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Mental health among the Moroccan population during SARS-CoV-2 outbreak: MAROCVID study

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ABSTRACT

Background: The SARS-CoV-2 pandemic's unpredictability and ambiguity, combined with the lockdown, social distancing, containment measures, and economic impact could increase the risk of mental health issues.

Objective: To assess the magnitude of mental health outcomes and risk factors among Moroccans, using an online survey, during the SARS-CoV-2 outbreak.

Methods: This cross-sectional, survey-based study collected demographic data and mental health measurements from 11,123 participants. The degree of depression, anxiety, and insomnia symptoms were assessed by the 9-item Patient Health Questionnaire, the 7-items Generalized Anxiety disorder, and the 7-items Insomnia Severity Index.

Results: The survey was completed by 11,123 individuals out of a total of 15,008 contacts. 7315 (65.8%) were women, and 7182 (64.6%) were aged 18 to 34. A significant proportion of respondents experienced depression (5894 [53%]), anxiety (5544 [49.8%]), and insomnia (4410 [39.6%]). Multivariable logistic regression analysis showed that being a woman, being married, and being a parent of children aged less than five years were associated with severe symptoms of depression and anxiety (e.g. severe depression among women vs. men (OR, 1.19; 95%CI, 1.06–1.33; P = .003), severe depression among married compared to unmarried respondents (OR, 1.92; 95%CI, 1.71–2.16; P < .000), e.g. severe anxiety among women vs. men (OR, 1.40; 95%CI, 1.24–1.58; <0.000), severe anxiety among married people compared to unmarried (OR, 1.14; 95%CI, 1.00–1.28; P < .003).

Conclusion: Our findings reported a significant mental health burden on the general public during the COVID-19 lockdown. In addition to efforts deployed to prevent the spread of the disease, timely and culturally-specific mental health care needs to be developed urgently.

1. Introduction

According to the World Health Organization, viral epidemics present a significant problem to public health, with new viruses emerging all the time. In the past 20 years, several viral diseases have occurred, such as severe acute respiratory syndrome (2003), H1N1 influenza (2009), Middle East respiratory syndrome (2012), and Ebola virus disease (2014) (Ashour et al., 2020; Kisely et al., 2020). In 2019, a novel virus belonging to the coronavirus (CoV) family, SARS-CoV-2, emerged in

Wuhan in China (Zou et al., 2020). COVID-19 caused a global pandemic with 438 million confirmed cases in more than 216 countries on February 27, 2022. Also, there are 5,969,439 confirmed deaths across the globe, as reported by WHO (2022). Morocco has increased from 1140 case on April 6, 2020 to 1,161,290 on February 27, 2022, and 16,002 deaths (WHO, 2020, 2022). During the early stages of the spread of COVID-19, the Moroccan government contained the pandemic using syndromic surveillance, prompt isolation of suspected and confirmed patients, restrictions on travel, strict household quarantine, and social

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distancing (Berni et al., 2021). The state of lockdown of the population in many parts of the world has significant consequences, including the population's health, economy, and social life (Ebrahim et al., 2020). Along with the economic impacts and physical damage, the community's mental health issues are the biggest challenge and might be a source of distress. This feeling can be provoked by the increased anxiety levels caused by earners' commitment to secure basic supplies (e.g., food, medical supplies). Previous research revealed that mental health issues could occur in frontline workers and the general population during the lockdown (Lai et al., 2020; Li et al., 2020; Kisely et al., 2020). Several studies identified a noticeable increase in adult mental disorders during the COVID-19 lockdown (Wang et al., 2020). Hence, students' and children's psychological well-being has also been significantly affected (Xie et al., 2020; Tang et al., 2021). A recent meta-analysis on mental health and COVID-19 among the Italian population showed that 32.4% of participants reported high to extremely high depressive levels; and 18.7% reported high to extremely high anxiety symptoms (Mazza et al., 2020). Similarly, Huang and Zhao, 2020 found that almost 18.2% of 7236 respondents had poor sleep quality. It is assumed that those symptoms of mental disorders are partly caused by the imposed physical distancing measures leading to social isolation and a break-down of social network (Brooks et al., 2020). These findings confirm those of earlier infectious disease outbreaks (SARS, H1N1, EBOLA, MERS, equine influenza), in which increased psychological disorders including symptoms of depression, anxiety, and insomnia were reported as well (Lee et al., 2007; Samantha K Brooks et al., 2020). The economic downturn and reduced earnings following lockdown might further exacerbate psychological depression, and increase vulnerability of populations with lower socio-economic status (Kazmi et al., 2020). Previous research has demonstrated the capability of COVID-19 to increase rate of depression and anxiety in the population, especially among women and youngsters (Huang et al., 2019; Wang et al., 2020; Gutiérrez-Hernández et al., 2021). Furthermore, it was reported that the mental disorders are perceived as an opportunity to remedy disconnection from God, which might be considered as positive since it reinforces the Muslim attitudes toward mental illness. Hence, a recent study on the religion commitment showed that reduced depressive and stress, better health, and subjective well-being may be seen in people with higher intrinsic religiosity and spirituality (Ting et al., 2021). Accordingly, mental well-being is a crucial aspect that must be addressed during this pandemic as all means of communication revolve around the coronavirus.

Evidence on detrimental impacts of the lockdown and the COVID-19 pandemic on mental health is now accumulating, mainly through studies performed on the Asian (China, India), American and European (Italy, UK) continents, with only few research on the African continent and very few targeting the Arab and Muslim communities, especially during the pandemic circumstances, while it is to our mind important to expand on different cultures and societal aspects within these countries.

In Morocco, the mental health status of the general public during the COVID-19 pandemic has never been assessed. In general, the mental health public and self-stigma in Arab countries continues to be a major barrier for individuals with mental disorders. Indeed, the general population endorse stereotypes about mental health issues, which impacts their willingness to seek mental health care. Instead of being assessed through an intrapsychic approach, mental illness in the Arab countries tends to rather be explained in a more intersubjective terms (Cocker and Scott, 2006). In response, we conducted a large sample, cross-sectional online survey study to investigate the prevalence of symptoms of depression, anxiety, and insomnia and potential risk factors in the general public in Morocco.

Overall, this study contributes to improving awareness in three ways. First, it sheds new light on the severity of quarantine's impact on the mental health of the Moroccan population. Second, it provides more empirical data on society's current mental health burden for tailoring and implementing relevant mental health intervention policies to cope with this challenge efficiently and effectively. Third, it contributes to the

international efforts of understanding the mental health disparities in response to the pandemic in a Muslim North-African country.

2. Methods

2.1. Study design

This cross-sectional survey was conducted from March 30, 2020, to April 10, 2020, 10 days immediately after the announcement of the lockdown in Morocco. During the early stages of the spread of the pandemic strain of COVID-19, the Moroccan government implemented several mitigation measures to prevent the person-to-person spread of the disease. One of the most common interventions in the early weeks of the pandemic was a non-pharmaceutical measure including school or work-place closure, travel restrictions, case isolation, personal protection and hygiene, household quarantine, and social distancing, all of which are recommended by WHO. These recommendations include frequent handwashing with soap and water or alcohol-based hand gel, covering mouth and nose with a disposal tissue when coughing or sneezing, avoiding touching eyes, nose and mouth, and using face masks (Berni et al., 2021). Approval from the Ethics committee of the Moulay Ismail University of Meknes was received before the initiation of this study (N: CERB-UMI 03/2020).

An online questionnaire was spread via Facebook, WhatsApp, Instagram, Twitter, and LinkedIn using sponsored social network advertisements. We used a convenience sampling method. The registered members of the various social networking sites clicked the link on the platform and responded to the survey voluntarily until the convenience sample covered all 12 regions in Morocco.

2.2. Participants

A total of 15,008 participants clicked on the survey link, and 14,359 individuals commenced the survey, among whom 101 individuals refused to provide informed consent, and 14,258 participants provided informed consent and submitted the questionnaires. After excluding 2483 participants who did not complete all the questions and 652 respondents younger than 18 years, the final sample consisted of 11,123 participants. Those who participated in the study did not differ from those who did not complete all the questions in terms of age, sex, marital status, working position and education.

2.3. Outcomes and covariates

We focused on symptoms of depression, anxiety, and insomnia for all participants using the 9-items Patients Health Questionnaire (PHQ-9) (Spitzer et al., 1999), the 7-item Generalized Anxiety Disorder scale (GAD-7) (Spitzer et al., 2006), and the 7-item Insomnia Severity Index (ISI-7) (Morin et al., 2011). PHQ-9 consists of 9 questions on depression symptoms over the last 10 days, with response of "not at all" (=0), "several days" (=1), "more than half the days" (=2), and "nearly every day" (=3), with item scores summed to produce a total score range of 0–27. The GAD-7 instrument consists of 7 questions on anxiety symptoms over the last 10 days, with the same response options and scoring as the PHQ-9. ISI-7 was measured using the 7-item Insomnia Severity Index with respondents asked 7 questions about severity of sleep onset, sleep dissatisfaction, distress caused by sleep difficulties. Response options ranged from 1 to 4, with response of "No problem" (=0), "mild" (=1), "moderate" (=2), "severe" (=3), "very severe" (=4). The total score of these measurement tools was interpreted as follows: PHQ-9, normal (0–4), mild (5–9), moderate (10–14), and severe (15–27) depression; GAD-7, normal (0–4), mild (5–9), moderate (10–14), and severe (15–21) anxiety; ISI-7, normal (0–7), subthreshold (8–14), moderate (15–21), and severe (22–28) insomnia. These categories were based on values established in the literature (Spitzer et al., 1999) (Spitzer et al., 2006). Participants were classified as having severe

symptoms according to the following cutoffs: at least 15 on the PHQ-9, at least 15 on the GAD-7, and at least 22 on the ISI.

The questionnaire was first developed in French between the co-investigators and shared with other mental health experts in Morocco and Belgium for review. It was then translated into Arabic language, and piloted with 25 participants to examine feasibility, clarity, errors, and ethical issues. The mental health outcomes measures showed good internal reliability, with Cronbach alpha scores ranging from 0.72 to 0.92 for the three measures.

The participants reported demographic data, including gender, age group (18–24, 25–34, 35–54, >55), marital status (married, others including single, divorced, widowed), educational level (None, primary school, secondary school, Bachelor degree, Master and Doctorate), working position (student, employee, self-employed, unemployed, and retired), religion (the same level of religion as before, more religious), parent of children, quarantined, being infected by Covid-19 (having a confirmed infection at the time of questionnaire completion), and monthly income family.

2.4. Statistical analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 20.0 (Insight, Grimbergen, Belgium). The significance level was set at $\alpha = 0.05$, and all tests were 2-tailed. The ranked data, which were derived from the counts of each level for symptoms of depression, anxiety, and insomnia, are presented as numbers and percentages. The nonparametric Mann-Whitney *U* test and Kruskal-Wallis test were applied to compare the severity of each symptom between 2 or more groups. To determine potential risk factors for symptoms of depression, anxiety, and insomnia within participants, unadjusted logistic regression and multivariable logistic regression analysis were performed. All of the variables that were statistically significant in the unadjusted regression analysis and those that might convey important information were entered into the multivariable model. Detailed information of variables in the logistic regression is listed in Table S1. The associations between risk factors and outcomes are presented as odds ratios (O.R.s) and 95%CIs, after adjustment for confounders.

Table 1
Demographic and occupational characteristics of respondents.

Characteristic	No. (%)				
	Overall (N = 11,123)	North-Center (n = 5579) ^a	North-eastern (n = 1134) ^b	South (n = 2051) ^c	Center south (n = 2359) ^d
Gender					
Women	7315 (65.8)	3612 (49.4)	770 (10.5)	1281 (17.5)	1652 (22.6)
Men	3808 (34.2)	1967 (51.7)	364 (9.6)	770 (20.2)	707 (18.6)
Age group, years					
18–24	2366 (21.3)	1442 (61)	161 (6.8)	462 (19.5)	301 (12.7)
25–34	4816 (43.3)	2051 (42.6)	588 (12.2)	889 (18.5)	1288 (26.7)
35–54	3360 (30.2)	1771 (52.7)	336 (10)	595 (17.7)	658 (19.6)
>55	581 (5.2)	315 (54.2)	49 (8.4)	105 (18.1)	112 (19.3)
Marital status					
Married	5537 (49.8)	2625 (47.7)	665 (12)	952 (17.2)	1295 (23.4)
Others ^e	5586 (50.2)	2954 (52.9)	469 (8.4)	1099 (19.7)	1064 (19)
Educational level					
None	28 (0.3)	7 (25)	0 (0)	21 (75)	0 (0)
Primary school	112 (1)	42 (34.7)	7 (5.8)	42 (34.7)	21 (17.4)
Secondary school	1218 (11)	672 (55.2)	112 (9.2)	252 (20.7)	182 (14.9)
Bachelor degree	4389 (39.5)	2065 (47.1)	455 (10.4)	847 (19.3)	1022 (23.3)
Master & doctorate	5376 (48.3)	2793 (52)	560 (10.2)	889 (16.5)	1134 (21.1)
Working position					
Student	3178 (28.6)	1820 (57.3)	238 (7.5)	658 (20.7)	462 (14.5)
Employee	5243 (47.1)	2639 (50.3)	609 (11.6)	891 (17)	1204 (23)
Self-employed	1074 (9.6)	448 (41.7)	91 (8.5)	210 (19.6)	315 (29.3)
Unemployed	1470 (13.2)	602 (41)	175 (11.9)	357 (24.3)	336 (22.9)
Retired	168 (1.5)	70 (41.7)	21 (12.5)	35 (20.8)	42 (25)
Religion/spirituality					
The same level of religion	3556 (32)	1701 (47.8)	301 (8.5)	679 (19.1)	875 (24.6)
More religious	7567 (68)	3878 (51.2)	833 (11)	1372 (18.1)	1484 (19.6)
Children in household, years					
Aged <5	3444 (31)	1652 (48)	406 (11.8)	644 (18.7)	742 (21.5)
Aged >5, or no children	7679 (69)	3927 (51.1)	728 (9.5)	1407 (18.3)	1617 (21.1)
Quarantine					
Quarantined	5950 (53.5)	2849 (47.9)	595 (10)	1141 (19.2)	1365 (22.9)
Not quarantined	5173 (46.5)	2730 (52.8)	539 (10.4)	910 (17.6)	994 (19.2)
Infection with Covid-19					
Confirmed cases	119 (1.1)	63 (52.9)	35 (29.4)	21 (17.6)	0 (0)
Not infected	11,004 (98.9)	5516 (50.1)	1099 (50.1)	2030 (18.4)	2359 (212.4)
Monthly family income					
<2000 dh	896 (8.1)	546 (60.9)	91 (10.2)	126 (14.1)	133 (14.8)
2000 – 4000 dh	1372 (12.3)	581 (42.3)	161 (11.7)	273 (19.9)	357 (15)
4000 – 8000 dh	2198 (19.8)	1225 (55.7)	196 (8.9)	448 (20.4)	329 (15)
8000 – 12 000 dh	2475 (22.1)	1085 (44.2)	259 (10.5)	518 (21.1)	595 (24.2)
>12 000 dh	4200 (37.8)	2142 (51)	427 (10.2)	686 (16.3)	945 (22.5)

^a Rabat-Salé-Knitra, Fes-Meknes

^b Tanger-Tetouan, région oriental.

^c Agadir, Marrekech, Dakhla.

^d Casablanca-Settat, Jdida, Beni mellal.

^e Others includes single, widowed and divorced participants.

3. Results

3.1. Demographic characteristics

Data from a total of 11,123 eligible participants were included in the final analysis. The participants included in the analysis represented all the 12 regions in Morocco. Among the total sample, 7315 (65.8%) were women, and 3808 (34.2%) were men; 7182 participants (64.6%) were aged 18–34. Of the total number of the respondents, 9765 (87.8%) had a Bachelor's degree or higher, and 5537 (49.8%) were married. More than half of the respondents (50.2%) were from the center-north of Morocco. A total of 7567 (68%) participants became more religious, 5950 (53.3%) were quarantined during the lockdown in Morocco. The survey included data from 119 participants (1.1%) with confirmed cases of Covid-19. Additional demographic characteristics are presented in [Table 1](#). Among those who did not participate, 1897 (76.4%) were women, and 586 (23.6%) were men; 867 participants (34.9%) were student, and 1466 (59%) were married.

3.2. The severity of measurements and associated factors

A considerable proportion of participants had symptoms of depression (5894 [53%] total participants, including 4522 participants [40.7%] with mild to moderate depression and 1372 participants [12.4%] with severe depression), anxiety (5544 [49.8%] total participants, including 4375 participants [39.3%] with mild to moderate anxiety and 1169 participants [10.5%] with severe anxiety), and insomnia (4410 [39.6%] total participants, including 3962 participants [35.6%] with subthreshold to moderate insomnia and 448 participants [4%] with severe insomnia). Women, married, unemployed and students reported experienced more severe symptom level of depression, anxiety, and insomnia (eg. Severe depression among women vs men: 854 [11.7%] vs 401 [10.5%]; $P = .001$; Severe anxiety among women vs men: 686 [9.4%] vs 283 [7.4%]; $P = .001$; Severe insomnia among married vs others: 266 [4.8%] vs 182 [3.3%]; $P = .002$; Severe insomnia among unemployed and student vs employed: 84 [5.7%], 126 [4%] respectively vs 401 [10.5%]; $P = .001$) ([Table 2](#)). Compared with parents of children aged more than 5 years, participants who have children less than 5 years were more likely to report severe symptoms of depression (581 [16.9%] vs 728 [10.3%]; $P < .001$), anxiety (623 [18.1%] vs 546 [7.1%]; $P < .001$), and insomnia (154 [4.5%] vs 249 [3.2%]; $P < .001$) ([Table 2](#)).

3.3. Risk factors of mental health outcomes

Multivariable regression analysis showed that, after controlling for confounders, being a woman, married were associated with severe symptoms of depression, anxiety, and insomnia (e.g., severe depression among women vs. men: OR, 1.19; 95%CI, 1.06–1.33; $P = .003$; severe anxiety among married participants vs. others: OR, 1.14; 95%CI, 1.00–1.28; $P < .0035$). Individuals with lower income levels had at least twice the risk for the three mental health symptoms compared with high-income levels (adjusted O.R.s, 3.06 [95%CI, 2.49–3.76] for depression, 3.44 [95%CI, 2.85–4.14] for anxiety, 2.15 [95%CI, 1.56–2.97] for insomnia). Participants who reported being infected with COVID-19 had higher odds of depressive symptoms (adjusted OR, 2.21; 95%CI, 1.44–3.39), anxiety (adjusted OR, 3.62; 95%CI, 3.28–8.58), insomnia (adjusted OR, 5.31; 95%CI, 3.28–8.58), compared to those who did not report infection with COVID-19.

Respondents who were in quarantine during the lockdown in Morocco had a higher odds of having anxiety than those who were not quarantined (adjusted O.R.s, 3.62 [95%CI, 2.43–5.40]), anxiety (adjusted O.R.s, 1.30 [95%CI, 1.15–1.47]), insomnia (adjusted O.R.s, 0.66 [95%CI, 0.55–0.81]). Parents of children aged under 5 years had an elevated risk for depression (adjusted OR, 1.76; 95%CI, 1.57–1.98) and anxiety (adjusted OR, 2.88; 95%CI, 2.55–3.62), and being unemployed

remained statistically significant in the multivariable model of depression (adjusted OR, 2.60; 95%CI, 1.62–4.17) and anxiety (adjusted OR, 0.31; 95%CI, 0.22–0.45). The detailed results of the multivariable analysis are shown in [Table 3](#).

4. Discussion

To the best of our knowledge, this is the first study on mental health outcomes and associated risk factors among the Moroccan population during the COVID-19 outbreak. This cross-sectional survey enrolled 11,123 participants and reported a high prevalence of mental health issues among Moroccan adults after less than ten days after the Moroccan government announced the “state of Health Emergency” response to the COVID-19 outbreak. Overall, a significant proportion of respondents experienced depression, anxiety, and insomnia. Being a woman, married, becoming more religious, and being a parent of children aged < 5 years revealed a higher odds of developing unfavorable mental health outcomes. Furthermore, it was reported that the mental disorders are perceived as an opportunity to remedy disconnection from God, which might be considered as positive since it reinforces the Muslim attitudes toward mental illness. Generally, our results showed concerns about the psychological well-being of the Moroccan population during the Covid-19 pandemic outbreak.

No study in Morocco using the same sampling method was used before COVID-19 to allow the comparison. The latest estimated prevalence of slipping disorder, depression, and anxiety in Morocco is from 2007 and shows respective proportions of 18.6, 4.5%, and 4.5% ([Kadri et al., 2007](#); [Koyanagi and Stickley, 2015](#)). Our study disclosed a high prevalence of insomnia (39.6%). Additionally, 10.5% of the studied sample had symptoms of severe anxiety, moderate anxiety (11.6%). The results of depression revealed that 53% of respondents suffered from depressive symptoms (mild depression: 20.2%, moderate depression: 20.5%, and severe depression: 12.4%). The increase of such disorders was associated with several stressors. During the outbreak, there was a higher odds of infection, a longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, and inadequate information, financial loss, stigma overwork, isolation, a lack contact with families and friends, and the excess information from mass media ([Lai et al., 2020](#)).

However, caution is needed when interpreting these results since the instruments and criteria used might differ widely. [Huang and Zhao \(2020\)](#) and [Kazmi et al. \(2020\)](#) also reported that COVID-19 pandemic lockdown presents a high odds of psychological symptoms in China and India, respectively. Our results are more alarming than the ones reported from a study conducted in Sweden and using the same methodology. [McCracken et al. \(2020\)](#) reported levels of depression, anxiety, and insomnia at rates of 30%, 24.2%, and 38%, respectively, which are 10% less than the rates we found. However, similarly to our study, financial worries have been confirmed as one of the main predictors of mental health problems.

A higher mortality rate, infection rate, the lack of knowledge during COVID-19's early stage, and the current lockdown measures imposed in Morocco and worldwide may explain the higher rates of mental health symptoms. In general, the number of individuals suffering from psychological effects after a significant incident is often greater than the number of physically affected people, and mental health impacts can last further ([Kang et al., 2020a, 2020b](#); [Xiong et al., 2020](#)). In this regard, our findings require more surveillance and tailored strategies for Moroccan people throughout the COVID-19 pandemic to avoid long-term disorders linked to mental health.

The present study identified several population groups who are likely to develop mental health symptoms. Compared with uninfected people, those with confirmed COVID-19 were 2 to 5 times more likely to report mental health symptoms. The prevalence of symptoms of the 3 mental health conditions was high among patients with COVID-19 (depression, 76.5%; anxiety, 70.6%; insomnia, 41.2%). This is partially consistent

Table 2
Severity categories of depression and anxiety, measurements in total study and subgroups.

Characteristic	PHQ-9, depression symptoms					GAD-7, anxiety					ISI, insomnia symptoms				
	Total, no (%)					Total, no (%)					Total, no (%)				
	Normal	Mild	Moderate	Severe	P value	Normal	Mild	Moderate	Severe	P value	Normal	Subthreshold	Moderate	Severe	P value
Total, no (%)	5229 (47)	2240 (20.2)	2282 (20.4)	1372 (12.4)		5579 (50.2)	3080 (27.7)	1295 (11.6)	1169 (10.5)		6713 (60.4)	3262 (29.3)	700 (6.3)	448 (4)	
Location															
Center North	2506 (44.9)	1197 (21.5)	1148 (20.6)	728 (13)	<0.001	2996 (53.7)	1428 (25.6)	637 (11.4)	518 (9.3)	<0.001	3388 (60.7)	1624 (29.1)	371 (6.6)	196 (3.5)	<0.001
North Eastern	525 (46.3)	252 (22.2)	196 (17.3)	161 (14.2)		532 (46.9)	287 (25.3)	112 (9.9)	203 (17.9)		623 (54.9)	336 (29.6)	84 (7.4)	91 (8.0)	
South	987 (48.1)	588 (28.7)	266 (13)	210 (10.2)		959 (46.8)	581 (28.3)	280 (13.7)	231 (11.3)		1225 (59.7)	637 (31.1)	122 (5.9)	56 (2.7)	
Centre south	1211 (51.3)	469 (19.9)	406 (17.2)	273 (11.6)		1092 (46.3)	784 (33.2)	266 (11.3)	217 (9.2)		1477 (62.6)	665 (28.2)	112 (4.7)	105 (4.5)	
Gender															
Women	3598 (49.2)	1386 (18.9)	1477 (20.2)	854 (11.7)	0.001	3491 (47.7)	1876 (25.6)	812 (11.1)	686 (9.4)	<0.001	4410 (60.3)	2128 (29.1)	413 (5.6)	364 (5)	0.03
Men	1631 (42.8)	1120 (29.4)	656 (17.2)	401 (10.5)		1638 (43)	1404 (36.9)	483 (12.7)	283 (7.4)		2303 (60.5)	1134 (29.8)	287 (7.5)	84 (2.2)	
Age group, years															
18–24	980 (41.4)	497 (21)	595 (25.1)	294 (12.4)	<0.001	1218 (51.5)	518 (21.9)	420 (17.8)	210 (8.9)	<0.001	1449 (61.1)	700 (29.5)	140 (5.9)	84 (3.5)	0.464
25–34	2394 (49.7)	1064 (22.1)	763 (15.8)	595 (12.4)		2401 (49.9)	1435 (29.8)	518 (10.8)	462 (9.6)		2898 (60.2)	1379 (28.6)	301 (6.3)	238 (4.9)	
35–54	1603 (47.7)	819 (24.4)	560 (16.7)	378 (11.3)		1722 (51.3)	938 (27.9)	315 (9.4)	385 (11.5)		2009 (49.8)	1022 (30.4)	217 (6.5)	112 (3.3)	
>55	252 (43.4)	126 (21.7)	98 (16.9)	105 (18.1)		238 (41)	189 (32.5)	42 (7.2)	112 (19.3)		357 (62.2)	161 (28)	42 (7.3)	14 (2.4)	
Marital status															
Married	2569 (46.4)	1190 (21.5)	903 (16.3)	875 (15.8)	<0.001	2884 (52.1)	1470 (26.5)	567 (10.2)	616 (11.1)	0.002	3297 (59.5)	1568 (28.3)	406 (7.3)	266 (4.8)	0.002
Others	2660 (47.6)	1316 (23.6)	1113 (19.9)	497 (8.9)		2695 (48.2)	1610 (28.8)	728 (13)	553 (9.9)		3416 (61.2)	1694 (30.3)	294 (5.3)	182 (3.3)	
Educational level															
None	0	14 (50)	14 (50)	0	<0.001	21 (75)	0	0	7 (25)	0.006	14 (50)	14 (50)	0	0	<0.001
Primary school	42 (37.5)	35 (31.3)	28 (24.1)	7 (6.3)		63 (56.3)	21 (18.8)	28 (25)	0 (0)		63 (56.3)	28 (25)	14 (12.5)	7 (6.3)	
Secondary school	602 (49.4)	259 (21.3)	294 (24.1)	63 (5.2)		609 (50)	308 (25.3)	196 (16.1)	105 (8.6)		655 (53.8)	399 (32.8)	98 (8)	56 (4.6)	
Bachelor degree	1988 (45.3)	1015 (23.1)	742 (16.9)	644 (14.7)		2289 (52.2)	1148 (26.2)	525 (12)	427 (9.7)		2373 (54.1)	1169 (26.6)	280 (6.4)	203 (4.6)	
Master & doctorate	2597 (48.3)	1183 (22)	938 (17.4)	658 (12.2)		2597 (48.3)	1603 (29.8)	546 (10.2)	630 (11.7)		3234 (60.2)	1652 (30.7)	308 (5.7)	182 (3.4)	
Working position															
Student	1120 (35.2)	756 (23.8)	728 (22.9)	574 (18.1)	<0.001	1603 (50.4)	861 (27.1)	441 (13.9)	273 (8.6)	<0.001	1841 (57.9)	1057 (33.3)	154 (4.8)	126 (4)	<0.001
Employee	2765 (52.7)	1330 (25.4)	833 (15.9)	315 (6)		2688 (51.3)	1484 (28.3)	511 (9.7)	560 (10.7)		3374 (64.4)	1372 (26.2)	308 (5.9)	189 (3.6)	
Self-employed	630 (59.2)	203 (19.1)	168 (15.8)	63 (5.9)		525 (49.3)	287 (27)	133 (12.5)	119 (11.2)		574 (53.9)	329 (30.9)	119 (11.2)	42 (3.9)	
Unemployed	609 (41.4)	210 (14.3)	252 (17.1)	399 (27.1)		700 (47.6)	399 (27.1)	203 (13.8)	168 (11.4)		833 (56.7)	441 (30)	112 (7.6)	84 (5.7)	
Retired	105 (62.5)	7 (4.2)	35 (20.8)	21 (12.5)		63 (37.5)	49 (29.2)	7 (4.2)	49 (29.2)		91 (1.8)	63 (1.2)	7 (0.1)	7 (0.1)	
Religion/spirituality															
Same level of religion	1638 (46.1)	658 (18.5)	616 (17.3)	644 (18.1)	<0.001	1960 (55.1)	889 (25)	406 (11.4)	301 (8.5)	<0.001	1988 (55.9)	1092 (30.7)	315 (8.9)	161 (4.5)	<0.001
More religious	3591 (48.3)	1848 (24.4)	1400 (18.5)	728 (9.6)		3619 (47.8)	2191 (29)	889 (11.7)	868 (11.5)		4725 (62.4)	2170 (28.7)	385 (5.1)	287 (3.8)	
Children in household, years															
Aged <5	1428 (41.5)	749 (21.7)	686 (19.9)	581 (16.9)	<0.001	1603 (46.5)	833 (24.2)	385 (11.2)	623 (18.1)	<0.001	2009 (58.3)	1071 (31.1)	210 (6.1)	154 (4.5)	<0.001

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Table 2 (continued)

Characteristic	PHQ-9, depression symptoms				GAD-7, anxiety				ISI, insomnia symptoms			
	Total, no (%)		P value		Total, no (%)		P value		Total, no (%)		P value	
	Normal	Mild	Moderate	Severe	Normal	Mild	Moderate	Severe	Normal	Subthreshold	Moderate	Severe
Aged >5, or no children	3801 (49.5)	1757 (22.9)	1330 (17.3)	791 (10.3)	3976 (51.8)	2247 (29.3)	910 (11.9)	546 (7.1)	4704 (61.3)	2191 (28.5)	490 (6.4)	249 (3.2)
Quarantine	2730 (45.9)	1379 (23.2)	910 (15.3)	931 (15.6)	2688 (45.2)	1617 (27.2)	616 (10.4)	1029 (17.3)	3241 (60.0)	1603 (29.7)	385 (7.1)	175 (3.2)
Not quarantined	2499 (48.3)	1127 (21.8)	1106 (21.4)	441 (8.5)	2891 (55.9)	1463 (28.3)	679 (13.1)	140 (2.7)	3472 (60.7)	1659 (29.0)	315 (5.5)	237 (4.1)
Infection with Covid-19 Confirmed cases	28 (23.5)	21 (17.6)	42 (35.3)	28 (23.5)	35 (29.4)	21 (17.6)	28 (23.5)	35 (29.4)	70 (58.8)	14 (11.8)	14 (11.8)	21 (17.6)
Not infected	5201 (47.3)	2219 (20.2)	2240 (20.4)	1344 (12.2)	5544 (50.4)	3059 (27.8)	1267 (11.5)	1134 (10.3)	6643 (60.4)	3248 (29.5)	686 (6.2)	427 (3.9)
Family monthly income	399 (44.5)	63 (7.0)	266 (29.7)	168 (18.8)	469 (52.3)	133 (14.8)	77 (8.6)	217 (24.2)	553 (61.7)	189 (21.1)	98 (10.9)	56 (6.3)
<2000 dh,	644 (46.9)	203 (14.8)	238 (17.3)	287 (20.9)	735 (53.6)	371 (27)	112 (8.2)	154 (11.2)	812 (59.2)	462 (33.7)	49 (3.6)	49 (3.6)
2000–4000,	910 (41.4)	406 (18.5)	574 (26.1)	308 (14)	1071 (48.7)	546 (24.8)	350 (15.9)	231 (10.5)	1309 (59.6)	644 (29.3)	140 (6.4)	105 (4.8)
4000–8000 dh,	1127 (45.9)	665 (27.1)	350 (14.2)	315 (12.8)	1211 (49.3)	791 (32.2)	245 (10)	210 (8.5)	1505 (61.3)	721 (29.3)	119 (4.8)	112 (4.6)
8000–12,000 dh	2149 (51.2)	903 (21.5)	854 (20.3)	294 (7)	2093 (49.8)	1239 (29.5)	511 (12.2)	357 (8.5)	2534 (60.3)	1246 (29.7)	294 (7)	126 (3)
>12,000												

Abbreviations: PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalized Anxiety Disorder; ISI, 7-item Insomnia Severity Index.

Table 3

Risk factors for mental health outcomes identified by multivariable logistic regression analysis.

Variable	No. of severe cases/no. of total cases (%)	Adjusted OR (95%CI)	P value ^d	Categories	Overall
PHQ-9, depression symptoms ^a					
Gender					
Women	854/7315 (11.7)	1.19 (1.06–1.33)	0.003	0.003	0.003
Men	401/3808 (10.5)	Reference	NA	NA	
Age group in years					
18–24	294/2366 (12.4)	0.64 (0.50–0.82)	<0.001	<0.001	<0.001
25–34	595/4816 (12.4)	0.63 (0.51–0.80)	<0.001	<0.001	
35–54	378/3360 (11.3)	0.57 (0.45–0.72)	<0.001	<0.001	
>55	105/581 (18.1)	Reference	NA	NA	
Marital status					
Married	875/5537 (15.8)	1.92 (1.71–2.16)	<0.001	<0.001	<0.001
Others	497/5586 (8.9)	Reference	NA	NA	
Educational level					
None	0/28 (0)	0.00	0.99	0.99	<0.001
Primary school	7/112 (6.3)	0.47 (0.22–1.03)	0.06	0.06	
Secondary school	63/1218 (5.2)	0.39 (0.30–0.51)	<0.001	<0.001	
Bachelor degree	644/4389 (14.7)	1.23 (1.09–1.38)	<0.001	<0.001	
Master & doctorate	658/5376 (12.2)	Reference	NA	NA	
Working position					
Student	574/3178 (18.1)	1.54 (0.96–2.45)	0.048	0.048	<0.001
Employee	315/5243 (6)	0.44 (0.27–0.71)	0.001	0.001	
Self-employed	63/1074 (5.9)	0.44 (0.27–0.74)	0.002	0.002	
Unemployed	399/1470 (27.1)	2.60 (1.62–4.17)	<0.001	<0.001	
Retired	21/168 (12.5)	Reference	NA	NA	
Religion/spirituality					
Same level of religion	644/3556 (18.1)	2.08 (1.85–2.33)	<0.001	<0.001	<0.001
More religious	728/7567 (9.6)	Reference	NA	NA	
Children in household, years					
Aged <5	581/3444 (16.9)	1.76 (1.57–1.98)	<0.001	<0.001	<0.001
Aged >5, or no children	791/7679 (10.3)	Reference	NA	NA	
Quarantine					
Quarantined	931/5950 (15.6)	0.50 (0.47–0.56)	<0.001	<0.001	<0.001
Not quarantined	441/5173 (8.5)	Reference	NA	NA	
Infection with COVID-19					
Confirmed cases	28/119 (23.5)	2.21 (1.44–3.39)	<0.001	<0.001	<0.001
Not infected	1344/11004 (12.2)	Reference	NA	NA	
Monthly income family					
<2000 dh	168/896 (18.8)	3.06 (2.49–3.76)	<0.001	<0.001	<0.001
2000–4000	287/1372 (20.9)	3.51 (2.94–4.19)	<0.001	<0.001	
4000–8000 dh	308/2198 (14)	2.16 (1.82–2.56)	<0.001	<0.001	
8000–12,000 dh	315/2457 (12.8)	1.95 (1.65–2.31)	<0.001	<0.001	
>12,000	294/4200 (7)	Reference	NA	NA	

(continued on next page)

Table 3 (continued)

Variable	No. of severe cases/no. of total cases (%)	Adjusted OR (95%CI)	P value ^d	
			Categories	Overall
GAD-7, anxiety ^b				
Gender				
Women	686/7315 (9.4)	1.40 (1.24–1.58)	<0.001	<0.001
Men	283/3808 (7.4)	Reference	NA	
Age group, years				
18–24	210/2366 (8.9)	0.41 (0.32–0.52)	<0.001	<0.001
25–34	462/4816 (9.6)	0.44 (0.35–0.59)	<0.001	
35–54	385/3360 (11.5)	0.54 (0.43–0.68)	<0.001	
>55	112/581 (19.3)	Reference	NA	
Marital status				
Married	616/5537 (11.1)	1.14 (1.00–1.28)	0.035	0.035
Others	553/5586 (9.9)	Reference	NA	
Working position				
Student	273/3178 (8.6)	0.23 (0.16–0.32)	<0.001	<0.001
Employee	560/5243 (10.7)	0.29 (0.20–0.41)	<0.001	
Self-employed	119/1074 (11.2)	0.31 (0.21–0.45)	<0.001	
Unemployed	168/1470 (11.4)	0.31 (0.22–0.45)	<0.001	
Retired	49/168 (29.2)	Reference	NA	
Religion/spirituality				
Same level of religion	301/3556 (8.5)	0.71 (0.62–0.82)	<0.001	<0.001
More religious	868/7567 (11.5)	Reference	NA	
Children in household, years				
Aged <5	623/3444 (18.1)	2.88 (2.55–3.62)	<0.001	<0.001
Aged >5, or no children	546/7679 (7.1)	Reference	NA	
Quarantine				
Quarantined	1029/5950 (17.3)	1.30 (1.15–1.47)	<0.001	<0.001
Not quarantined	140/5173 (2.7)	Reference	NA	
Infection with COVID-19				
Confirmed cases	35/119 (29.4)	3.62 (2.43–5.40)	<0.001	<0.001
Not infected	1134/11004 (10.3)	Reference	NA	
Monthly income family				
<2000 dh	217/896 (24.2)	3.44 (2.85–4.14)	<0.001	<0.001
2000–4000	154/1372 (11.2)	1.36 (1.11–1.66)	0.002	
4000–8000 dh	231/2198 (10.5)	1.26 (1.06–1.50)	0.008	
8000–12,000 dh	210/2457 (8.5)	1.00 (0.84–1.20)	0.947	
>12,000	357/4200 (8.5)	Reference	NA	
ISI, insomnia symptoms ^c				
Gender				
Women	364/7315 (5)	2.32 (1.82–2.95)	<0.001	<0.001
Men	84/3808 (2.2)	Reference	NA	
Marital status				
Married	266/5537 (4.8)	1.49 (1.23–1.81)	<0.001	<0.001
Others	182/5586 (3.3)	Reference	NA	

Table 3 (continued)

Variable	No. of severe cases/no. of total cases (%)	Adjusted OR (95%CI)	P value ^d	
			Categories	Overall
Quarantine				
Quarantined	175/5950 (3.2)	0.66 (0.55–0.81)	<0.001	<0.001
Not quarantined	237/5173 (4.1)	Reference	NA	
Infection with COVID-19				
Confirmed cases	21/119 (17.6)	5.31 (3.28–8.58)	<0.001	<0.001
Not infected	427/11004 (3.9)	Reference	NA	
Monthly income family				
<2000 dh	56/896 (6.3)	2.15 (1.56–2.97)	<0.001	<0.001
2000–4000	49/1372 (3.6)	1.19 (0.85–1.67)	<0.001	
4000–8000 dh	105/2198 (4.8)	1.62 (0.85–1.67)	<0.001	
8000–12,000 dh	112/2457 (4.6)	1.54 (1.19–2.00)	0.001	
>12,000	126/4200 (3)	Reference	NA	

Abbreviations: PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalized Anxiety; NA, not applicable.

^a Adjusted for sex, age, marriage, educational level, working status, being quarantined, religion, presence of children in household, infection with COVID-19, and monthly family income.

^b Adjusted for sex, age, marriage, working status, being quarantined, religion, presence of children in household, infection with COVID-19, and monthly family income.

^c Adjusted for sex, marriage, religion, infection with COVID-19, being quarantined, and monthly family income.

^d Category refers to the P value for each category vs the reference, while overall refers to the results of the logistic regression.

with findings among patients with severe acute respiratory syndrome (Cheng et al., 2004). higher risk of mental health symptoms among patients suffering a pandemic may be attributable to their physical pain, distressing circumstances, and adverse effects of medications that are used to treat infections (Tsang et al., 2004).

Another prominent finding was the significant impact of quarantine experience on mental health, which is consistent with previous studies (Zhu et al., 2020). Quarantine can contribute to poor mental health in both children and adult (Thienkrua et al., 2006). People may experience fear of infection, frustration, and boredom during quarantine. High fatality of the disease and negative and fake news can increase tension and anxiety (Zhu et al., 2020). According to this study, quarantine enhance the odds of adverse mental health outcomes, including anxiety. Furthermore, being in an enclosed space can have a more pernicious effect to because of fear of infection. The environment plays a critical role in preserving healthy emotions and sleep (Rautio et al., 2018).

Consistent with prior research (Taylor et al., 2008), this study's findings showed that being a parent of children reported more severe symptoms of depression and anxiety. Data in this study indicated that those having children aged <5 years had a 1.7- and 2.8-times higher risk of high depression and anxiety, respectively, than those having a child aged >5 years or no children. The possible reasons for these mental disorders may be related to the “hypochondriac concerns” (worry about being infected and infecting family members) (Furer et al., 1997) and the panic that the disease would be difficult to control, especially in the early stage of COVID-19 where there was a lack of information about the disease, or because parents had to take care of their children following the closing of schools.

In relation to religious aspects, a third of our respondents reported having higher spiritual practices, following the lockdown, as a way for

resilience. Moreover, those who are at the same level of religion as before COVID-19 pandemic among our study participants was associated with a higher level of depression and anxiety. Similarly, Kang et al. (2020a) found an inverse correlation between those who are not religious and worsening mental health during COVID-19. Therefore, this result was explained by the fact that those who turn to their faith in crisis and those whose religious beliefs help guide them in difficult situations have had their faith strengthened during COVID-19 (Kang et al., 2020a, 2020b). Faith in Allah (God) and religious practices such as offering supplications to God and praying are important ways for dealing with affliction in Arab cultures (Lazenby et al., 2013) over 97% of the Moroccan population are Muslim (Jarego et al., 2021). The Islamic faith is seen as a way of life since it instructs people on how to deal with all elements of their existence, including physical, psychological, social, and spiritual concerns. In contrast to our study, Jarego et al. (2021) have shown the absence of association between any form of religious commitment and mental health.

Some demographic factors may also influence mental health during the COVID-19 pandemic. Being a women was identified as risk factor for poor mental health outcomes, which is consistent with prior research (Qiu et al., 2020; Wang et al., 2020). The result may also be related to international literature evidence that women tend to be more vulnerable to experiencing stress and depression symptoms (Sareen et al., 2013). From the general perspective of the well-being of women, it is crucial to consider the long-term effects and potential burden of disease if these consequences are persisting. In the current study, a moderate psychological impact was reported for younger participants. Conflicting results have been reported by some researchers who found that younger people exhibited higher psychological effects (Huang and Zhao, 2020; Wang et al., 2020). Regarding the coping strategies used by the general public during the COVID-19 outbreak, the findings of this study have confirmed that religion plays an integral role in helping people cope with the COVID-19 pandemic.

The final main factors associated with a high level of mental health outcomes were work status and lower-income. There were more cases of depression and anxiety among respondents who were unemployed or having a lower monthly income family (< 2000 D.H. (200 €)). Unsurprisingly, people who are experiencing financial difficulties are likely to be significantly predisposed to high psychological symptoms. This finding is in concordance with previous studies conducted in other countries, highlighting the severity of being unemployed under lockdown on the population's mental health (Kazmi et al., 2020; Mazza et al., 2020; Bueno-Notivol et al., 2021; Nikčević et al., 2021). These mental health issues may be attributable to the difficulty accessing health services (especially in the absence of employment insurance). Therefore, accessibility to medical insurance and the public health service system should be further strengthened and improved in Morocco.

This study has several limitations. First, considering the limited resources available and time sensitivity of the COVID-19 outbreak, we followed the snowball sampling method. The snowballing sampling technique did not use a random sample range, and the study population did not represent the sample actual trend. However, basic descriptive analyses and investigations of potential associations can be appropriate in such surveys, and have been used in the majority of COVID-19 mental health surveys which have been conducted so far (Pierce et al., 2020). The key effect of non-probabilistic sampling was the substantial over-representative of women in the study sample (with 65.8% of the study sample being women, compared to 51% in census data from Morocco) (Haut Commissariat au Plan, 2020), and this is common with other such online surveys (Pierce et al., 2020). Other demographic data such as age distribution are more in line with Moroccan census data, with the exception of an over-representative of those aged 25–34 (30% difference), and aged 55 and over (8;8% difference) (Haut Commissariat au Plan, 2020), which is perhaps predictable given the online nature of survey and likely lower use of the internet use among older people in Morocco. There was also significant under representative of respondents

with primary and secondary school (27%, and 13.3% difference respectively), and over-representative of respondents with higher education (70% difference) (Haut Commissariat au Plan, 2020). Marital status distribution is more in line with Moroccan census data (Haut Commissariat au Plan, 2020). Secondly, our study was limited in scope. Our sample was obviously over-representative of women, well-educated people, and people working full or part-time, limiting the generalization of our findings to the whole population. Thirdly, this study was carried out in the early stage of the COVID-19 outbreak in Morocco. Because of the increasingly difficult situation, the mental health of the Moroccan population would become more severe. Further follow-up could be helpful to monitor the psychological implications on the population, especially during specific religious periods (as during Ramadan for example).

Despite the above limitations, the significance of the present study as the first survey offering valuable information on the initial psychological responses ten days after the COVID-19 outbreak from respondents across Morocco cannot be diminished. Our findings could be used as a historical reference. Most notably, our results explicitly inform the development of psychological strategies that can reduce the psychological effect, anxiety, depression, and insomnia throughout the COVID-19 outbreak and provide a framework for assessing prevention, control, and treatment efforts during the continuation of the pandemic. Furthermore, our study emphasizes the need for evidence-based approaches to design local interventions, culturally specific and carefully targeted, taking into consideration the specific community attitudes and believes.

5. Conclusion

The detrimental impact of the COVID-19 pandemic on mental health is now a fact. Describing and understanding this impact, mainly in terms of demographic and cultural aspects is mandatory to design tailored strategies for intervention and prevention.

In Morocco, during the COVID-19 pandemic lockdown, many of our study respondents reported to be suffering from mental health symptoms, including depression, anxiety, and insomnia. Being a woman, being married, becoming more religious, and being a parent of children aged less than 5 years revealed more severe symptoms on all measurements. Post COVID-19 plans should account for the probable increase in mental illness to come, particularly among at-risk populations. Therefore, it seems that in addition to efforts deployed to prevent the spread of the disease, special attention should be paid to promote the mental well-being of the community.

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CRedit authorship contribution statement

Conceptualization, all authors; data curation A.M., I.B.; formal analysis, A.M., I.B., S.E.J. and Y.F.Z.; funding acquisition, A.M., I.B., M-P.K. and L.G; investigation, I.B., A.M. and S.E.J.; methodology, A.M., I. B., T.A., and M-P.K.; project administration, A.M. and I.B.; writing—original draft, A.M., I.B., S.E.J. and L.G; writing—review and editing, all authors. All authors have read and agreed to the published version of the manuscript.

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Institutional review board statement

The study was conducted according to the guidelines of the

Declaration of Helsinki, and approved by the Ethics Committee of Moulay Ismail University of Meknes (N: CERB-UMI 03/2020).

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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