



## Research article

## Women mental health status and behaviour change during the COVID-19 in Sudan

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## ABSTRACT

During the outbreak of the COVID-19 pandemic in Sudan, women took the heaviest burden in taking care of family health needs. Potential health risks and its ensuing readiness to adopt and comply with public health measures may be especially distressing on women. Mental health challenges involved with modifying health behaviours that adhere to pandemic guidelines are considered following the Stages of Change Model. A total of 498 Sudanese women completed a cross-sectional online survey during the COVID-19 pandemic in Khartoum State. A questionnaire was designed to assess the transition within the stages of change towards maintenance to protective behaviours. Mental health status was assessed using an Arabic validated version of the Hopkins Symptoms Checklist for depression and anxiety. Most of the respondents were 40-year university graduate women. Depression and anxiety were low among 75% of respondents. The stages of change indicated that 22% of the women are in the maintenance stage compared to 1% in precontemplation. Anxiety increased significantly with the progression in the stages. The multiple regression equation  $R^2 = .42$ ,  $F(1, 416) = 6.71$ ,  $p = .005$  indicated that the preparation stage and action stage has a significant effect on the maintenance of protective behaviours. The most likely factors to motivate Sudanese women to comply with COVID-19 protective behaviours are the perception of self-efficacy coupled with access to information. The implications may be central to empirically stage-match transition points in the change process as they relate to mental health status.

## 1. Introduction

Sudan reported its first coronavirus case in the capital city of Khartoum in March 2020, by April the government issued a suspension of all flights, imposed the first health-related nationwide curfew, and banned mass gatherings. These measurements constituted tremendous demands on an individual's daily lifestyle, work and income, and the deeply rooted culture of social gatherings and support was now absent. Sudanese women were at the heart of these behavioural changes. Experience from past outbreaks, such as during the 2014-16 West Africa Ebola virus disease, women were more likely to be infected by the virus, given their predominant roles as caregivers within families and as front-line healthcare workers (Davies and Bennett, 2016).

Globally women and girls are responsible for 75% of domestic care in homes and communities every day (Moreira da Silva, 2019). The public health efforts and response have not addressed the gendered impacts of the coronavirus disease outbreaks (Smith, 2019). Despite the WHO Executive Board recognising the need to include women's voices in decision

making for outbreak response in terms of their important role in non-pharmaceutical interventions including hand washing, social distancing, and mask-wearing to minimize transmission of the coronavirus (WHO, 2020), little is known about how women will respond to this type of risk-reducing information and which factors will influence their decision to comply with protective orders (Cowling et al., 2020). Emerging evidence suggests that vulnerability to the COVID-19 outbreak in South Sudan (Mayai, 2020) affects the elderly (those over 60 years), those with pre-existing health conditions, and women (Tee et al., 2020; China CDC Weekly 2020).

Sudanese women are a prime example where socially prescribed gender roles govern their direct responsibility of sanitation, home-schooling, caring for the elderly, and the sewing of cloth facial masks (Ibnouf, 2009). These demands in addition to economic hardship have been associated with elevated stress and adverse mental health (Li et al., 2020; Witteveen and Velthorst, 2020).

Furthermore, the acceptance, maintenance, and commitment of women to comply with public health safety measures may depend largely

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on a plethora of social, economic, intrinsic and extrinsic motivations, and psychological factors including the perceived threat of the coronavirus infection on family health and wellbeing (Carlucci, 2020). While there is evidence of the role of risk perception on the engagement in protective behaviours during a health pandemic (Wise et al., 2020), there are no known studies that present data on factors associated with the commitment to maintain the protective COVID-19 behaviours among women in African countries.

The global struggle to control the COVID-19 pandemic is not only due to the nature of the virus nor medical preparedness, weakness of the health system. The COVID-19 pandemic revealed the weakness of the health system and health interventions to incorporate indicators of human behaviour in the rapid response to the virus (Wise et al., 2020).

Placing meaning to the ever-shifting information on the contagiousness of COVID-19 and its potential health risks calls for women to make informed decisions associated with protective behaviours on personal and family safety. Evidence has provided support that perceptions and beliefs of disease risks on mental health concerns can influence responses for public health compliance (Xiang et al., 2020). The potential insurmountable psychological problems, such as anxiety, fear, worry, depression, loneliness, insomnia, exhaustion, collective hysteria amongst the public, and bereavement and grief suffered by the families of deceased patients, have been reported (Xiang et al., 2020; Kang et al., 2020). Furthermore, surges in mental distress among women, the elderly, co-morbid patients may likely increase especially with the excessive quarantine measures, increasing daily numbers of cases and death worldwide (Li et al., 2020), and maternal depression and anxiety (Davenport et al., 2020).

### 1.1. The stages of change model

According to the Transtheoretical Model (Prochaska et al., 1994), behavioural change occurs in a series of discrete stages. In these Stages of Change Model, movement between stages are thought to be influenced by shifts in thinking about change (pre-contemplation), perceptions and cognitions (contemplation) in-line with abilities and preparation allowing them to act the behaviour needed to reach an anticipated outcome on their way to maintain the desired health behaviour (DiClemente et al., 2004).

Behavioural change is not a two-step process, change or not change, a person transit in the ladder of change while adjusting their behaviour (Levit et al., 2016). Initially, in the first stage *pre-contemplation* stage, individuals lack awareness of the need for change, they are in denial or rejecting the new behaviour. As such they diminish the pandemic threat and its effect on their physical and mental health more importantly such individuals have no intention to engage in any protective behaviours. Proceeding into the second stage is *contemplation* is characterized by individuals who are aware of a serious need for change and are considering modifying their behaviour but have not translated those thoughts into actions. The contemplation stage is characterized by ambivalence about change. Within the COVID 19 context contemplators are aware of the pandemic threat and they may have depression or anxiety, related, or intensified by the pandemic, still, they are ambivalence about change. The third stage is *preparation* characterized by information seeking readiness to commit to change within the coming 30 days (Prochaska et al., 1994). People will transit to the action stage if their self-efficacy is elevated, and the cost of change is perceived as low. The fourth stage is *Action* occurs when individuals are acting by the new desired behaviour they are committed to action and exert time, energy, needed for effective changes in their behaviour. Within the context of COVID19, we postulate that women would adhere to protective behaviours and are aware of the exceptional health and mental demands placed by the pandemic. The *maintenance* stage destigmatizes the relapse phase; as such it's expected that individuals will be encouraged to adhere to their new protective routines even when COVID-19 seems less of a threat (Akdaş and Cismaru, 2021). Theoretically, the maintenance stage is bound by six-month

duration, the current study assumes that the extraordinary threat placed by the pandemic would motivate people to maintain the protective behaviours within a shorter time frame. It is important to note that individuals do not necessarily transit through the stages in sequential order they might vacillate between action and contemplation.

The current study postulates that operationalizing the constructs of the stages of change within the Transtheoretical Model (Martin et al., 1996) during the coronavirus outbreak may capture the complexity by which Sudanese women navigate information, placing meaning, and integrating new behaviours that are perceived relevant at different points along the process of readiness to adopt protective behaviours that comply with public health measures. The current research addresses the intersection of two very important and timely topics, the COVID-19 pandemic and mental health. This study aimed to examine the levels of depression and anxiety among Sudanese women, to identify the influence of mental health, demographic characteristics on women's transition within the stage of change. Lastly to investigate the portions of women who progressed to the Maintenance stage from each of Precontemplation, Contemplation, Preparation and Action stages. The implications may be central to empirically stage-match transition points in the change process as they relate to mental health status associated (Schüz et al., 2009; Ajzen, 2015). The results will inform targeted media strategies and recovery-oriented mental health intervention services for Sudanese women across the behavioural change ladder during a pandemic and infectious disease outbreak (Voeten et al., 2009; Akdaş and Cismaru, 2021).

## 2. Method

### 2.1. Measurements and procedures

During the COVID-19 pandemic, an Arabic language online survey was distributed through social media platforms including WhatsApp, Facebook, and Twitter. Using the snowball-sampling technique a total of 498 women social media users participated. The survey included five independent statements designed to examine the relationship between perceived coronavirus disease health threats, stage of readiness to comply with public health measures and adopt protective behaviours, along the continuum of the Transtheoretical Model. The stages of change statements were answered in 4 points Likert scale the statements were: Pre-contemplation stage 'I don't think about the Coronavirus', Contemplation stage 'I think Coronavirus is a serious health threat', Preparation stage 'I have searched for information's about Coronavirus protective measures', Action stage 'I follow social distancing, and wear a facemask to protect myself from Coronavirus', and lastly Maintenance of protective behaviours stage 'I strictly adhere to all Coronavirus preventive health guidelines behaviours'.

Research operationalizing the stage of change assessment generally reported scores based on a single time (Romero-Blanco et al., 2020). To represent the five stages, the hundred scores were divided into five categories, converting scale one to four scores to degrees out of a hundred the study used the equation transformation of scale scores:

$$\text{Transformed scale} = (\text{Actual score} - \text{low possible raw score}) / \text{possible raw score range} \times 100$$

To measure mental health status, the study used the Arabic validation of the Hopkins Symptoms Checklist-25 (HSCL-25; Mahfoud et al., 2013). Consistent with the DSM-IV criteria, this version consisted of ten items from the anxiety cluster, fifteen items from the depression cluster and two additional somatic symptoms (poor appetite; difficulty asleep or staying asleep). The HSCL-25 has demonstrated its usefulness and has been employed in several studies including the screening of depression and anxiety in normal populations (Derogatis, 1974), and in comparisons between and across cultures and contexts (Cepeda-Benito and Gleaves, 2000), and its translatability in Arabic according to the standard

guidelines of instrument translation. Furthermore, the Arabic HSCL-25 has been validated and used several times with Sudanese samples (Badri et al., 2013) and similar populations to this study (Roberts et al.) and identified a cut-off score of 1.75 to detect clinically significant symptoms of generalized anxiety disorder and depression symptoms.

The HSCL-25 consists of two parts: Part I has 10 items for anxiety symptoms; Part II has 15 items for depression symptoms. The scale for each question includes four response categories ("Not at all", "A little", "Quite a bit", and "Extremely", rated 1 to 4, respectively). The higher the total score, the more likely it is that the respondent has a significant emotional illness. A total score of  $>1.75$  is generally considered "checklist positive" for emotional distress (Part I). A depression score of  $>1.75$  is generally considered "checklist positive" for probable depression (Part II). The HSCL anxiety subscale indicated excellent internal consistency with Alpha Cronbach  $\alpha = 0.90$  and item-total correlation ranging from (.554–.729). the depression subscale internal consistency with Alpha Cronbach  $\alpha = 0.90$  and item-total correlation ranging from (.513–.773).

## 2.2. Ethics

Ethical approval was obtained from Ahfad University for Women Ethical committee. Following ethical guidelines for experiments on human subjects. Informed consent was obtained from participants.

## 2.3. Data analysis

Statistical analysis was performed using the SPSS Statistic 24.0. Frequency and percentage were applied to describe variables (the five stages of change and the mental health status). Nonparametric Tests -Independent-Samples Kruskal-Wallis were used to identify the difference in the stages of change towards maintenance of protective behaviours explained by mental health depression and anxiety, age and education, Pairwise Comparisons test were used to determine the direction of the difference. Furthermore, Regression analysis was conducted to identify the effect size of the independent variables (the first four stages of change) and the dependant variable (the last stage of change represented by (maintenance of protective behaviours) all the variables were entered as a continuous data in the final model and were assessed for their normality (skewness and kurtosis).

## 3. Results

Most of the sample was above the age of 40 years and 51% were university graduates, this indicates that the respondents of this study are mostly mature educated women (Table 1).

**Table 1.** Demographic information and women stages of change.

Item	N	%
<b>Age</b>		
30 $\geq$	172	34.5
30–40 years	135	27.1
$\leq 40$	191	38.4
<b>Education</b>		
Secondary	23	4.6
University	255	51.2
Postgraduate	220	44.2
Pre Contemplation Stage (PC)	5	1.0
Contemplation Stage (CS)	34	6.8
Preparation (PR)	167	33.5
Action Stage (AS)	182	36.5
Maintenance of protective Behaviour (MPB)	110	22.1
<b>Total</b>	<b>498</b>	

The results indicated that 75% of the participants showed asymptomatic levels of depression and 76% asymptomatic levels of anxiety (1.48 where the cut off is 1.75). Although the final mark-up of considering for significant symptomology was small, by just a few points, it can be argued that other variables of this sample, such as the use of self-rated scale as HSCL-25, as with many self-reported measures mental health symptoms tend to be underestimated. The report of symptomology is crucial more specifically, with regards to the relationship between mental health status and the stages of change towards the maintenance of protective behaviours (see Table 2).

General ambivalence about behavioural changes needed to maintain protective behaviours against the disease was predicted as 36% (182) of women were at the action stage, followed by preparation stage 33% (167) and only 1% (5) of women were in the pre-contemplation stage (Table 1).

The Kruskal Wallis test identified a difference in women stage of change position explained by depression and anxiety, the results indicated that depression levels showed no significant differences in the five stages. However, anxiety level differed significantly between contemplation and maintenance  $H(2) = 6.439$ ,  $p = 0.02$ , preparation and maintenance  $H(2) = 222.86$ ,  $p = 0.00$  action and maintenance  $H(2) = 252.07$ ,  $p = 0.00$  (Table 3).

Age difference in stages of change were assessed using Kruskal-Wallis test (Table 4) the results showed differences in all stages of change except the initial stage. Women between 30- 40 years showed significant difference in *contemplation stage*,  $H(2) = 6.439$ ,  $p = 0.04$ , *preparation stage*  $H(2) = 8.776$ ,  $p = 0.012$  *action stage*,  $H(2) = 18.693$ ,  $p = 0.00$  and *maintenance to protective behaviour stage*,  $H(2) = 17.144$ ,  $p = 0.00$ .

Further, post graduate university level were significantly different from the other educational levels in *pre contemplation stage* (PC),  $H(2) = 14.817$ ,  $p = 0.01$ . *contemplation stage*,  $H(2) = 8.207$ ,  $p = 0.02$ . *preparation stage*,  $H(2) = 8.536$ ,  $p = 0.01$  and *action stage*,  $H(2) = 8.753$ ,  $p = 0.01$ .

The study examined the transition between the stages of change towards the independent variable the "*maintenance stage*". Two stages of change (preparation stage and action stage) explained 47% of the variance, thereby showing the validity of the model to assess the effect to maintain protective behaviour. A significant regression was found  $R^2 = .47$ ,  $F(1, 416) = 6.71$ ,  $p = .005$  (see Table 5).

## 4. Discussion

Although studies have documented the psychological impact of the COVID-19 pandemic on individuals and gender aspects (Cao et al., 2020; Wang et al., 2020; Davenport et al., 2020), to date the impact of COVID-19 on sub-Saharan African women's mental health remains largely under-researched (Wenham et al., 2020). This study highlights the need to conduct a contextual gender analysis of mental health impacts of COVID-19 amongst Sudanese women. It has applied the Stages of Change Model to provide an exploratory conceptualization of the relation between perceived coronavirus disease health threats, stage of readiness to comply, the level of compliance with public health measures as protection against the initial wave of COVID-19, and actual protective behaviours adopted, with the mental health status of Sudanese women.

**Table 2.** Level of depression and anxiety.

Depression	N	%	Std. Deviation	0.536
Asymptomatic	374	75,1	Lower Bound	1.48
Symptomatic	124	24,9	Upper Bound	1.57
			Mean	1.531
<b>Anxiety</b>				
Asymptomatic	379	76,1	Lower Bound	1.48
Symptomatic	119	23,9	Upper Bound	1.58
			Mean	1.537

**Table 3.** Kruskal Wallis test: Difference in Stages of Change explained by Depression and Anxiety.

Stages of Change	N	Mean	Kruskal-Wallis H	Sig.
<b>Anxiety</b>				
Pre-Contemplation Stage (PC)	5	207.10	22.242	0.000
Contemplation Stage (CS)	34	210.71		
Preparation (PR)	167	222.86		
Action Stage (AS)	182	252.07		
Maintenance of protective Behaviour (MPB)	110	299.61		
<b>Depression</b>				
Pre-Contemplation Stage (PC)	5	273.40	6.069	0.194
Contemplation Stage (CS)	34	281.91		
Preparation (PR)	167	244.00		
Action Stage (AS)	182	235.51		
Maintenance of protective Behaviour (MPB)	110	269.90		

**Table 4.** Kruskal Wallis test: difference in the stages of change explained by age and education.

Age groups	Df	Kruskal-Wallis H	Sig p<0.5.
Pre Contemplation Stage (PC)	2	0.573	0.751
Contemplation Stage (CS)	2	6.439	<b>0.040</b>
Preparation (PR)	2	8.776	<b>0.012</b>
Action Stage (AS)	2	6.522	<b>0.038</b>
Maintenance of protective Behaviour (MPB)	2	18.693	<b>0.000</b>
<b>Educational level</b>			
Pre contemplation Stage (PC)	2	14.817	<b>0.001</b>
Contemplation Stage (CS)	2	8.207	<b>0.017</b>
Preparation (PR)	2	8.536	<b>0.014</b>
Action Stage (AS)	2	8.753	<b>0.013</b>
Maintenance of protective Behaviour (MPB)	2	3.260	0.196

Among the 498 Sudanese women participating in this study, 38.4% were over the age of 40 years. This demographic is especially important as they represent the sole caretakers of the family; although it is at this pre-contemplative stage concepts of risk perceptions of infection were low. Investing very little in changing behaviours; viewing that the media may be exaggerating the severity of the health threat. Adherence to the protective behaviours is difficult; additional costs and financial challenges are placed on the household, some women may have found it initially difficult to comply or to progressively maintain protective behaviours. However, with increased information, a broadening of health vocabulary, and placing meaning (Glanz et al., 2015) on the information gathered a contemplation phase begins; they are more willing to consider the possibility that COVID-19 is a serious health threat. Gradually these educated mature women increase their frequency of social media usage,

**Table 5.** Regression results using Maintenance stage as the criterion. \*p<0.05.

Predictor	B	B 95% CI [LL, UL]	beta	beta 95% CI [LL, UL]	sr <sup>2</sup>	sr <sup>2</sup> 95% CI [LL, UL]	r	Fit
(Intercept)	0.48**	[0.19, 0.77]						
Pre contemplation Stage (PC)	0.03	[-0.05, 0.11]	0.03	[-0.05, 0.12]	.00	[-.00, .00]	.27**	
Contemplation Stage (CS)	0.03	[-0.05, 0.11]	0.03	[-0.05, 0.12]	.00	[-.00, .00]	.27**	
Preparation (PR)	0.23**	[0.15, 0.30]	0.23	[0.15, 0.31]	.04	[.01, .07]	.44**	
Action Stage (AS)	0.57**	[0.47, 0.67]	0.47	[0.38, 0.55]	.15	[.10, .20]	.60**	
								R <sup>2</sup> = .400**
								95% CI [.33, .45]

likely to stay informed on current updates from trustworthy and official channels (Rohwerder, 2020).

As the impacts of the pandemic gather pace in Sudan, a more nuanced understanding of age and educational level not only need to be regarded in socioeconomic status, but also in gendered contextualized notions of household roles, where the concerns of this particular demographic as they represent the sole caretakers of the family; ensuring the physical and emotional wellbeing of children, parents, and community (Carlucci, 2020), including caring for elderly parents and/or extended family members, tending to their immediate communities usually in a nurturing capacity. The majority of the sample were university graduates who are front and centre in immediate mitigation of disease prevention as they actively engage with web-based information, become avid data seekers, and respond to social media, including online surveys.

In terms of the mental health of the current sample, the findings indicated that 25% of the sample have symptoms of anxiety and potential depression, considering the global threat presented by COVID-19 these numbers are alarming (Davenport et al., 2020). Even though self-reported mental health symptoms tend to be underestimated nevertheless, they are indicative that worry, fear and isolation during COVID-19 constitute an important threat to mental health among Sudanese women. Increased levels of stress were shown for women between 30-40-year old's, where anxiety and depression scores were significantly higher and correlate positively with both pre-contemplations and contemplations stages than at any other age bracket.

Comparing the prevalence of anxiety and depression of the current study with other COVID-19 studies indicated that a majority of respondents rated the psychological impact of the outbreak as moderate to severe depressive and anxiety symptoms (Wang et al., 2020), whilst in a cross-content study comparing the same Chinese population with the Spanish cohort group, the report of both depression and anxiety was significantly higher in the Spanish group. Another Vietnamese study (Le et al., 2020) indicated in the first week of the lockdown (16.4%) reported a low level of psychological distress (5.3%) rated as moderate, and (5.4%) reported extreme psychological conditions. The report of anxiety and depression in the current study although used different standardized Arabic validated scales provided similar results. Despite the contextual difference including the high magnitude of the pandemic in China and Spain and the cultural differences in Vietnam nevertheless, the human suffering during the initial phase was similar.

The current study focused on Arab and African women these populations have not been widely studied in particular, not during the initial phases of the pandemic and their level of compliance as it relates to anxiety and depression. This population represents a unique sample of educated, exposed, Sudanese women who are front and centre in immediate mitigation of disease prevention as they actively engage with web-based information, become avid data seekers, and respond to social media, including online surveys.

The study identified that only 1% of Sudanese women were in the precontemplation stage which was an expected result considering the nature of the pandemic, the excessive media coverage and the profile of

the educated sample. Nonetheless, 22% of the women reached the stage of maintenance whereby they adhered and committed to protective behaviours, while the rest were distributed between gathering information and evaluating the risks. Furthermore, anxiety increased significantly as women progressed through the stages of change, this is an important finding that could be explained by their increased perceived susceptibility of contracting the virus and the increased demands needed to commit to wearing masks and social distancing, similar to a recent Nigerian study indicating that anxiety levels increased by 42% among participants reported having adopted at least two of the COVID-19 protective behaviours (Oyetunji et al., 2021).

The results identified that decisions were made during the preparation stage and action stages, both became the most predictive factors that motivate these Sudanese women to pursue and maintain health-protective behaviours. The results can be explained within a larger Sudanese contextual framework whereby women's socio-cultural qualities of empathy and acts of altruism and sacrifice, volunteerism, meaningful work, interpersonal relations, and level of social support could expand the potential implications to include peer support in recovery-oriented services (Cohen and Sherman, 2014).

Although the coronavirus pandemic has caused substantial mental health ramifications within most societies around the world (Davenport et al., 2020; Kang et al., 2020), Sudan included, it can also be said that Sudanese women have shown the important contributions of self-efficacy within the action stage and the role of interpersonal relationships in combination can have implications on mental health resilience as they relate to stage-match targeted media strategies associated within the transition points of pre-contemplation and contemplation stages of the behavioural change process.

The use of the Stage of Change Model in this study was proposed to reflect the complexity of human behaviour during stressful situations such as the COVID-19 pandemic and to indicate how women in low resource settings vary in terms of their risk perceptions and commitment to adhere to health recommendations. Some research has indicated that many weaknesses and disparities marred the response to social distancing and adherence to preventive measures at the level of countries, cities, and regions in a single country (Rohwerder, 2020). The fit for all health protective measures during COVID 19 including working from home and social distancing needs to be re-evaluated to incorporate individual age, gender, education and cultural differences so that specific advice can be incorporated in campaigns aiming to help people maintain protective health behaviours as well as their mental health.

## 5. Conclusion and recommendations

This study has applied the stages of change model to provide an exploratory conceptualization of the relation between perceived coronavirus disease health threats, stage of readiness to comply, the level of compliance with public health measures as protection against the initial wave of COVID-19, and mental health status of Sudanese women. The results indicated that the majority of the sample did not show significant symptoms of anxiety as they transitioned between the stages of change towards adherence to protective behaviours. The most likely factors that mitigated significant levels of mental health illness were the ability of Sudanese women to actively comply with COVID-19 protective behaviours, perception of self-efficacy, coupled with a sense of social support and community engagement.

Although the current result indicates that the report of anxiety and depression was below 25% nevertheless those women who are struggling with such symptoms could benefit from online therapeutic interventions such as CBT-I (He et al., 2021) as well as local tell-counselling services. Mitigating and addressing mental health symptoms is a priority, particularly in pandemics where risks of isolation and health hazards are elevated, left untreated could lead to serious implications.

The research outcomes can provide a roadmap to mental health policy that informs strategizing for intervention design in case of future

infectious disease outbreaks and the prevention of COVID-19 transmission in Sudan. Key demographic and sociocultural messaging in terms of mental health promotion interventions can use a tailored stage of changed behaviour model that speaks to Sudanese personal and community protective responsiveness to health-seeking behaviours.

### 5.1. Limitations

This study is limited by its cross-sectional nature; no causal relationship could be drawn, as well as the study sample was primarily comprised of educated women who have access and knowledge on how to use online surveys. Valuable studies into the impact of COVID-19 on different populations of the world during the pandemic have investigated Arab and African women. However, these populations have not been widely studied, nor published. While the level of homogeneity of this study limits generalizability, the focus of educated, avid data seekers, and globally-exposed, African women, tells a unique story of their level of compliance as it relates to anxiety and depression, as they actively engage in compliance behaviours, especially during the initial phases of the pandemic.

### Declarations

#### Author contribution statement

Shahla Eltayeb: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Alia Badri: Conceived and designed the experiments; Wrote the paper.

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#### Data availability statement

Data will be made available on request.

#### Declaration of interests statement

The authors declare no conflict of interest.

#### Additional information

No additional information is available for this paper.

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