

EPIDEMIOLOGY

Psychological and Sexual Health During the COVID-19 Pandemic in Egypt: Are Women Suffering More?



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ABSTRACT

Introduction: Psychological consequences of the COVID-19 pandemic include pandemic triggered feelings of fear, uncertainty, and anxiety added to the effects of restricting the population's activities in lockdown.

Aim: We aimed to study the effect of COVID-19 pandemic on sexual satisfaction of females and males in Egypt and to evaluate possible predictive factors.

Methods: Married men and females in Egypt were invited to respond to an online questionnaire. The questionnaire addressed medical history, socioeconomic status, sexual performance satisfaction before and during the lockdown in addition to validated Arabic questionnaires for depression, sexual function in males and females, and sexual satisfaction (Generalized Anxiety Disorder-7, Patient Health Questionnaire-9, Female Sexual Function Index, International Index of Erectile Function-5, Index of Sexual Satisfaction, respectively).

Main outcome measure: The main outcome measures were frequency of depression, anxiety, sexual dysfunction, and sexual satisfaction in males and females during COVID-19 lockdown.

Results: A total of 479 females and 217 males completed the questionnaire. Sexual satisfaction was significantly higher before (91.2%, 73.5%) than during lockdown (70.5%, 56.2%) in both males and females, respectively. During lockdown, significantly more males (70.5%) reported being satisfied with their sexual performance than females (56.2%) ($P < .001$). More than half of the male subjects (68.2%) had no erectile dysfunction while 97.3% females scored ≤ 26.5 on the Female Sexual Function Index scale suggestive of sexual difficulties. Sexual stress was significantly greater in females (70.8%) than males (63.1%). Educational level, occupation, anxiety, and erectile dysfunction were independently associated with sexual stress in males. Being a housewife or unemployed, husband's age > 35 years, marriage duration of 5-10 years, anxiety, and female sexual dysfunction were predictors of sexual relation stress in females.

Conclusion: COVID-19 pandemic was associated with lower sexual satisfaction in both genders. Females however suffered more anxiety and depression and thereby greater risk of sexual function difficulties and sexual dissatisfaction. Intervention strategies in order to lessen the suffering of affected individuals particularly after the pandemic are recommended. **Omar SS, Dawood W, Eid N, et al. Psychological and Sexual Health During the COVID-19 Pandemic in Egypt: Are Women Suffering More. Sex Med 2021;9:100295.**

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Key Words: Pandemic; COVID-19; Sexual Function; Sexual Satisfaction; Anxiety; Depression

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INTRODUCTION

COVID-19 originated from Wuhan city in China in December 2019 as a respiratory illness with a characteristically high mortality rate. It was found to be caused by a member of the coronaviruses family and was termed coronavirus disease (COVID-19). Subsequently, the virus spread worldwide and was eventually declared a global pandemic.¹

In Egypt, the first case was reported in February 2020. Subsequently, the number of cases has been rising with a reported fatality rate of 4.8%.² Starting from mid-March 2020, Egypt imposed a lockdown closing all workplaces (including schools) that provided nonessential services, and all employees and students worked from home.³

Most COVID-19 infections are mild to moderate respiratory illness that do not require special treatment. However, certain factors were associated with a poorer outcome such as old age, cardiovascular disease, diabetes, chronic respiratory disease, and cancer.⁴ It was observed globally that males suffered greater COVID-19 severity and mortality. Researchers proposed delayed viral RNA clearance in males, sex-related immune response differences and hormonal milieu differences contributed to this male preponderance.⁵ The rapid spread of the virus globally and the uncertainty about treatment and disease outcome provoked feelings of fear, worry, anxiety, and concern especially among certain groups as older adults, health care professionals and people with chronic diseases.^{3,4} This pandemic also caused life-threatening situations, unemployment, reduced income, and separation from families or partners.⁶ Females were reported to suffer greater psychological distress related to COVID-19.⁷ The unprecedented pandemic morbidity, mortality, and lockdown measures are expected to affect mental health of the population with possible changes in sexual behaviors.⁸ We hypothesized that women being more susceptible to psychological stress will suffer greater sexual stress.

We aimed to study the possible effect of COVID-19 pandemic on sexual satisfaction of females compared to males in Egypt and to evaluate possible risk factors.

METHODS

The study protocol of this observational cross-sectional study was approved by the ethics committee of the faculty of medicine, Alexandria University and followed the International Ethical Guidelines for Epidemiological Studies.⁹

Sample Size Calculation and Field Testing

The sample size was calculated using Epi info version 7.2.3.1 (CDC; Atlanta, Georgia).¹⁰ Based on a confidence level of 95%, power of 80%, proportion of sexual dissatisfaction 53.53%¹¹; the minimum required sample size was calculated to be 384 participants.

Owing to the COVID-19-related restrictions on face-to-face recruitment, data were collected online. At the end of March

2020, we started a Facebook page to communicate with our study participants and to enhance study recruitment. We also began an advertising campaign on Facebook. The invitation to participate in the study was displayed on the personal Facebook page of married men and women aged 16 to 75 years with an IP address in Egypt. The survey was administered online through Google Forms. The advertising campaign ended on 27th June 2020 at the end of the lockdown period in Egypt.

Structure of the Questionnaire

The questionnaire included a participant information sheet, a consent form, and debrief sheet. Sociodemographic and clinical data were collected from participants. Sexual performance satisfaction was evaluated by asking if participants were satisfied with their sexual performance before lockdown and during lockdown.

Assessment of Depressive Symptoms

The Arabic validated version of the Patient Health Questionnaire (PHQ-9) was administered to the study participants.¹² The PHQ is a useful screening tool for depression and other mental disorders commonly encountered in primary care settings. The PHQ-9 comprises a 9-item depression module from the full PHQ with each of the 9 items scored from 0 (not at all) to 3 (nearly every day).¹³ It is based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) diagnostic criteria allowing the measurement of the mood of the patient in the weeks prior to consultation. The validity, reliability and sensitivity of the PHQ-9 has been reported.¹⁴ PHQ-9 is short, can be self-administered taking about 3 minutes to be complete¹⁵ and can be quickly interpreted.¹⁴ PHQ-9 scores range from a minimum of 0 to a maximum of 27.¹³ The cut points used for the PHQ-9 were minimal or none (≤ 4); mild or minimal (5–9); moderate (10–14); moderately severe (15–19), and severe depression (20–27).¹³

Assessment of Anxiety

We used the Arabic version of Generalized Anxiety Disorder-7 (GAD-7) questionnaire¹² to assess generalized anxiety scores for the participants during the lockdown period. GAD-7 is a self-reporting questionnaire that takes about 2 minutes to answer to assess the individual's anxiety state based on DSM-IV criteria for generalized anxiety disorder. Each of the 7 items is rated on a 4-point Likert scale based on how frequently the symptom has been experienced. Item scores range from 0 (not at all) to 3 (nearly every day), with total scores ranging from 0 to 21. Scores on the GAD-7 were interpreted as follows: score 0–4: no anxiety; score 5–9: mild anxiety; score 10–14: moderate anxiety and score ≥ 15 : severe anxiety.¹⁶

Assessment of Female Sexual Function

The Arabic validated version of Female Sexual Function Index (FSFI)¹⁷ was used to assess the sexual function in the female study participants. It is a self-administered 19-item questionnaire comprising 6 domains to assess sexual desire (questions 1 and 2),

arousal (questions 3–6), lubrication (questions 7–10), orgasm (questions 11–13), satisfaction (questions 14–16), and pain (questions 17–19).

Each domain is scored on a scale of either 0–5 or 1–5. The score of each domain is calculated through summing up the scores of the domain's questions and then multiplying by a factor of that particular domain. Multiplier factors are 0.6, 0.3, 0.3, 0.4, 0.4, 0.4 used for domains 1–6 questions, respectively. The sexual function total score ranges from 2 to 36.¹⁸ Regarding cutoff values, FSFI total score of 26.55 was found to be the optimal cutoff score for differentiating women with elevated risk of sexual dysfunction. The cutoff scores to determine the presence of difficulties in particular domains of the FSFI were as follows: less than 4.28 in the first domain, less than 5.08 in the second domain, less than 5.45 in the third domain, less than 5.05 in the fourth domain, less than 5.04 in the fifth domain, and less than 5.51 in the sixth domain.¹⁹

Evaluation of Male Sexual Function

The Arabic version of the 5-item version of the International Index of Erectile Function (IIEF-5) was used to assess erectile function. It is a 5-item scale scored from 1 to 5 assessing maintenance ability, erection confidence, maintenance frequency, erection firmness, and intercourse satisfaction. Erectile dysfunction was classified into 5 categories based on the scores: severe (5–7), moderate (8–11), mild to moderate (12–16), mild (17–21), and no erectile dysfunction (22–25).²⁰

Evaluation of Male and Female Sexual Satisfaction

We employed the Arabic validated version of the Index of Sexual Satisfaction (ISS) which comprises 25 items presented on a 7-grade scale.²¹ ISS is used to assess different aspects of sexual satisfaction namely, satisfaction with sexual life, expression of sexual emotions towards partners, quality of the sexual partnership, and motivations for sexual intercourse. The final score of ISS are obtained through summing up item points and implementing a special ISS formula. The range of possible total score is from 0 (maximal satisfaction) to 100 points (minimal satisfaction). Higher scores indicate low quality of sexual life and stress in the sexual part of the marital relationship. Clinically significant sexual relationship dysfunctions are diagnosed at a cutoff point of 30.²²

Statistical Analysis of the Data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (IBM; Armonk, NY). The Kolmogorov-Smirnov test was used to verify the normality of distribution of variables, Comparisons between the 2 periods for categorical variables were assessed using McNemar test, while Wilcoxon signed ranks test was assessed for comparison between 2 periods for abnormally distributed quantitative variables. Significance of the obtained results was judged at the 5% level.

Possible mediation by sexual dysfunction on the association between anxiety/depression and sexual satisfaction was examined. The Preacher and Hayes method²³ was used to test the magnitude and significance of mediation.

RESULTS

Characteristics of the Study Subjects

A total of 484 females and 289 males responded to the questionnaire; however, only 479 females (98.9%) and 217 (75%) males completed the questionnaires in the period between 30th March and 30th June 2020. Around half the males (52.1%) were 35–45 years of age, while just under half of the females (47.4%) were 25–35 years of age. The majority of males (90.3%) and females (95.6%) were residing in urban areas. In nearly one third (30.9%) of the males, marriage duration ranged from 1–5 years and 5–10 years in 35.9% of females. 22 males (10.1%) and 67 (14%) females were diagnosed as COVID-19 positive and quarantined. The majority of males (76.5%) and females (76%) had no associated chronic illnesses. Diabetes mellitus was the most common associated illness in males (9.7%), while females reported other disorders (19.4%). Other reported minor illnesses included allergic conjunctivitis, asthma, atopic dermatitis, hay fever, hashimoto's thyroiditis, *Helicobacter pylori* infection, photosensitivity, discoid lupus erythematosus. Table 1 summarizes the clinical and demographic characteristics of the study subjects.

Sexual Performance Satisfaction Before and During COVID-19 Lockdown

The majority of males (91.2%) responded as satisfied with their sexual performance before COVID-19 lockdown versus only 70.5% responding as satisfied during the lockdown period. This difference was statistically significant ($P < .001$). About three fourths of females (73.5%) were sexually satisfied before lockdown decreasing to only 56.2% satisfied during the lockdown. This difference was statistically significant ($P < .001$).

Before COVID-19 lockdown, a higher proportion of males (91.2%) were significantly more satisfied with their sexual performance than females (73.5%) ($P < .001$). During lockdown, 70.5% of males reported being satisfied with their sexual performance compared to 56.2% of females ($P < .001$).

Prevalence Depression, Anxiety and Sexual Relationship Stress

According to the reported PHQ-9 scores, depression was absent or minimal in 20.3% of the males whereas only 2.1% of the females scored as no depression on the PHQ-9 scale. The mean depression score in males (8.8 ± 5.1) was significantly lower than females (13.1 ± 5.3) ($P < .001$). (Table 2).

Under half of the males (42.4%) and more than one third of the females (37.4%) scored as mild anxiety on the GAD-7

Table 1. Characteristics of the studied population

| Clinical characteristics | Male (n = 217) | Female (n = 479) |
|------------------------------|-------------------|---------------------|
| Age | | |
| <25 years | 4 (1.8%) | 24 (5%) |
| 25–<35 years | 63 (29%) | 227 (47.4%) |
| 35–<45 years | 113 (52.1%) | 216 (45.1%) |
| 45–55 years | 24 (11.1%) | 6 (1.3%) |
| >55 years | 13 (6%) | 6 (1.3%) |
| Residence | | |
| Urban | 196 (90.3%) | 462 (95.6%) |
| Rural | 21 (9.7%) | 17 (3.5%) |
| Education | | |
| Pre-university | 18 (8.3%) | 3 (0.6%) |
| University | 86 (39.6%) | 249 (52%) |
| Postgraduate | 113 (52.1%) | 227 (47.4%) |
| Occupation | | |
| Clerk | 184 (84.8%) | 323 (67.4%) |
| Unemployed | 23 (10.6%) | 149 (31.1%) |
| Manual work | 10 (4.6%) | 7 (1.5%) |
| Housewife | 0 (0%) | 149 (31.1%) |
| Manual work outside the home | 0 (0%) | 2 (0.4%) |
| Monthly income | | |
| <1,000 LE | 7 (3.2%) | 0 (0%) |
| 1,000–<3,000 LE | 25 (11.5%) | 52 (10.9%) |
| 3,000–<5,000 LE | 17 (7.8%) | 95 (19.8%) |
| 5,000–<7,000 LE | 46 (21.2%) | 112 (23.4%) |
| ≥7,000 LE | 122 (56.2%) | 220 (45.9%) |
| Husband's/wife age | | |
| <25 years | 14 (6.5%) | 41 (8.6%) |
| 25–<35 years | 99 (45.6%) | 153 (31.9%) |
| 35–<45 years | 91 (41.9%) | 129 (26.9%) |
| 45–55 years | 11 (5.1%) | 153 (31.9%) |
| ≥55 years | 2 (0.9%) | 3 (0.6%) |
| Marriage duration | | |
| 1–<5 years | 67 (30.9%) | 138 (28.8%) |
| 5–<10 years | 61 (28.1%) | 172 (35.9%) |
| 10–15 years | 59 (27.2%) | 126 (26.3%) |
| >15 years | 30 (13.8%) | 43 (9%) |
| Chronic illnesses | | |
| No | 166 (76.5%) | 364 (76%) |
| Yes | 51 (23.5%) | 115 (24%) |
| Cardiovascular | 29 (13.4%) | 19 (4%) |
| Diabetes | 21 (9.7%) | 0 (0%) |
| Rheumatoid | 0 (0%) | 9 (1.9%) |
| Hepatic | 2 (0.9%) | 3 (0.6) |
| Psychiatric diseases | 0 (0%) | 0 (0%) |
| Other | 10 (4.6%) | 93 (19.4%) |
| Quarantined | | |
| No | 195 (89.9%) | 412 (86%) |
| Yes | 22 (10.1%) | 67 (14%) |

questionnaire. The mean anxiety GAD-7 score was significantly higher in females (10.3 ± 4.9) than males (7.1 ± 5) ($P < .001$) (Table 2).

The ISS questionnaire scores in females showed that most of the females (70.8%) suffered sexual relationship stress with only 9 of them (1.9%) showing severe stress. Most males (63.1%) on the other hand had no sexual stress and just over a third (35.5%) had stress. The mean ISS score was 28.8 ± 15.4 and 38.9 ± 13.4 in males and females, respectively ($P < .001$) (Table 2).

Prevalence of Erectile Dysfunction

More than half of the male subjects (68.2%) had no ED scores on the IIEF-5 questionnaire while 57 subjects (26.3%) had mild ED, 7 (3.2%) had moderate ED, and only 5 (2.3%) had mild-moderate ED. The mean IIEF-5 score was 21.9 ± 3.2 .

Prevalence of Female Sexual Dysfunction Risk

The majority of females (97.3%) had difficulties in domain 6/pain, followed by domains 1/desire and 3/lubrication (81.6% and 81.2% respectively). About three fourths of the subjects (77.2%) had difficulties in domain 2/arousal, and more than half of the females had difficulties in domains 4/orgasm (68.5%), and 5/satisfaction (64.7%).

The total FSFI scores ranged from 2.6–32. Scores showed that 343 of the females (71.6%) had FSFI scores <26.5. The mean FSFI score was 21.6 ± 7.1 (Table 3).

Correlation of Sexual Function, Anxiety, and Depression

IIEF-5 score was significantly negatively correlated with PHQ-9 ($r_s = -0.381$, $P < .001$), GAD-7 ($r_s = -0.496$, $P < .001$), ISS score ($r_s = -0.680$, $P < .001$) (Table 4).

Domain 1 of FSFI score (sexual desire) was significantly negatively correlated with PHQ-9 ($r_s = -0.276$, $P < .001$), GAD-7 ($r_s = -0.228$, $P < .001$), ISS score ($r_s = -0.588$, $P < .001$).

Domain 2 of FSFI score (sexual arousal) was significantly negatively correlated with PHQ-9 ($r_s = -0.323$, $P < .001$), GAD-7 ($r_s = -0.226$, $P < .001$), ISS score ($r_s = -0.661$, $P < .001$).

Domain 3 of FSFI score (lubrication) was significantly negatively correlated with PHQ-9 ($r_s = -0.310$, $P < .001$), GAD-7 ($r_s = -0.263$, $P < .001$), ISS score ($r_s = -0.467$, $P < .001$).

Domain 4 of FSFI score (orgasm) was significantly negatively correlated with PHQ-9 ($r_s = -0.285$, $P < .001$), GAD-7 ($r_s = -0.193$, $P < .001$), ISS score ($r_s = -0.575$, $P < .001$).

Domain 5 of FSFI score (satisfaction) was significantly negatively correlated with PHQ-9 ($r_s = -0.322$, $P < .001$), GAD-7 ($r_s = -0.258$, $P < .001$), ISS score ($r_s = -0.699$, $P < .001$).

Domain 6 of FSFI score (pain) was significantly positively correlated with PHQ-9 ($r_s = 0.175$, $P < .001$), GAD-7 ($r_s = 0.299$, $P < .001$), ISS score ($r_s = 0.392$, $P < .001$). Domain 6 of FSFI score negatively correlated with satisfaction

Table 2. Comparison between the 2 genders according to total score of PHQ-9, GAD-7, and ISS

| Score | Male (n = 217) | Female (n = 479) | P |
|---------------------------------------|-----------------|------------------|---------------------|
| PHQ total score | | | |
| Minimal or no depression (≤ 4) | 44 (20.3%) | 10 (2.1%) | <.001 ^{†*} |
| Mild depression (5-9) | 93 (42.9%) | 129 (26.9%) | |
| Moderate depression (10-14) | 50 (23%) | 156 (32.6%) | |
| Moderately severe depression (15-19) | 20 (9.2%) | 122 (25.5%) | |
| Severe depression (20-27) | 10 (4.6%) | 62 (12.9%) | |
| Median (Min.–Max.) | 8 (0–24) | 13 (3–27) | <.001 ^{†*} |
| Mean \pm SD. | 8.8 \pm 5.1 | 13.1 \pm 5.3 | |
| GAD total score | | | |
| No anxiety (< 5) | 76 (35%) | 54 (11.3%) | <.001 ^{†*} |
| Mild anxiety (5–9) | 92 (42.4%) | 179 (37.4%) | |
| Moderate anxiety (10–14) | 26 (12%) | 140 (29.2%) | |
| Severe anxiety (≥ 15) | 23 (10.6%) | 106 (22.1%) | |
| Median (Min.–Max.) | 7 (0–21) | 10 (0–21) | <.001 ^{††} |
| Mean \pm SD. | 7.1 \pm 5 | 10.3 \pm 4.9 | |
| ISS total score | | | |
| No stress (< 30) | 137 (63.1%) | 131 (27.3%) | <.001 ^{†*} |
| Stress (> 30) | 77 (35.5%) | 339 (70.8%) | |
| Severe stress (> 70) | 3 (1.4%) | 9 (1.9%) | |
| Median (Min.–Max.) | 25.3 (6.7–87.9) | 38.6 (12.7–72.3) | <.001 ^{††} |
| Mean \pm SD. | 28.8 \pm 15.4 | 38.9 \pm 13.4 | |

GAD-7 = Generalized Anxiety Disorder-7; IIEF-5 = International Index of Erectile Function-5; PHQ-9 = Patient Health Questionnaire-9; P: P value for comparing between the studied groups.

*Chi-square test.

†Mann-Whitney test.

‡Statistically significant at $P \leq .05$.

scores before ($r_s = -0.153$, $P = .001$) and during lockdown ($r_s = -0.107$, $P = .019$).

FSFI total score was significantly negatively correlated with PHQ-9 ($r_s = -0.327$, $P < .001$), GAD-7 ($r_s = -0.217$, $P < .001$), ISS score ($r_s = -0.680$, $P < .001$) (Table 4).

The PHQ-9 total score positively correlated with GAD-7 ($r_s = 0.810$, $P < 0.001$) and ($r_s = 0.608$, $P < .001$) in males and females. ISS total score positively correlated with PHQ-9 ($r_s = 0.477$, $P < 0.001$) and ($r_s = 0.320$, $P < .001$) in males and females, respectively.

GAD-7 total score positively correlated with ISS total score ($r_s = 0.477$, $P < .001$) and ($r_s = 0.244$, < 0.001) in males and females, respectively.

Relation of Sexual Satisfaction to Different Parameters in Males

The ISS total score was significantly related to subject's age ($P = .014$), education level ($P < .001$), occupation ($P = .001$, .003 for clerks and the unemployed respectively), sexual satisfaction before lockdown ($P < .001$), presence of depression on the PHQ-9 total score ($P < .001$), diagnosis of anxiety on the

Table 3. Descriptive analysis of the studied cases according to Female Sexual Function Index (FSFI) in female group (n = 479)

| FSFI | Median (IQR) | Mean \pm SD | Presence of difficulties |
|-------------------------|------------------|----------------|--------------------------|
| Domain1 (< 4.28) | 3.6 (2.4–4.2) | 3.3 \pm 1.3 | 391 (81.6%) |
| Domain2 (< 5.08) | 3.9 (2.7–4.8) | 3.7 \pm 1.6 | 370 (77.2%) |
| Domain3 (< 5.45) | 4.5 (3.6–5.4) | 4.2 \pm 1.6 | 389 (81.2%) |
| Domain4 (< 5.05) | 4.4 (2.8–5.2) | 3.9 \pm 1.8 | 328 (68.5%) |
| Domain5 (< 5.04) | 4 (2.4–5.6) | 3.9 \pm 1.7 | 310 (64.7%) |
| Domain6 (< 5.51) | 2.4 (1.6–3.6) | 2.6 \pm 1.4 | 466 (97.3%) |
| Total FSFI (< 26.5) | 23.3 (18.5–26.8) | 21.6 \pm 7.1 | 343 (71.6%) |

IQR = interquartile range.

Table 4. Correlation between depression, anxiety, sexual satisfaction scores, and IIEF-5 and FSFI scores

| Score | PHQ total score | | GAD total score | | ISS total score | |
|------------------|-----------------|--------|-----------------|--------|-----------------|--------|
| | r_s | P | r_s | P | r_s | P |
| IIEF total score | -0.381* | <.001* | -0.496* | <.001* | -0.680* | <.001* |
| FSFI | | | | | | |
| Domain1 | -0.276* | <.001* | -0.228* | <.001* | -0.588* | <.001* |
| Domain2 | -0.323* | <.001* | -0.226* | <.001* | -0.661* | <.001* |
| Domain3 | -0.310* | <.001* | -0.263* | <.001* | -0.467* | <.001* |
| Domain4 | -0.285* | <.001* | -0.193* | <.001* | -0.575* | <.001* |
| Domain5 | -0.322* | <.001* | -0.258* | <.001* | -0.699* | <.001* |
| Domain6 | 0.175* | <.001* | 0.299* | <.001* | 0.392* | <.001* |
| Total FSFI | -0.327* | <.001* | -0.217* | <.001* | -0.680* | <.001* |

FSFI = Female Sexual Function Index; GAD-7 = Generalized Anxiety Disorder-7; IIEF-5 = International Index of Erectile Function-5; PHQ-9 = Patient Health Questionnaire-9; r_s : Spearman coefficient.

*Statistically significant at $P \leq .05$.

GAD-7 score ($P < .001$), and presence of ED on the IIEF-5 questionnaire ($P < .001$).

No significant relation was shown between ISS total score and residence ($P = .407$), monthly income ($P = .314$), wife's age ($P = .500$), marriage duration ($P = .057$), chronic illnesses ($P = .466$), nor previous quarantine for being COVID-19 positive ($P = .147$).

Relation of Sexual Satisfaction to Different Parameters in females

The ISS total score in the studied females was significantly related to female's age ($P = .001$), residence in urban or rural areas ($P = .024$), occupation ($P = .006$, $.002$, 0.002 for clerks, unemployed females and housewives, respectively), husband's age ($P < .001$), marriage duration ($P < .001$), presence of chronic illnesses ($P < .001$), sexual satisfaction before lockdown ($P < .001$), PHQ-9 diagnosis of depression ($P = .006$), presence

of anxiety on GAD-7 score ($P = .043$) and diagnosis female SD on the FSFI score ($P < .001$).

The ISS total score was not related to education level ($P = .411$), manual work ($P = .398$), monthly income ($P = .359$) or previous quarantine for being COVID-19 positive ($P = .924$).

Multivariate Regression Analysis for Parameters Affecting ISS in the Studied Subjects

Results of the linear regression analysis of factors affecting ISS score in males revealed that level of education as university graduates (odds ratio [OR]: 13.071, $P = .035$), occupation as clerks (OR:0.020, $P = .003$), GAD-7 presence of anxiety (OR:112.1, $P < .001$), and diagnosis of ED on IIEF-5 scale (OR:17.50, $P < .001$) were significantly associated sexual relationship stress and sexual satisfaction after controlling for other factors (Table 5).

Table 5. Univariate and multivariate analysis for the parameters affecting stress status for males (n = 217)

| ISS total score | Univariate | | Multivariate* | |
|-----------------------------|--------------------|-----------------------------------|--------------------|----------------------------------|
| | P | OR (95% CI) | P | OR (95% CI) |
| Age (>35 Y) | .927 | 0.973 (0.536–1.765) | | |
| Education | | | | |
| University | <.001 [†] | 3.579 [†] (2.005–6.389) | .035 [†] | 13.071 [†] (1.12–142.9) |
| Postgraduate | <.001 [†] | 0.231 (0.128–0.418) | .112 | 7.130 (0.633–80.36) |
| Occupation | | | | |
| Clerk | .001 [†] | 0.270 [†] (0.124–0.585) | .003 [†] | 0.020 [†] (0.002–0.253) |
| Unemployed | .005 [†] | 3.721 [†] (1.50–9.23) | .705 | 0.543 (0.023–12.91) |
| PHQ-9 total score | <.001 [†] | 1.161 [†] (1.091–1.235) | .955 | 0.997 (0.905–1.099) |
| GAD-7 total score (anxiety) | <.001 [†] | 45.810 [†] (10.82–193.9) | <.001 [†] | 112.1 [†] (15.14–829.9) |
| IIEF-5 total score (ED) | <.001 [†] | 14.845 [†] (7.39–29.82) | <.001 [†] | 17.50 [†] (5.93–51.62) |

ED = erectile dysfunction; GAD-7 = Generalized Anxiety Disorder-7; IIEF-5 = International Index of Erectile Function-5; OR = odds ratio; PHQ-9 = Patient Health Questionnaire-9.

*All variables with $P < .05$ were included in the multivariate analysis.

[†]Statistically significant at $P \leq .05$.

Table 6. Univariate and multivariate analysis for the parameters affecting stress status for females (n = 479)

| ISS total score | Univariate | | Multivariate* | |
|--------------------------------|--------------------|-----------------------------------|--------------------|-------------------------------------|
| | P | OR (95% CI) | P | OR (95% CI) |
| Age (>35 Y) | <.001 [†] | 2.120 [†] (1.396–3.21) | .792 | 0.861 (0.282–2.625) |
| Residence (urban) | .022 [†] | 3.135 [†] (1.183–8.309) | .252 | 2.471 (0.525–11.630) |
| Occupation | | | | |
| Clerk | .006 [†] | 0.523 [†] (0.330–0.831) | .127 | 7.198 (0.572–90.618) |
| Unemployed | .003 [†] | 2.079 [†] (1.290–3.35) | .041 [†] | 15.515 [†] (1.120–214.970) |
| Housewife | .003 [†] | 2.079 [†] (1.290–3.35) | | |
| Husband's/wife age (>35 Y) | <.001 [†] | 4.052 [†] (2.651–6.193) | .010 [†] | 3.395 [†] (1.340–8.603) |
| Marriage duration | | | | |
| 1–<5 years | | | | |
| 5–<10 years | .001 [†] | 2.238 [†] (1.384–3.617) | .006 [†] | 3.672 [†] (1.459–9.239) |
| 10–15 years | <.001 [†] | 4.332 [†] (2.395–7.83) | .196 | 2.244 (0.659–7.636) |
| >15 years | .005 [†] | 3.365 [†] (1.455–7.784) | .660 | 0.675 (0.118–3.879) |
| Chronic illnesses | .044 [†] | 1.687 [†] (1.014–2.808) | .329 | 1.522 (0.655–3.536) |
| PHQ-9 total score (depression) | .007 [†] | 6.492 [†] (1.653–25.49) | .086 | 58.510 (0.565–6,053.891) |
| GAD-7 total score (anxiety) | .046 [†] | 1.822 [†] (1.012–3.283) | .005 [†] | 0.217 [†] (0.075–0.631) |
| FSFI | | | | |
| Total FSFI (<26.5) | <.001 [†] | 19.759 [†] (11.94–32.68) | <.001 [†] | 7.377 [†] (2.906–18.727) |

FSFI = Female Sexual Function Index; GAD-7 = Generalized Anxiety Disorder-7; OR = odds ratio; PHQ-9 = Patient Health Questionnaire-9.

*All variables with P < .05 were included in the multivariate analysis.

[†]Statistically significant at P ≤ .05.

In females at the multivariate logistic regression analysis, we observed that being a housewife or unemployed (OR:15.515, P = .041), husband's age more than 35 years (OR:3.395, P = .010), marriage duration of 5–10 years (OR:3.672, P = .006), GAD-7 presence of anxiety (OR:0.217, P = .005), and diagnosis of sexual dysfunction on FSFI scale (OR:7.377, P < .001) were significant predictors of sexual dissatisfaction after controlling for other factors (Table 6).

Mediation by Sexual Function

Mediation analysis showed that sexual function was a significant mediator in the association between anxiety/depression and sexual stress (Figures 1 and 2).

The indirect effect of anxiety on sexual stress via male sexual function is positive and significant: 95%CI = (0.4892, 1.1003). The majority of the pathway between anxiety and sexual stress is mediated by male sexual function (67.4%) (Figure 1A).

The indirect effect of depression on sexual stress via male sexual function is positive and significant: 95%CI = (0.3442, 0.9022). The pathway between depression and sexual stress is mediated by male sexual function (51.9%) (Figure 1B).

The indirect effect of anxiety on sexual stress via female sexual function is positive and significant: 95%CI = (0.0803, 0.3560). The pathway between anxiety and sexual stress is mediated by female sexual function (31.7%) (Figure 2A).

The indirect effect of depression on sexual stress via female sexual function is positive and significant: 95%CI = (0.2381, 0.4914). The pathway between anxiety and sexual stress is mediated by female sexual function (47.9%) (Figure 2B).

DISCUSSION

Following the rapid rise of the number of detected cases in mid-March 2020, our government decided to suspend schools and universities and impose a curfew from 7 PM until 6 AM, closing all shops and markets from 5 PM and a complete shutdown was imposed on Fridays and Saturdays. All means of public and private transportation were suspended during curfew hours. Flights into or out of Egypt were suspended as well. All sports were interrupted and many social activities banned in an attempt to control the spread of COVID-19.²⁴ The relatively high mortality in addition to the stressful lock down measures are expected to have an impact on the psychological and physical well-being of individuals.

According to the World Health Organization's definition, sexual health is "...not merely the absence of disease, dysfunction or infirmity. Sexual health requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence"²⁵ It is linked with a variety of predictors as mental stress, working hours, pregnancy, and so forth. Sexual satisfaction is a well-known indicator of sexual health and sexual well-being.²⁶

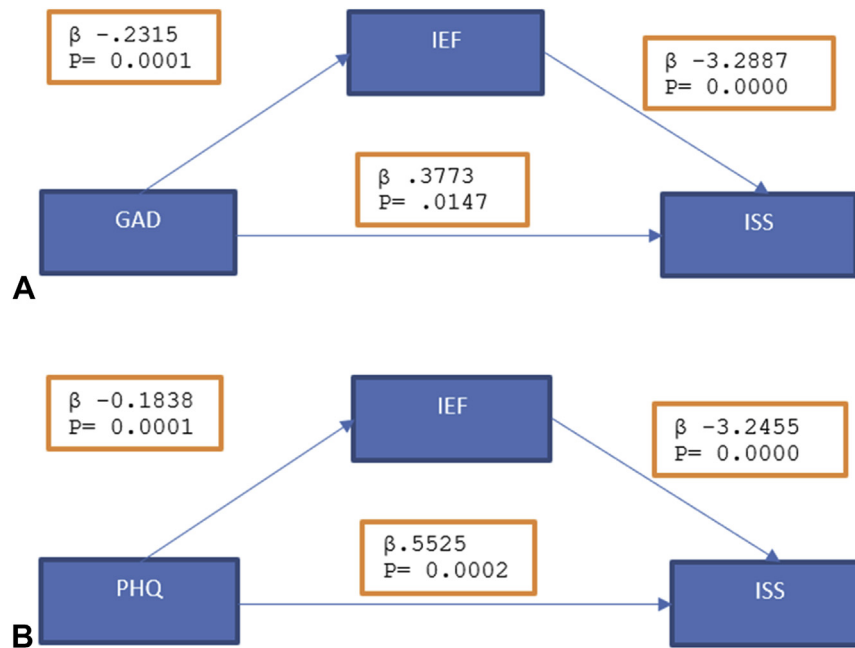


Figure 1. Panel A shows the direct effect of anxiety on male sexual function is negative and significant ($\beta = -0.2315$, $P = .0001$). The direct effect of anxiety on sexual stress is positive and significant ($\beta = 0.3773$, $P = .0147$). The direct effect of male sexual function on sexual stress is negative and significant ($\beta = -3.2887$, $P < .0001$). Panel B shows the direct effect of depression on male sexual function is negative and significant ($\beta = -0.1838$, $P = .0001$). The direct effect of depression on sexual stress is positive and significant ($\beta = 0.5525$, $P = .0002$). The direct effect of male sexual function on sexual stress is negative and significant ($\beta = -3.2455$, $P < .0001$).

The effect of mass disasters on sexual function has always been controversial. The pandemic and its containment measures are suspected to lead to behavior anxiety, feelings of fear, and even panic resulting in the precipitation or exacerbation of adaptation

disorders and depression. These will have their implications on sexual function and satisfaction. On the other hand, it can be advocated that the availability of more free time in lock down provides the opportunity of sharing more time with a love

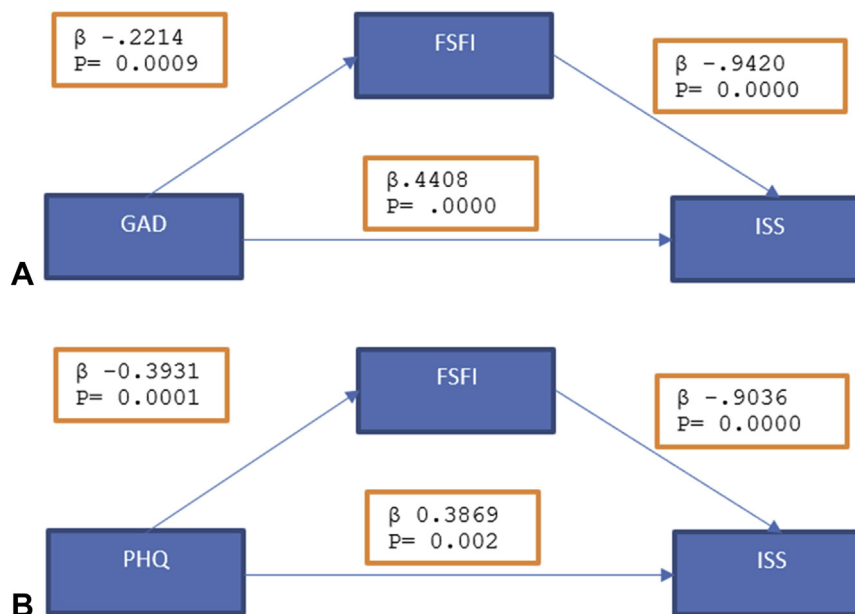


Figure 2. Panel A shows the direct effect of anxiety on female sexual function is negative and significant ($\beta = -0.2214$, $P = .0009$). The direct effect of anxiety on sexual stress is positive and significant ($\beta = 0.4408$, $P < .0001$). The direct effect of female sexual function on sexual stress is negative and significant ($\beta = -0.9420$, $P < .0001$). Panel B shows the direct effect of depression on female sexual function is negative and significant ($\beta = -0.3931$, $P = .0001$). The direct effect of depression on sexual stress is positive and significant ($\beta = 0.3869$, $P = .002$). The direct effect of female sexual function on sexual stress is negative and significant ($\beta = -0.3869$, $P = .002$).

partner that could positively influence the quality of the sex life.²⁷ It is known that the differences between males and females in responding to stress may affect their sexual satisfaction differently.²⁸ The effect of the COVID-19 pandemic in Egypt during the quarantine period on sexual satisfaction of females in Egypt in relation to males has not been previously studied.

Out of the study respondents, more females completed the questionnaire compared to male respondents. As the study was carried out during a period of complete lock down, we believe that this reflects the cultural barriers males face to discuss sexual complaints in public even if for scientific purposes. It is usual that studies addressing sexual function conducted on Egyptian males encounter similar rejection to complete the questionnaires and refusal to openly discuss sexual complaints with the medical personnel.^{29,30} In conservative eastern countries, males with sexual dysfunction or a recognizable sexual problem are considered deficient by their partners and acquaintances. Male sexual function is perceived to be equivalent to masculinity and any declared dissatisfaction is believed to threaten this masculine genital pride and male dominance.³¹

Most of the study participants were from urban areas. This again reflects the greater ease subjects have to declare intimate taboo issues in urban than in the more conserved rural society. The majority of the subjects were aged 25–45 years which reflects the expected age for peak sexual activity in eastern societies^{32,33} and hence the interest in participating in the study.

About three fourths of females were sexually satisfied before lockdown. This is in agreement with previously reported figures of sexual satisfaction in Egyptian females.³⁴ We observed that more males responded as being satisfied with their sexual performance than females both and during COVID-19 lockdown. This disproportionate sexual satisfaction between Egyptian males and females is a cause of many sexual problems that might even lead to divorce in many instances. It is suggested that in most cases, this unmatched sexual satisfaction between males and females stems from the couples' ignorance as how to deal sexually with their partner that mainly stems from miscommunication.³⁵ Laumann et al³⁶ reported that higher rates of sexual satisfaction are reported in males than females globally. This might be explained by the cultural beliefs and gender differences regarding the importance of sex and sexual satisfaction. This might be even more evident in eastern societies with male dominance giving sexual satisfaction a greater importance in males.

More males and females responded sexually satisfied before than during lockdown in this study. We suggest this might be related to the impact of the psychological consequences of the pandemic and the lockdown on sexual function and satisfaction. Just a year earlier to the pandemic, a nation-wide survey conducted by the Ministry of Health in 2018 on a random sample of 22,000 families across the country reported a prevalence of anxiety disorders in 43.7% and depression in 30.1% of the respondents. These figures were alarming and probably were amplified with the pandemic effects.³⁷ Greater depression and

anxiety scores were reported in females than males. This is in agreement with Cocci et al¹¹ who reported greater depression and anxiety scores in females than males in Italy during the quarantine. This supports the fact that women are more susceptible to develop post-traumatic stress disorders than men.³⁸ The risk of emotional disturbances as depression or anxiety is believed to be as twice as common in females than males.³⁹

The total FSFI score revealed that majority of our female subjects were at risk of sexual dysfunction. Most of our females had coitus-related pain, decreased desire and lubrication, difficulties with arousal, orgasm and satisfaction. A previous cross-sectional study conducted before the pandemic reported lower prevalence of female sexual dysfunction risk among Egyptian females.⁴⁰ This increased prevalence might be related to the pandemic associated emotional disturbances. Evidence from literature has shown the negative effect of stressful events as natural disasters and wars on female sexual function.⁴¹ Yuksel et al⁴¹ showed that the FSFI total score of their Turkish female sample was lower compared to COVID-19 pre-pandemic total score. All the 6 domains except pain and arousal were significantly reduced in their Turkish sample. It is possible that the greater domains affected in our sample might reflect a sexual dysfunction risk not totally attributed to the pandemic quarantine as baseline pre-pandemic scores were not available making comparison with previous data not possible.

Hamilton et al⁴² similarly showed that exposure to chronic psychological stress is associated with lowered FSFI scores. Besides the psychological influences, hormonal disturbances accompanying stress as increased cortisol level that inhibits the hypothalamic-pituitary-gonadal axis may be responsible for the sexual dysfunction particularly the decreased arousal. Cocci et al¹¹ on the other hand reported increased desire in up to 40% of their respondents. However, they did not use validated questionnaires to assess desire, which might make comparison difficult.

On the other hand, most of the males in our study reported no erectile dysfunction and no sexual relationship stress. The majority of females however were observed to suffer sexual relationship stress on the ISS score. This might reflect the higher depression and anxiety experienced by the females. To the best of our knowledge, this is the first report of the magnitude of sexual dysfunction risk and sexual dissatisfaction in Egyptian females compared to males during COVID-19 pandemic.

The positive correlation of depression, anxiety, and sexual relationship satisfaction scores among our subjects proposes that anxiety and depression are modifying factors that can influence sexual satisfaction. Carcedo et al⁴³ reported previously that higher sexual satisfaction was associated with lower levels of depression and anxiety for young Spanish adults. The negative correlation domains 1 to 5 of the FSFI scale (sexual desire, arousal, lubrication, orgasm and satisfaction) and positive

correlation of domain 6 (pain) of FSFI score with the depression, anxiety, and sexual relationship satisfaction scores emphasizes the interplay between the 6 domains of the female sexual function and sexual and psychological well-being of females.

In the current study, sexual function of both genders correlated negatively with depression and anxiety scores and sexual stress emphasizing the importance of sexual function as an important domain of sexual relationship satisfaction. Mediation analysis in agreement showed that sexual function is a significant mediator in the pathway between anxiety/depression and sexual stress. This stresses the influence of emotional well-being to sexual function and thereby sexual satisfaction in both males and females.⁴⁴

Previous quarantine for being COVID-19 positive unexpectedly was not related to sexual stress in the current study. This however could be explained by the better knowledge of the disease secondary to contraction of infection and contact with health care professionals ameliorating anxiety and depression. This observation was also reported by Cocci et al.¹¹

We reported that ISS total score in males was significantly related to subject's age, education level, and occupation (clerks and manual workers). Sexual dissatisfaction by increasing age might be affected by other factors as comorbidities associated with increasing age. Results of the linear regression analysis in males revealed that level of education (university graduates) and occupation (clerks) were risk factors for sexual stress. Data from literature show an association of lower educational levels and male sexual dysfunction.⁴⁵ Occupation as clerks were associated with greater sexual stress as this category of workers were among the most affected by the lockdown and labour lay off during the lockdown. Manual workers and the unemployed were supported by a social security grant and thereby more secure economically alleviating some of the pandemic associated psychologic consequences. We report that anxiety and erectile dysfunction were predictors of sexual relationship stress in our cohort of Egyptian males after controlling for other factors Anxiety is independently associated with sexual stress. Male sexual dysfunction is also a predictive factor of sexual stress as sexual dysfunction will prevent males from having satisfying sexual relations. Research showed that there is a direct and meaningful relation between people's sexual performance and sexual satisfaction.⁴⁶

On the other hand, we observed that presence of sexual stress (ISS) in Egyptian females was significantly related to female's age. It has been previously suggested that sexual satisfaction possibly declines with age.⁴⁷ We also reported that residing in urban areas was associated with greater stress in the studied females as well as those working clerks, housewives, and being unemployed. These subgroups economically dependent on the male partner and are liable to be affected more by the partner's stress and enforced isolation and restriction of activities affecting their economic security.

Husband's increasing age, marriage duration, and chronic illnesses were observed to be significantly related to sexual stress in our females. The relation of sexual relationship stress to presence of chronic illnesses might be explained by the effect of disease on sexual functioning either pathologically or psychologically or to male partner's negative attitude towards the diseased wife. However, linear regression analysis for females showed that being housewife or unemployed were risk factors for sexual relationship stress. This might be to the plenty of time not matched by husband work hours and the economic dependency on their partners. Unemployment and financial dependency were reported to be associated with increased sexual stress in different populations.^{48,49} We also observed that husband's age more than 35 years and a marriage duration of 5-10 years were predictive of sexual stress. It is likely that older men and those married for longer durations are not likely to seek improvement in their relationship. It is also likely that with the longer duration of marriage, the couples might get acclimatized to the condition, accept, and are less likely to seek help. It has been previously shown that sexual satisfaction in females can be associated with spouses' age, duration of marriage, and husband's age.⁵⁰ Data from 33 countries have reported that sexual satisfaction tends to decrease with longer duration of marriage.⁵¹ Presence of anxiety and FSFI scores suggestive of FSD risk were also significant predictors of sexual relationship stress after controlling for other factors. This emphasizes the impact of anxiety in natural disasters on sexual function and satisfaction.

This study tackled sexual function and relationship dissatisfaction which are prevalent, however, infrequently investigated issues among Arab countries generally and Egypt in particular. In Egypt, literature on the prevalence of sexual satisfaction among women is scanty. To the best of our knowledge, this is the first report of the burden of anxiety, depression, and sexual satisfaction in women in particular in Egypt during COVID-19 pandemic. Conducting the study online allowed participants to declare culturally sensitive aspects confidentially in this study. Nevertheless, the results of the present study should be interpreted with recognition of its limitations. The study participants were recruited through Facebook, which may not be representative of the community. Certain groups of people might not be well represented on the Internet, such as elderly people, people from low socioeconomic backgrounds, and lower education. Furthermore, the sampling technique did not allow us to reach illiterate subjects. Facebook advertising however offered an efficient and unique access to hard-to-reach populations specially during the lockdown-imposed limitation on direct recruitment. This study relied on self-reporting of satisfaction before the lockdown which is liable to recall and desirability bias. We did not have FSFI or IIEF-5 scores prior to COVID-19 pandemic making comparisons with baseline values not possible. We recognize that unmarried, separated, or divorced subjects may be more at risk of sexual dysfunction. However, the study only included married subjects and excluded unmarried ones (because

of cultural barriers) and those who were separated or divorced (because of the similar cultural barriers that prohibit single subjects who are supposedly sexually inactive to talk about sexuality).

Our results indicate that sexual stress is an important public health concern, and emotional problems likely contribute to the experience of these problems. Long-term follow-up of the changes in sexual function and satisfaction after the pandemic is recommended to confirm the results and to evaluate changes over time. We are in need to increase the society's awareness of the importance of acknowledging such complaints so as to put an end to the stigma attached to them. Mental health of women in Egypt needs more attention especially in certain groups as housewives, the unemployed, and those with longer duration of marriage.

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