assess knowledge about COVID-19 symptoms and transmission. The total score of the questionnaire ranged from 0 to 21. The score was trichotomized: low score < 13, medium score between 13 and 16, and high score ≥ 17. Previously
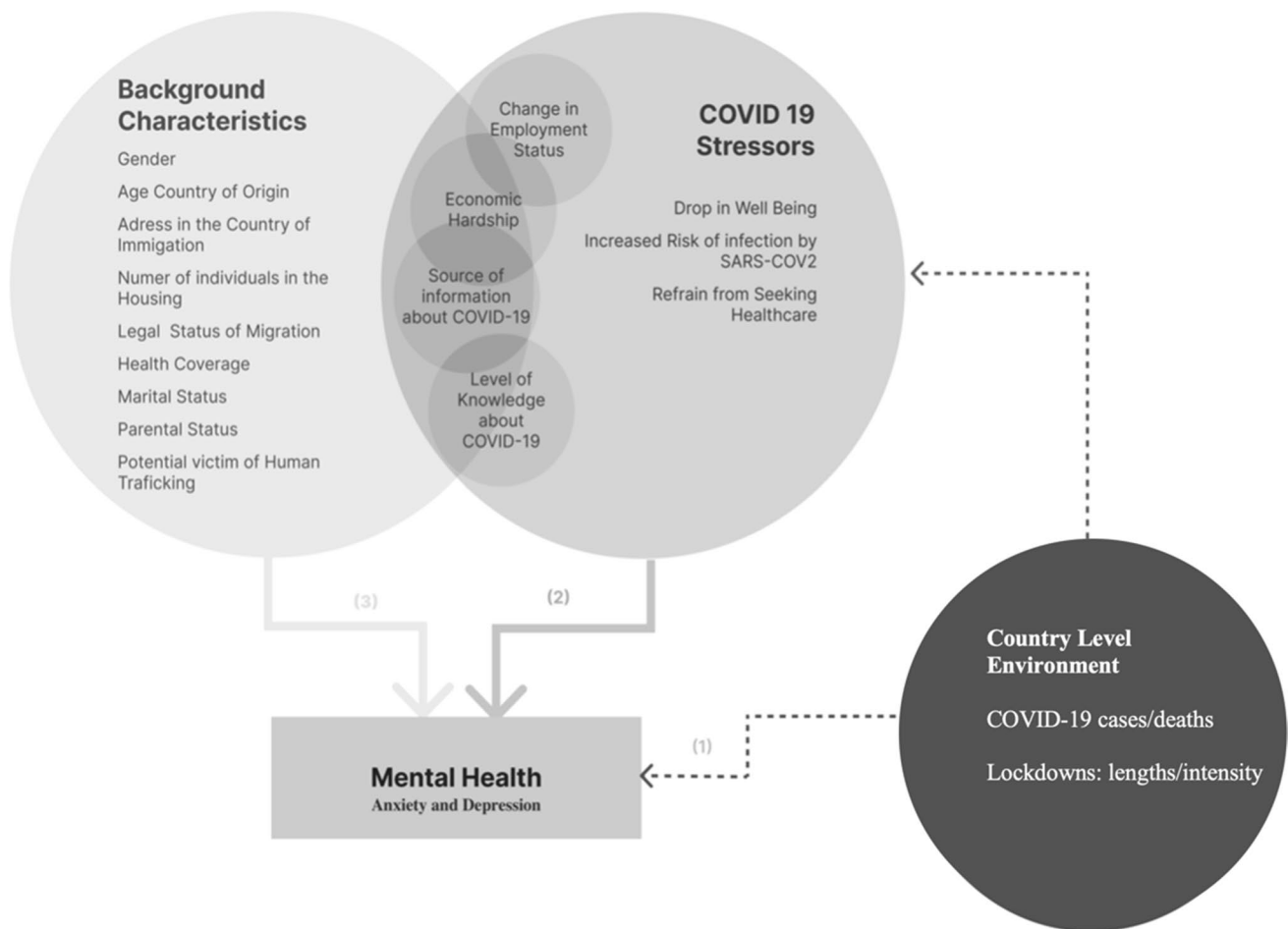
Fig. 1 Theoretical framework of the hypothesized impact of COVID-19 stressors, background characteristics and the country-level environment on mental health. (1), (2) and (3): an adapted version of Porter et al. Solid arrows represent variables included in the analysis/ Dashed arrows represent variables considered in the model but not integrated in the analysis

defined cut-off values were not available, so those utilized in this analysis were considered clinically practical by the research team. To assess attitudes related to seeking information and healthcare services, multiple choice questions were used. Sources of information used by participants to know about the pandemic and the officially communicated recommendations were explored. Answer options were categorized into social media sources (e.g., Facebook, twitter, TikTok, Instagram…) or other conventional media including newspapers, radios, or TV. Attitudes for seeking care in case of a suspected COVID-19 infection were evaluated through a yes/no question. Answer options were either call the emergency assistance hotline/ Visit the emergency or the primary care center (as recommended by the local health authorities), or not. Attitudes for seeking care in case of a psychological distress were evaluated through questioning if the participant would consult a health professional/Call the Psychological Assistance Hotline, or not. Participants were asked about the number

of individuals living in the same household, and their professional and income status during the pandemic.

Mental health: anxiety and depression

The main outcome of this study is the mental health status during the pandemic, a dichotomous variable indicating absence or presence of psychological distress. The dichotomization was derived from the French validated version of the «Hopkins Symptoms Checklist (HSCL-25) », which includes 10 items to assess symptoms of anxiety and 15 items to assess symptoms of depression (Nabbe et al., 2019). The total score ranges between 1.00 and 4.00 (Nabbe et al., 2019). Scores equal or higher than the cut-off of 1.55 indicate a patient at risk of characterized mental disorder. This cut-off was selected rather than 1.75 to increase sensitivity as data from previous studies suggested that people of African culture tend to underreport symptoms on the HSCL scale (Steel et al., 2017).

Data collection

A pilot study was first performed to test and optimize the study protocol. The interviewers were psychologists working at MdM and data collection was conducted through phone call interviews. The study information sheet and the consent form were sent to the respondent as a web link in a text message. Oral approval was retained for those without internet access. Following the interview, information on the COVID-19 disease and its prevention were provided, along with official recommendations of health authorities in case of exposure or suspected infection. Information related to symptoms of psychological distress that may appear in this context and recommendations and resources for seeking medical, social, and psychological help were provided. Participants with significant HSCL-25 scores were offered a psychological follow-up by MdM. All procedures of the study were approved by the ethics committee of Razi University Hospital.

Statistical analysis

Statistical analysis was conducted using SAS 3.81 (SAS Institute, Cary NC). Internal reliability of QK-COVID-19 and the HSCL-25 was tested using a Cronbach statistic. To investigate the association between HSCL-25 and QK-COVID-19, we performed: (1) a bivariate analysis of the covariates in relation to psychological distress (HSCL scores). Comparisons of percentages on independent series were assessed using the chi-square test, or Fisher's two-tailed exact test. The student t test for independent series was used to compare two means, or if not applicable the Wilcoxon Rank Sum test. The ANOVA test was used to compare the differences of HSCL sub-scores across categories of QK-COVID-19 score. In this analysis, the main outcome –HSCL-25 score– was analyzed as a dichotomous variable given its clinical utility, and as a continuous variable using the sub-scores of anxiety and depression to evaluate any linear relationship with the exposure. (2) Logistic regression was conducted to investigate the association between psychological distress and level of information about COVID-19, after adjusting for confounders. A backward selection method was used for model building; covariates were iteratively removed from the model if the percentage change in the odds ratio between the dependent variable (mental health status – absence or presence of psychological distress) and the independent variable (QK-COVID-19) in the full model and the reduced model was lower than 10%. An assessment of interaction was performed by testing interaction between QK-COVID-19 categories and all variables in the model, along with assessing two-way interactions between covariates. Assessment of multicollinearity was conducted using the variance inflation factor and the tolerance statistics. The choice of the reference levels for the measurement of the odds ratios in the bivariate and multivariate analyses was made post hoc.

Results

Pre-COVID-19 pandemic background characteristics

The final sample included 133 respondents for a response rate of 92%. Among the total respondents, 82% were identified as females, 85% were younger than 35 years old, 83% were from Ivory Coast, 62% reported high school or higher level of education, 88% were undocumented migrants, 96% did not have health coverage and 10% were potential victims of human trafficking (Table 1).

COVID-19 pandemic stressors

During the early pandemic, when the data collection was performed, 91% of the participants were unemployed, 22% of them were living with more than five individuals in the same household. In terms of knowledge about COVID-19 symptoms, transmission, and prevention, 20% had a low knowledge score, 44% had medium score and 35% had high score (Table 1).

Mental health: anxiety and depression

The prevalence of psychological distress among all the respondents was 34.6% (95% CI: 26.5, 42.7). The prevalence across different groups is presented in Fig. 2: among females, the prevalence was 42% versus 33% among males, 43% among single participants versus 29% among those in couples (Fig. 2). In terms of attitudes, 70% of those who reported significant distress did not express willingness to seek help (Table 1).Through the bivariate analysis (Tables 1 and 2), we found a significant association between HSCL-25 and QK-COVID-19 (p-value = 0.03); The crude odds of having psychological distress in participants with medium knowledge were 4.5 (95% CI: 1.4, 14.7) times that of those with low knowledge. The crude odds of having psychological distress in participants with high knowledge score were 3 (95% CI: 0.9, 10.1) times that of those with low knowledge.

Considering the continuous sub-scores of anxiety (HSCL-10) and depression (HSCL15) (Table 2), participants living with five or more individuals had significantly higher levels of anxiety than their counterparts (1.44 versus 1.32 HSCL-10 sub-score, p-value = 0.0349). Single mothers had significantly higher sub-score of depression compared to non-single mothers (p-value = 0.0302). Not willing to seek help in case of psychological distress was significantly associated with having a higher sub-score of anxiety (1.73 versus 1.51 HSCL-15 sub-score, p-values = 0.0024). No significant linear association

Table 1 Descriptive and bivariate analysis to measure the relationship between psychological distress (HSCL-25 score) and pre- and COVID-19 Determents of Mental Health

	N (%)	Psychological Distress HSCL-25 ≥ 1.55 (Colum%)	No Psychological Distress HSCL-25 < 1.55 (Colum%)	P-value	OR (95% CI)
Total	133 (100)	46 (34.59)	87 (65.41)		
Pre-COVID-19 Background Characteristics					
Age				0.3281	
≤ 35	113 (84.96)	41 (89.13)	72 (63.72)		1.71 (0.58, 5.04)
> 35	20 (15.04)	5 (10.48)	15 (17.24)		-
Gender				0.4205	
Male	24 (18.05)	10 (21.74)	14 (16.09)		-
Female	109 (81.96)	36 (78.26)	73 (83.91)		0.69 (0.28, 1.71)
Country of Origin				0.3242	
Ivory Coast	110 (82.71)	36 (78.26)	74 (85.06)		-
Other (Guinea, Cameroon, Gabon, Democratic Republic of Congo, Mali, Burkina Faso, Ghana)	23 (17.29)	10 (21.74)	13 (14.94)		1.58 (0.63, 3.95)
Address in Tunisia				0.689	
North (Ariana and Tunis)	72 (54.55)	24 (52.2)	48 (55.2)		-
South (Sfax and Medenin)	60 (45.45)	22 (47.8)	38 (43.7)		0.86 (0.42, 1.77)
Education				0.5389	
Not educated/Primary school	51 (38.35)	16 (34.80)	35 (40.20)		0.79 (0.38, 1.67)
Secondary school / University	82 (61.65)	30 (65.2)	52 (59.8)		-
Marital Status				0.1085	
Single	54 (40.6)	23 (50)	31 (35.63)		1.81 (0.87, 3.73)
In couple	79 (59.4)	23 (50)	56 (64.37)		-
Parental Status				0.4102	
Parent	73 (54.89)	23 (50)	50 (57.50)		0.74 (0.36, 1.52)
Not parent	60 (45.11)	23 (50)	37 (42.5)		-
Single Mother				0.7403	
Yes	24 (18.05)	9 (19.57)	15 (17.24)		1.17 (0.47, 2.92)
No	109 (81.95)	37 (80.43)	72 (82.76)		-
Potential Victim of Human Trafficking					
Yes	13 (9.77)	6 (13.04)	7 (8.05)	0.3559	1.71 (0.54, 5.44)
No	120 (90.23)	40 (86.96)	80 (91.95)		-
Undocumented Migration				0.6081	
Yes	117 (88.64)	39 (88.67)	78 (89.66)		1.33 (0.44, 4.01)
No	15 (11.36)	6 (13.33)	9 (10.34)		-
Medical Coverage					
Yes	5 (3.76)	3 (6.52)	2 (2.30)	0.2233	-
No	128 (96.24)	43 (93.48)	85 (97.70)		0.34 (0.05, 2.09)
COVID-19 Stressors					
Score «QK- COVID-19»				0.03*	
Low: < 13	27 (20.3)	4 (8.7)	23 (26.44)		-
Medium: 13 ≤ score < 17	59 (44.36)	26 (56.52)	33 (37.93)		4.53 (1.39, 14.74)
High: ≥ 17	47 (35.34)	16 (34.78)	31 (35.63)		2.97 (0.88, 10.06)
Professional Status during the pandemic				0.9238	
Working	12 (9)	4 (8.7)	8 (9.2)		-
Not working	121 (91)	42 (91.3)	79 (90.8)		1.06 (0.30, 3.74)
Economic Status during the pandemic				0.925	

Table 1 (continued)

	N (%)	Psychological Distress HSCL-25 ≥ 1.55 (Colum%)	No Psychological Distress HSCL-25 < 1.55 (Colum%)	P-value	OR (95% CI)
Have an income	14 (10.5)	5 (41)	9 (10.3)		-
Not having an income	119 (89.5)	41 (89.1)	78 (89.7)		0.95 (0.30, 3.01)
Number of Individuals in the Household				0.1673	
> 5 persons	103 (78.03)	13 (44.83)	16 (55.17)		1.15 (0.55, 2.4)
≤ 5 persons	29 (21.97)	32 (31.07)	71 (68.93)		-
Sources of information related to COVID-19					
Social medias				0.4069	
Yes	90 (67.67)	29 (63.04)	61 (70.11)		0.73 (0.34, 1.54)
No	43 (32.33)	17 (36.96)	26 (29.89)		-
Other Medias (Television, newspaper, radio)				0.7732	
Yes	70 (52.63)	25 (54.35)	45 (51.72)		1.11 (0.54, 2.27)
No	63 (47.37)	21 (45.65)	42 (48.28)		-
Attitudes in case of suspicion of an infection by the SARS-COV2					
Call the emergency assistance Hotline/ Visit the emergency or the primary care center				0.6482	
Yes	107 (80.45)	38 (82.61)	69 (79.31)		1.24 (0.49, 3.12)
No	26 (19.55)	8 (17.39)	18 (20.69)		-
Attitudes when feeling of psychological distress during the pandemic					
Consult a health professional/ or Call the Psychological Assistance Hotline				0.0546	
Yes	40 (30.08)	9 (19.57)	31 (35.63)		0.44 (0.19, 1.03)
No	93 (69.92)	37 (80.43)	56 (64.37)		-

OR: odds ratio/ CI: confidence interval/ QK-COVID-19: Questionnaire of Knowledge towards COVID-19/

HSCL-25: Hopkins Symptoms Checklist. *p-value < 0.05

was found between QK-COVID-19 score and each of the sub-scores of anxiety and depression.

Through the multivariate analysis (Table 3), significant confounders were marital status, potential victim of human trafficking and number of individuals sharing the same household. Gender and age were the two conceptually important confounders that were added to the adjusted model (Model b, Table 3). No significant interactions were found. Table 3 presents results of the regression analysis. The adjusted odds of psychological distress for those with high QK-COVID-19 score was 3.9 (95% CI: 1.08, 14.13) times that of those with low score. The odds of psychological distress for those with medium QK-COVID-19 score was 6.39 (CI; 1.79, 22.9) times that of those with low score.

Discussion

In this study, the prevalence of psychological distress was 35%. The association between psychological distress and the level of knowledge towards COVID-19, quantified in

terms of QK-COVID-19 score, was statistically significant; The adjusted odds of psychological distress for those with high and medium QK-COVID-19 scores were respectively 3.9 (95% CI: 1.08, 14.13) and 6.39 (95% CI: 1.79, 22.9) times that of those with low scores.

In a previous study on the mental health of sub-Saharan African populations during the pandemic, the prevalence of anxiety and depression was estimated to be 10%. (Workneh et al., 2021). The higher prevalence estimated in our study suggests that migration may be associated with an increase in the mental health distress of sub-Saharan African migrants during the pandemic.

In the literature, the association between the level of information about COVID-19 and psychological distress have produced conflicting results. Galić et al. found an association between knowledge about COVID-19 and higher levels of anxiety, depression, and pessimism only among participants who answered correctly about handwashing and prognosis of COVID-19, but not to other questions related to COVID-19 knowledge (Galić et al.,

Fig. 2 Prevalence of psychological distress (symptoms of anxiety and depression) measured by the Hopkins Symptom Checklist-25 (HSCL-25). The figure was made using Microsoft Excel
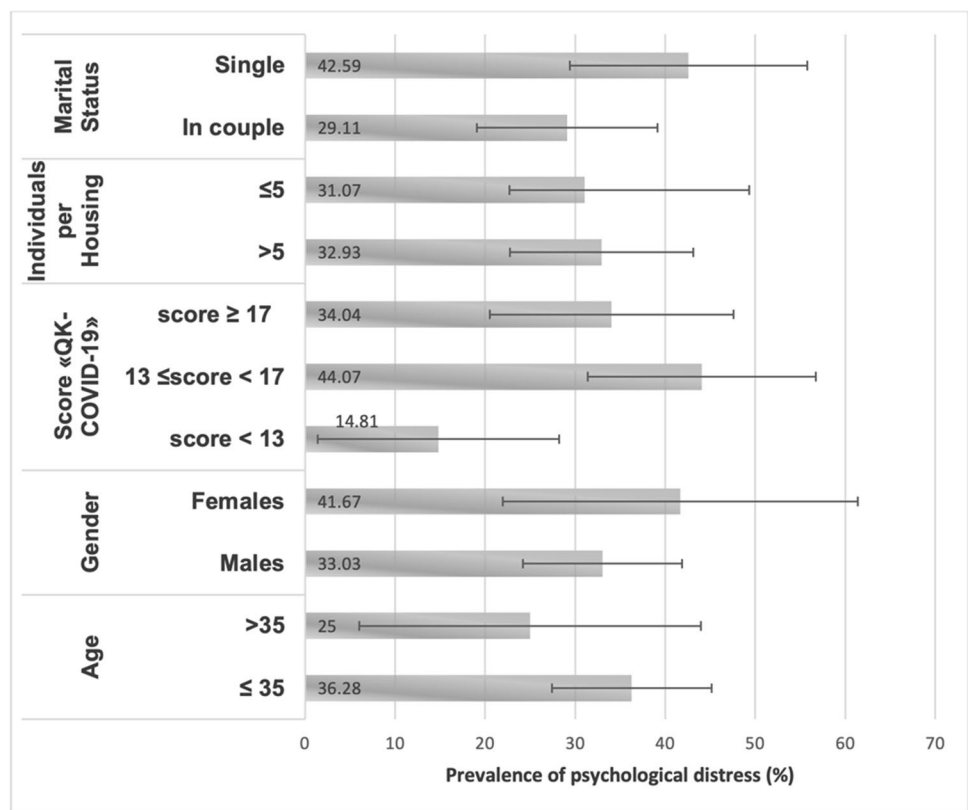
2020). In our study, we found that the level of knowledge about COVID-19 was significantly associated with anxiety and depression but following an inversed-U shaped pattern. Study participants who had low scores of QK-COVID-19 were less likely to experience psychological distress. Knowing less about the disease, its transmission and prognosis, might involve worrying less about it. It is compatible with the adage "less you know, better you sleep". Similar results were found in a recent study exploring the association between knowledge and attitudes towards COVID-19 and anxiety in a group of university students in Bangladesh; the study concluded that non-quarantined students with low levels of knowledge were 50% less likely to develop anxiety than those with high level of knowledge (Patwary et al., 2022). The participants with medium knowledge had the highest level of anxiety and depression. Incomplete knowledge about COVID-19 could have led to higher anxiety compared to both a lack of knowledge and a highest knowledge about COVID-19. This perspective was supported by a meta-analysis addressing the mental health and psychosocial support in Sub-Saharan Africa during COVID-19, and reporting that anxiety would heighten by uncertainties due to poor information coming from governments and media (Molebatsi et al., 2021). It is important to mention that the confidence intervals of the estimated odds of psychological distress in those with medium score of

knowledge and those with high score of knowledge as compared to low score overlap. This overlap indicates either a low precision due to the relatively small sample size, or that medium and high level of knowledge may represent a same category in respect to their association with psychological distress.

Other findings

Gender

In this study, the majority of participants were females (82%). This may be explained by the feminization of migration. With a global trend towards an increase in the proportion of female working migrants worldwide (de Leon Siantz, 2013). Another plausible explanation is that females may have high needs for healthcare services compared to males which makes them more likely to reach out to a humanitarian health center. Interpreting the findings through the lenses of intersectionality, black sub-Saharan African female migrants, often undocumented and with potentially low economic status, would be more likely to express high needs for healthcare compared to their male counterpart, especially for reproductive healthcare services (Llácer et al., 2007; World Health Organization African Region, 2018).

Table 2 Bivariate Analysis to measure the association between HSCL Anxiety and Depression sub-scores, and Pre- and COVID-19 Determinants of Mental Health

	Sub-score HSCL-10 Anxiety (Mean and SD)	p-value*	Sub-score HSCL-15 Depression (Mean and SD)	p-value*
Total	1.35 (0.34)		1.56 (0.46)	
Pre-COVID-19 Background Characteristics				
Age				
≤ 35	1.36 (0.35)	0.2673	1.57 (0.45)	0.3488
> 35	1,26 (0.25)		1.5 (0.53)	
Gender		0.3369		0.7162
Male	1.36 (0.33)		1.56 (0.33)	
Female	1.3 (0.35)		1.54 (0.48)	
Country of Origin		0.7547		0.9335
Ivory Coast	1.36 (0.39)		1.61 (0.59)	
Other (Guinea, Cameroon, Gabon, Democratic Republic of Congo, Mali, Burkina Faso, Ghana)	1.35 (0.32)		1.55 (0.43)	
Address in Tunisia		0.2468		0.2858
North (Ariana and Tunis)	1.32 (0.32)		1.61 (0.49)	
South (Sfax and Medenine)	1.38 (0.34)		1.52 (0.43)	
Education		0.2855		0.9889
Not educated/Primary school	1.33 (0.36)		1.57 (0.49)	
Secondary school / University	1.36 (0.32)		1.55 (0.44)	
Matrimonial Status		0.6107		0.0521
Single	1.38 (0.37)		1.65 (0.49)	
In couple	1.33 (0.31)		1.65 (0.48)	
Parent Status		0.0886		0.6850
Parent	1.31 (0.32)		1.58 (0.48)	
Not parent	1.40 (0.32)		1.53 (0.43)	
Single Mother				
Yes	1.36 (0.34)	0.8246	1.73 (0.5)	0.0302*
No	1.35 (0.33)		1.51 (0.45)	
Potential Victim of Human Trafficking		0.6851		0.0896
Yes	1.44 (0.45)		1.83 (0.6)	
No	1.34 (0.32)		1.53 (0.44)	
Undocumented Migration		0.3943		
Yes	1.35 (0.33)		1.55 (0.46)	0.4728
No	1.33 (0.35)		1.54 (0.47)	
Medical Coverage		0.9144		0.6481
Yes	1.3 (0.26)		1.68 (0.59)	
No	1.35 (0.34)		1.55 (0.46)	
COVID-19 Stressors				
Score «QK- COVID-19»		0.0822		0.086
Low score: < 13	1.26 (0.28)		1.47 (0.46)	
Medium score: 13 ≤ score < 17	1.42 (0.36)		1.65 (0.5)	
High score: score ≥ 17	1.32 (0.32)		1.49 (0.38)	
Professional Status during the pandemic		0.2116		0.9185
Working	1.24 (0.3)		1.56 (0.48)	
Not working	1.36 (0.34)		1.56 (0.46)	
Economic Status during the pandemic		0.6595		0.4920
Have an income	1.31 (0.32)		1.45 (0.34)	
Not having an income	1.35 (0.33)		1.57 (0.47)	

Table 2 (continued)

	Sub-score HSCL-10 Anxiety (Mean and SD)	p-value*	Sub-score HSCL-15 Depression (Mean and SD)	p-value*
Number of Individuals in the Household		0.0349*		0.6876
≤ 5 persons	1.32 (0.33)		1.54 (0.45)	
> 5 persons	1.44 (0.33)		1.6 (0.51)	
Sources of information related to COVID-19				
Social medias		0.1776		0.5809
Yes	1.37 (0.33)		1.53 (0.44)	
No	1.31 (0.36)		1.6 (0.5)	
Other medias (Television, newspaper, radio)		0.1637		0.9964
Yes	1.31 (0.33)		1.57 (0.49)	
No	1.39 (0.343)		1.55 (0.43)	
Attitudes in case of suspicion of an infection by the SARS-COV2				
Call the emergency assistance hotline/ Visit the emergency or the primary care center		0.5941		0.9841
Yes	1.35 (0.34)		1.55 (0.45)	
No	1.36 (0.3)		1.58 (0.53)	
Attitudes when feeling psychological distress during the pandemic				
Consult a health professional/ Call the psychological assistance hotline (CAP)		0.0206*		0.1008
Yes	1.24 (0.25)		1.47 (0.46)	
No	1.4 (0.36)		1.59 (0.46)	

P-values: two-tailed p-value of the Wilcoxon Rank Sum test/* OR: odds ratio/ CI: confidence interval/ QK-COVID-19: Questionnaire of Knowledge towards COVID-19/ HSCL-25: Hopkins Symptoms Checklist/ *p-value < 0.05

Legal status

In this study, most of the participants were undocumented migrants. This finding may be explained by the fact that countries of the Maghreb do not promote immigration and have cumbersome legal and administrative procedures that increase the risk of transgressing the law for overstay among those requesting extension of their immigration permit (Cassarini, 2020). Further investigation may be needed to explore whether this population of migrants prefer to remain undocumented or are they constrained to be so.

Socio-economic status

In our study, we found that living with five or more individuals was associated with having significant levels of distress. This may be explained by an increased fear given the difficulty to social distance. Crowded household is a well-known risk factor for transmission of COVID-19 (Ghosh et al., 2021). Additionally, crowded household could be a proxy for financial difficulties, which might also trigger distress. During the lockdown, many migrants lost their employment-consistent with our study- and have had difficulty paying rent and ensuring food security (Burton-Jeangros et al., 2020) which potentially led them to adjust by living in larger households. Our study found that participants had a high level of economic insecurity. This finding is consistent with results found by the International Labor Organization reporting that 44.7% of the sub-Saharan migrants in Tunisia lost their employment during the pandemic (International Labour Organization, 2021). The high level of loss of employment was explained by the repetitive lockdowns, and the suspension of many economic activities where sub-Saharan migrants were often employed, including construction industry, catering, and housekeeping services.

Source of information

Social Media was the main source of information about COVID-19 among study participants. The majority (80%) had accurate knowledge about the health authorities' recommendations in case of suspicion of COVID-19 infection. This finding is consistent with the results of a systematic review conducted to assess knowledge, attitudes, perceptions and practices towards COVID-19 in sub-Saharan Africa; the authors reported that in most of the reviewed studies the level of knowledge was good to very good (Nwagbara et al., 2021)

Table 3 Logistic Regression Model to measure the association between psychological distress and variables assessing the socioeconomic characteristics and knowledge towards COVID-19 among Sub-Saharan African migrants

	Model (**a**) OR (95% CI) of Psychological Distress versus No Psychological Distress	Model (**b**) OR (95% CI) of Psychological Distress versus No Psychological Distress
Age (Reference > 35)	-	1.555 (0.49, 4.90)
Gender (Reference Female)	-	0.708 (0.27, 1.86)
Marital Status (Reference in couple)	2.76 (1.21, 6.28)	2.695 (1.18, 6.15)
Potential Victim of Human Trafficking (Reference No)	2.11 (0.56, 8.03)	2.377 (0.61, 9.26)
Number of Individuals in the Household (Reference ≤ 5)	1.28 (0.58, 2.83)	1.257 (0.57, 2.79)
QK-COVID-19 (Reference low score < 13)		
Medium score: 13 ≤ score < 17	6.90 (1.94, 24.59)	6.39 (1.79, 22.90)
High score: score ≥ 17	3.93 (1.09, 14.16)	3.90 (1.08, 14.13)
LR (p-value)	0.0103	0.0244
Hosmer and Lemeshow Goodness-of-Fit Test (p-value)	0.7828	0.9877

a: Model (adjusting only for variables found to be confounders in this study): Marital Status, Victim of Human Trafficking, Number of Individuals in the Household

b: Model (adjusting for variables found to be confounders in this study and for some conceptual confounders): Age, Gender, Marital Status, Victim of Human Trafficking, Number of Individuals in the Household.

OR: Odds Ratio/ CI: Confidence Interval / LR (p-value): P-value of the likelihood ratio to test the global null hypothesis

in western sub-Saharan African countries. The high level of knowledge was explained by a relatively good access to information through media and internet (Nwagbara et al., 2021).

Seeking care

A concerning proportion (70%) of respondents reported unwillingness to seek mental healthcare despite their significant level of psychological distress. Among studies on the mental health of migrants during COVID-19 pandemic, Chew et al. found that in addition to developing symptoms of anxiety and depression, some individuals, including migrants, would rather isolate, refrain from seeking care and focus on ensuring the needs and safety of their families (Chew et al., 2020). Byrow et al. reported several barriers to seeking mental healthcare among refugees during the pandemic, including stigma and misconception about mental conditions, lack of trust, limited financial resources, unstable accommodation, and limited understanding about how to navigate the health system (Byrow et al., 2020). Similar findings were reported in a study evaluating the impact of the pandemic on the health and living conditions of undocumented migrants which found high prevalence of poor mental health associated with common avoidance of health care (Burton-Jeangros et al., 2020).

Limitations

This study has several limitations. It may be underpowered as indicated by the relatively wide confidence intervals. Recruiting more participants could have increased the power of the study but was challenging given the context of lockdown and suspension of most of non-urgent patient visits. Results should be interpreted as exploratory and hypothesis generating. Given the study design, causality cannot be inferred. However, from a clinical perspective, it is unlikely that anxiety or depression would impact the level of information about COVID-19. Distinguishing between baseline levels of distress and those attributable to the pandemic remains challenging given the absence of estimates prior to the pandemic. Several aspects that might be associated with the baseline level of distress were not investigated, including perceived discrimination, and pre-and post-migration trauma. We did not explore whether the unwillingness to seek mental healthcare was related to hesitancy to seek services or a perception that services are not accessible. However, the former may be more plausible given that participants were recruited from a humanitarian help center for migrants.

Conclusion and recommendations

Migration is an established risk factor of psychological distress, including anxiety and depression (Close et al., 2016). In the context of a pandemic, migrant populations are prone to experience higher levels of distress given the increased burden of socio-economic difficulties they face. Our study focused on estimating the prevalence of symptoms of anxiety and depression in a group of sub-Saharan African migrants living in a North-African Maghrebin country during COVID-19 pandemic, and exploring the relationship between psychological distress and the level of knowledge towards COVID-19 symptoms, transmission, and treatment. Results have shown that those with medium and high levels of knowledge were more likely to present significant psychological distress than those with low level of knowledge.

In view of these findings, we recommend taking into consideration the challenges encountered by migrants while designing interventions to respond to an outbreak. These challenges include language barriers, difficulties navigating the healthcare system, lack of trust in the health authorities, and lack of awareness about the need to early seek healthcare. Undocumented migrants are usually eclipsed from sociodemographic data in the Maghreb region (Cassarini, 2020), but should not be excluded from the strategy to respond to the pandemic. In practice, improving communication about the pandemic in this population by providing tailored messages to facilitate knowledge about prevention and treatment is key for an effective control of the outbreak. Screening for symptoms of psychological distress and promote early treatment is paramount.

Author contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Imen Ben Abid, Uta Ouali, and Louisa Abdelhafidh. The first draft of the manuscript was written by Imen Ben Abid. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data availability The dataset generated during the current study are not publicly available due to restrictions to share the collected data made by Doctors of the World, Belgium, Bureau of Tunisia, but are available from the corresponding author on reasonable request.

Declarations

All procedures of the study were approved by the ethics committee of Razi University Hospital.

The authors do not have financial or non-financial interests that are directly or indirectly related to this study.

Information Sheet.

(*Translated from French to English*)

« Hello,

I am a psychologist/psychiatrist calling you from the office of Doctors of the Word – Tunisia.

I would like to inform you that we are conducting a study to evaluate the level of knowledge of our patients regarding COVID-19 and asses their mental health in this context.

We would like to ask you questions which would take 10 to 20 minutes. It would be followed by an information session about COVID-19, its prevention and treatment in Tunisia, as well as how to maintain a good mental health during the pandemic and how to seek help if needed.

This study would help formulating and sharing recommendations to guide future health interventions that would take into considerations the specificities and the needs of the communities of sub-Saharan African migrants.

It is important for the quality of the study to obtain the response of all contacted participants. However, the choice to participate is yours.

● The participation to the study is strictly anonymous and your name will not be reported on any document of the study.

● There is no negative implication associated with your participation to this study.

● If you want, you can stop the interview at any time.

Informed Consent.

(*Translated from French to English*)

I read and clearly understood the information provided regarding my participation to this research project.

I clearly understood that I have the choice to participate or not, and that there is no negative implication if I decide to not participate.

I clearly understood that I am not obliged to answer questions that I am not comfortable with, and that I can stop the interview at any time if that is what I want.

I clearly understood that the research team working on this project will ensure strict confidentiality, that my name will not appear in the collected data, nor in the publication documents of the study and that none of my comments will be reported.

I give my informed and voluntary consent to participate to this research study:

Date:

Signature:

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