

## ORIGINAL RESEARCH ARTICLE

# The effects of COVID-19 pandemic and its related lockdown on female sexual function and reproductive health: An observational study in Egypt

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## Abstract

This retrospective observational online study was carried out to evaluate the effect of the COVID-19 pandemic and its related lockdown on female sexual functions and reproductive health. It included 409 sexually active females. The sexual function was assessed using the Female Sexual Function Index (FSFI). The reproductive life was assessed by a structured self-administered questionnaire modified from Egypt Demographic and Health Survey. The study revealed a significant decrease in the overall FSFI score during the pandemic lockdown compared to the pre-pandemic score ( $19.3 \pm 6$  vs.  $21.3 \pm 6.4$ ,  $P < 0.001$ ). Below half (41.6 %) of women were using contraception methods during the pandemic, while 27.9% had stopped taking contraception during the pandemic, 30.6% (57/186) of the pregnant women only tended to get pregnant. So, the COVID-19 pandemic and its related lockdown were associated with an elevated risk for female sexual dysfunction and altered women's reproductive health quality. Health system should therefore develop new methods to provide basic reproductive health service, family planning services, and to ameliorate the female sexual function during COVID-19 pandemic including consults with physicians, counsellors, and psychologists, as well as health education programs, either in person or virtually via telemedicine. (*Afr J Reprod Health* 2022; 26[9]: 64-75).

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**Keywords:** COVID19 pandemic; sexual dysfunction, reproductive health; Egypt

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## Résumé

Cette étude observationnelle rétrospective en ligne a été réalisée pour évaluer l'effet de la pandémie de COVID-19 et de son confinement connexe sur les fonctions sexuelles et la santé reproductive des femmes. Il comprenait 409 femmes sexuellement actives. La fonction sexuelle a été évaluée à l'aide du Female Sexual Function Index (FSFI). La vie reproductive a été évaluée par un questionnaire auto-administré structuré modifié à partir de l'enquête démographique et sanitaire égyptienne. L'étude a révélé une diminution significative du score global FSFI pendant le confinement pandémique par rapport au score pré-pandémique ( $19,3 \pm 6$  contre  $21,3 \pm 6,4$ ,  $P < 0,001$ ). Moins de la moitié (41,6 %) des femmes utilisaient des méthodes de contraception pendant la pandémie, alors que 27,9 % avaient arrêté de prendre une contraception pendant la pandémie, 30,6 % (57/186) des femmes enceintes avaient seulement tendance à tomber enceintes. Ainsi, la pandémie de COVID-19 et son confinement connexe ont été associés à un risque élevé de dysfonction sexuelle féminine et à une altération de la qualité de la santé reproductive des femmes. Le système de santé devrait donc développer de nouvelles méthodes pour fournir des services de santé reproductive de base, des services de planification familiale et pour améliorer la fonction sexuelle féminine pendant la pandémie de COVID-19, y compris des consultations avec des médecins, des conseillers et des psychologues, ainsi que des programmes d'éducation sanitaire, soit en personne ou virtuellement via la télémédecine. (*Afr J Reprod Health* 2022; 26[9]: 64-75).

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**Mots-clés:** Pandémie de COVID19; dysfonction sexuelle, santé reproductive; Egypte

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## Introduction

In December 2019, an outbreak caused by the severe acute respiratory syndrome coronavirus 2

(SARS-CoV-2), known later as coronavirus disease 2019 (COVID-19), was discovered in Wuhan, China. COVID-19 has rapidly spread over the following months almost to the whole globe as a

pandemic<sup>1</sup>. COVID-19 has infected more than 8.5 million persons globally and caused more than 450,000 deaths<sup>2</sup>. The first case was registered in Egypt in February 2020. Soon, the number of cases increased, with a recorded fatality rate of 4.8%<sup>3</sup>.

Egypt instituted a lockdown in mid-March 2020, shutting all non-essential workplaces (including schools) and imposing all staff and students to work from home<sup>4</sup>. This lockdown had a negative impact on individuals' wellbeing and health, as well as on the governmental and private health services<sup>5</sup>.

Sexual health, according to the World Health Organization, is defined as "a state of physical, emotional, mental and social wellbeing concerning sexuality; it is not merely the absence of disease, dysfunction, or infirmity"<sup>6</sup>. Sexual wellbeing necessitates a healthy and supportive attitude toward sexuality, sexual relationships, and the ability to have pleasurable and safe sexual experiences. It has been related to several predictors, including mental stress, work hours, and pregnancy<sup>6</sup>. Sexual satisfaction is a well-established measure of sexual wellbeing and health<sup>7</sup>. During the COVID-19 pandemic and its related lockdown, sexual health has been most probably affected due to the social distancing, travel limitations, fulfilling work at home, continuous presence of children at home, anxiety, fear of infection, and psychological stress due to economic slowdowns<sup>8</sup>.

Few studies evaluated the sexual health problems faced by women during the COVID-19 pandemic and its lockdown measures. They demonstrated negative effects on the scores of the female sexual function index (FSFI) of participating women<sup>9-10</sup>. These women reported a reduced overall rate of their sexual activity and negatively evaluated their own sexual life owing to their feelings of loneliness and stress<sup>11-12</sup>.

Reproductive health, especially for women living in low- and middle-income countries, also has been affected by the local or national lockdowns that have forced health services to shut down<sup>8</sup>. The COVID-19 pandemic has also affected the supply chain for contraceptive commodities by disrupting their manufacture or delaying transportation<sup>13</sup>. Additionally, equipment and staff involved in providing sexual and reproductive health services may be diverted to fulfill other

needs. Clinics may have been closed, and people may be reluctant to go to health facilities for reproductive health services<sup>14</sup>. Most pregnant women and new mothers have been unable to leave their homes, often with older children to care for, and have been unable to rely on domestic help<sup>15</sup>.

Emergency lockdown has been initiated in countries worldwide, and its effects on health, wellbeing, business, and other aspects of daily life have been felt throughout societies and individuals<sup>16</sup>. National lockdowns have also had an impact on sexual and reproductive health since they have forced health services to close if they were not required, and caused physical distance, travel limitations, and economic slowdowns<sup>8</sup>.

Egypt, as a Muslim, conservative community, lacks adequate studies on reproductive problems and sexual health during the COVID-19 pandemic, probably because of the sensitivity of the topic. Therefore, this study was conducted to evaluate and compare the women's sexual health in Egypt pre and intra the COVID-19 pandemic lockdown using FSFI. It also aimed to assess the pattern of contraceptive use, the rate of unwanted pregnancy, and the utilization of reproductive health services during the COVID-19 pandemic.

### **Objectives**

The purpose of this study was to evaluate the effect of the COVID-19 pandemic and its related lockdown on female sexual functions and reproductive health.

### **Methods**

#### **Study design**

A retrospective observational study was performed.

#### **Study setting**

The study was conducted in Egypt between July and October 2020.

#### **Study population**

The study participants were Egyptian females resident in Egypt who had active social accounts and have access to the internet. social media groups using an online survey.

**Eligibility criteria****Inclusion criteria**

All married women aged 18 years and older who were in a stable marital relationship were included in the study.

**Exclusion criteria**

Post-menopause women, those with a history of urinary incontinence, pelvic surgery, pelvic organ prolapse or malignancy, women with sexually transmitted or chronic diseases, or women suffering from marital relationship problems were excluded.

**Sample size calculation**

The sample size was calculated according to the equation of one proportion to be 372 based on a proportion of sexual dissatisfaction of 53.53%<sup>17</sup> and the previous rate of contraception use in Egypt in 2014 (59 %)<sup>18</sup>. After adding a non-response rate of 10%, the total sample size was 409.

**Sampling technique**

The purposive sampling technique was used to select study participants using an online surveys according to the inclusion and exclusion criteria until they reached the determined sample.

**Data collection tools**

Participants completed a structured self-administered online questionnaire modified from the Arabic validated FSFI<sup>19-20</sup> and the Egypt Demographic and Health Survey<sup>21</sup>. The questionnaire was divided into three sections, including the demographic data of the respondents, data about female sexual behavior using FSFI during the period of the pandemic and the 6 months before the pandemic, and data about reproductive health during the pandemic. It was available in the Arabic version. The FSFI questionnaire included 19 questions to assess sexual desire (questions 1 and 2), arousal (questions 3 to 6), lubrication (questions 7 to 10), orgasm (questions 11 to 13), satisfaction (questions 14 to 16), and pain (questions 17 to 19). The answers to four questions were assigned from 1–5 points, and the answers to the remaining 15

questions were assigned from 0–5 points. Besides, each area had its own impact on the calculation of the final score. The score of each domain was calculated by summing up the scores of the domain's questions and then multiplying by a factor of that particular domain. Multiplier factors were 0.6, 0.3, 0.3, 0.4, 0.4, and 0.4 used for domains from 1 to 6, respectively. The total FSFI score ranged between 2 and 36, with higher scores indicating better female sexual function. Regarding the cut-off values, the FSFI total score of 26.55 was found to be the optimal cut-off score for differentiating women with an elevated risk of sexual dysfunction. The cut-off scores to determine the presence of difficulties in particular domains of the FSFI were as follows: Less than 4.28 for the sexual desire domain, less than 5.08 for the arousal domain, less than 5.45 for the lubrication domain, less than 5.05 for the orgasm domain, less than 5.04 for the sexual satisfaction domain, and less than 5.51 for the sexual pain domain<sup>16</sup>. The validity and reliability of the questionnaire were previously tested<sup>22</sup>.

Responses were collected till the completion of the required sample; the questionnaire was anonymous to keep confidentiality and to avoid mentioning any identifying features of the participants. Informed consent was written at the beginning of the online questionnaire, and participants had the right to agree or disagree to fill out the form. Completion of the survey denoted women's acceptance to participate in the study and to publish the results. The purpose of the research and the potential benefits were explained in the form. The collected data was limited to the current study. One of the author's contact information was available to provide any needed explanation for the participants.

The form link was distributed to many social media groups. Women were directed via this electronic link ([https://docs.google.com/forms/d/e/1FAIpQLSeX-fX2MXqW7-8lmWu3\\_nx5ZqfgCnZSpZ07nNJBnHIB9ihilQ/vi\\_ewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSeX-fX2MXqW7-8lmWu3_nx5ZqfgCnZSpZ07nNJBnHIB9ihilQ/vi_ewform?usp=sf_link)), to the online survey platform. Duplicate entries were avoided by asking people to provide their e-mail addresses at the end of the survey. Duplicate entries having the same e-mail address were eliminated before analysis, and the first entry was kept.

### Statistical analysis

Gathered data were processed using SPSS version 18 (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as mean  $\pm$  SD, while qualitative data were expressed as frequency and percentages (%). Student t-test was used to test the significance of difference for quantitative variables, and Chi-Square was used to test the significance of difference for qualitative variables. Kolmogorov-Smirnov test was used to verify the normality of the distribution of variables. Wilcoxon signed ranks test was used for non-normally distributed quantitative variables. The significance of the obtained results was judged at the 5% level. A  $p$ -value  $< 0.05$  was considered significant.

### Results

The mean age of women was  $31.8 \pm 7.2$  years, ranging from 18 to 57 years, with 85% of women in the age group of 20-40 years. Two hundred and four (49.95) women had primary to secondary educational levels, and 189 (46.2%) had a high educational level. Regarding residency, 278 women (68%) lived in urban areas. Two hundred fifty-nine women (63.3%) were employed, and 322 (78.7%) belonged to the moderate-income population (Table 1).

The study revealed a significant decrease in the overall FSFI score during the pandemic lockdown compared to the score before it ( $19.3 \pm 6$  vs.  $21.3 \pm 6.4$ ,  $P < 0.001$ ). Moreover, there was a significant reduction in the six domains of the FSFI score (desire, arousal, lubrication, orgasm, sexual satisfaction, and pain) during the pandemic lockdown compared to the scores before it (3.4 vs. 2.9,  $P = 0.001$ ; 3.1 vs. 2.7;  $P = 0.001$ ; 3.5 vs. 3.1;  $P = 0.001$ , 3.6 vs. 3.3,  $P = 0.001$ ; 4.2 vs. 4.0;  $P = 0.001$ ; 3.5 vs. 3.3;  $P = 0.001$ , respectively) (Table 2).

Regarding the relation between the socio-demographic characteristics and the overall FSFI score of the participants, we found that age groups, level of education, and income significantly impacted the score of both pre and intra COVID-19 ( $P = 0.008$ ;  $P < 0.001$ ;  $P < 0.001$ , respectively) (Supplementary Table 1).

There was a significant negative correlation between the overall FSFI score and the age of husbands, both pre and intra COVID-19

**Table 1:** Socio-demographic characteristics of the studied participants (n=409)

Personal data	No. (%)
<b>Age of participants</b>	
<20	13 (3.2%)
20 –30	163 (39.9%)
$\geq 30 - 40$	184 (45.0%)
$\geq 40$	49 (12.0%)
Mean $\pm$ SD.	$31.8 \pm 7.2$
Median (Min. – Max.)	31 (18 – 57)
<b>Level of education</b>	
Illiterate	16 (3.9%)
Primary/secondary education	204 (49.9%)
University education	189 (46.2%)
<b>Level of income</b>	
Low	52 (12.7%)
Moderate	322 (78.7%)
High	35 (8.6%)
<b>Employment status of participants</b>	
Housewife	150 (36.7%)
Employed	259 (63.3%)
<b>Residence</b>	
Urban	278 (68%)
Rural	131 (32%)
<b>Age of marriage</b>	
Mean $\pm$ SD.	$22.8 \pm 3.8$
Median (Min. – Max.)	23 (18 – 45)
<b>Age of husband</b>	
Mean $\pm$ SD.	$35.3 \pm 8.5$
Median (Min. – Max.)	35 (20 – 65)
<b>Occupation of husband</b>	
Employee	153 (37.4%)
Engineer	49 (12%)
Free work/unemployed	126 (30.8%)
Nurse	24 (5.9%)
Pharmacist	9 (2.2%)
Physician	39 (9.5%)
Police officer	1 (0.2%)
University Staff	3 (0.7%)
Teacher	5 (1.2%)
<b>Cigarettes smoking</b>	
No	372 (91%)
Yes	37 (9%)

SD: standard deviation; Min. – Max.: minimum to maximum

( $P = 0.034$ ;  $P < 0.001$ , respectively). Also, a significant positive correlation was detected between the overall FSFI score and the participants' age of marriage ( $P = 0.045$ ) during the pandemic lockdown (Supplementary Table 2).

Table 3 shows that the mean age of menarche was 13.3 years  $\pm$  1.4, and the mean number of vaginal deliveries was  $1 \pm 1.2$ . Among the pregnant women during the study (45.5%, 186/409), only 30.6% (57/186) already tended to get that pregnancy. Although most pregnant women in the study made visits to follow up on their pregnancies (90.9%, 169/186), the median

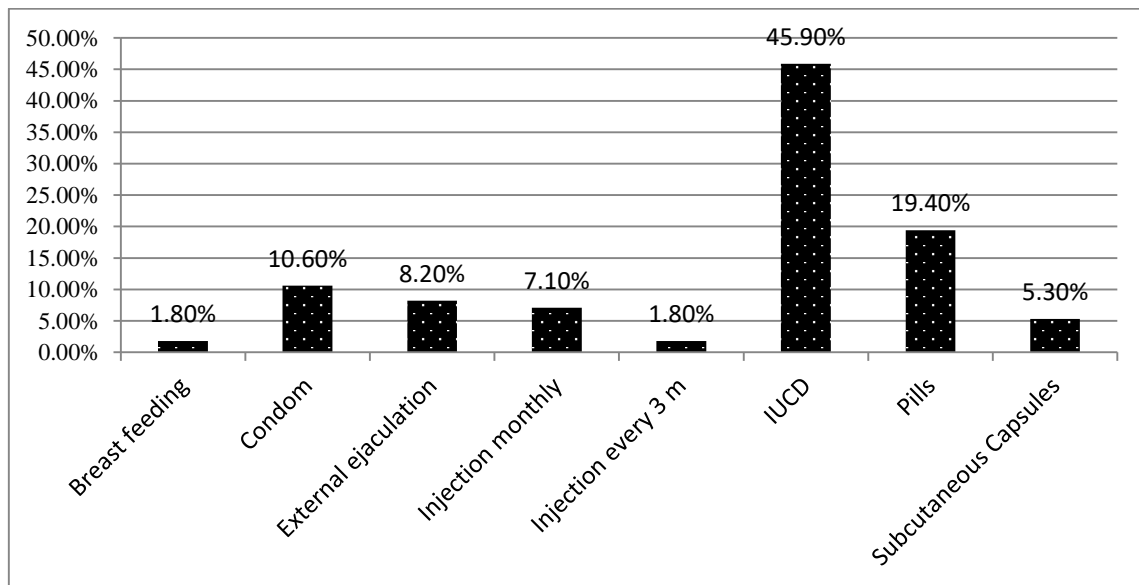
**Table 2:** Comparison between the total score of women's sexual function before and during the COVID-19 pandemic lockdown (n = 409)

Women's sexual health	Before the pandemic lockdown	During the pandemic lockdown	Z	P value
<b>Desire</b>				
Mean ± SD.	3.4 ± 1	2.9 ± 0.9	10.926*	<0.001*
Median (Min. – Max.)	3.6 (1.2 – 6.0)	3 (1.2 – 6)		
<b>Arousal</b>				
Mean ± SD.	3.1 ± 1.2	2.7 ± 1.1	11.961*	<0.001*
Median (Min. – Max.)	3 (0 – 6)	2.7 (0 – 5.7)		
<b>Lubrication</b>				
Mean ± SD.	3.5 ± 1.4	3.1 ± 1.3	10.447*	<0.001*
Median (Min. – Max.)	3.6 (0 – 6)	3 (0 – 6)		
<b>Orgasm</b>				
Mean ± SD.	3.6 ± 1.4	3.3 ± 1.3	10.458*	<0.001*
Median (Min. – Max.)	3.6 (0 – 6)	3.2 (0 – 6)		
<b>Sexual Satisfaction</b>				
Mean ± SD.	4.2 ± 1.3	4 ± 1.3	7.964*	<0.001*
Median (Min. – Max.)	4.4 (0.8 – 6)	4 (0.8 – 6)		
<b>Pain</b>				
Mean ± SD.	3.5 ± 1.4	3.3 ± 1.4		
Median (Min. – Max.)	3.6 (0 – 6)	3.6 (0 – 6)	7.808*	<0.001*
<b>Overall FSFI</b>				
Mean ± SD.	21.3 ± 6.4	19.3 ± 6	13.109*	<0.001*
Median (Min. – Max.)	22 (2 – 33.5)	19.4 (2 – 33.2)		

Z: Wilcoxon signed ranks test

\*: Statistically significant at p < 0.05

SD: standard deviation; Min. – Max.: minimum to maximum



**Figure 1:** The pattern of contraception used by studied participants (n=170)

number of follow-up visits throughout the pregnancy was only three (1-11). The fear of catching COVID-19 infection was the reason for missing follow-up visits in about three-quarters of cases (76.5%, 13/17). Moreover, approximately

half (48.5%) of the follow-up visits were private-based.

Thirty participant pregnant women (7.3%, 30/409) had abortion, and only 5 women (16.7%) underwent care after abortion.

**Supplementary Table 1:** Relation between overall FSFI with Socio-demographic characteristics of the studied participants (n = 409)

Personal data	No.	Overall FSFI Before the lockdown			Overall FSFI during the lockdown		
		Mean ± SD.	Median (Min. - Max.)	(p)	Mean ± SD.	Median (Min. - Max.)	(p)
<b>Age (years)</b>							H=11.785
<20	13	21.5 ± 5	22.1(15.8 – 28.2)	H=4.042	19.4 ± 2.9	20.8 (16 – 25.1)	(0.008*)
20 – 30	163	21.1 ± 6.6	21.4 (2 – 33.5)	(0.257)	19.3 ± 6.3	19.3 (2 – 33.2)	
≥30 – 40	184	21.9 ± 6.2	22.4 (2 – 33)		20 ± 5.9	20.1 (2 – 32.5)	
≥40	49	19.7 ± 6.5	20.1 (2.6 – 29.8)		16.6 ± 5.3	17.7 (2.6 – 28)	
<b>Level of education</b>							
Illiterate	16	20.3 ± 4	18.1 (14.4 – 28.1)	H=7.146	18.1 ± 2.8	17.9 (12.6 – 22.5)	H=16.560
Primary/secondary education	204	20.7 ± 5.9	21.4 (2 – 31.5)	(0.028*)	18.3 ± 5	18.4 (2 – 28.3)	(<0.001*)
University education	189	22 ± 6.9	22.2 (2 – 33.5)		20.5 ± 6.9	20.6 (2 – 33.2)	
<b>Level of income</b>							
Low	52	20.2 ± 6.2	18.8 (4.8 – 31.5)	H=12.531	17.6 ± 5	17.9 (4.8 – 27.6)	H=24.998
Moderate	322	21.1 ± 6.3	21.4 (2 – 33.5)	(0.002*)	19.1 ± 6	19.1 (2 – 33.2)	(<0.001*)
High	35	24.5 ± 6.5	24 (2.6 – 33)		23.6 ± 6	23.3 (2.6 – 31.9)	
<b>Occupation- status</b>							
Housewife	150	21.1 ± 6.1	21.1 (4.4 – 33.5)	U=18298.0	19.6 ± 5.8	19.6 (4.4 – 32)	U=19222.0
Employed	259	21.4 ± 6.5	22.2 (2 – 33)	(0.328)	19.2 ± 6.1	19.4 (2 – 33.2)	(0.860)
<b>Residence</b>							
Urban	278	21.3 ± 6.9	21.8 (2 – 33.5)	U=17382.5	19.5 ± 6.5	19.9 (2 – 33.2)	U=16576.5
Rural	131	21.2 ± 5.1	22.1 (2 – 32.1)	(0.459)	18.8 ± 4.8	18.5 (2 – 29.9)	(0.143)
<b>Cigarettes smoking</b>							
No	372	21.4 ± 6.5	22.1 (2 – 33.5)	U=5829.0	19.4 ± 6.1	19.7 (2 – 33.2)	U=5877.0
Yes	37	20.4 ± 4.8	18.6 (12.5 – 31.3)	(0.125)	18.5 ± 5.4	17.5 (9.2 – 32.5)	(0.143)

U: Mann Whitney test

H: Kruskal Wallis test

\*: Statistically significant at p < 0.05

SD: standard deviation; Min. – Max.: minimum to maximum; FSFI: Female Sexual Function Index.

**Supplementary Table (2):** Correlation between overall FSFI and socio-demographic data of the studied participants (n = 409)

Socio-demographic characteristics	Overall FSFI Before the pandemic lockdown		During the pandemic lockdown	
	r	p	R	p
Age of participants	-0.009	0.861	-0.055	0.269
Age of marriage	0.096	0.053	0.099	0.045*
Age of husband	-0.105	0.034*	-0.162	0.001*

r: Spearman coefficient

\*: Statistically significant at p < 0.05, FSFI: Female Sexual Function Index

Out of the 409 participants, 170 women (41.6%, 170/409) used different contraceptive methods (Figure 1). During the pandemic, around 114 individuals (28%) stopped using contraception for a variety of reasons, including fear of contracting COVID 19 during a visit to the primary health care unit, a lack of oral contraceptive tablets in pharmacies, financial reasons, and a desire for conception. There were significant differences

between the frequencies of vaginal infections, menstrual disorders, and utilization of governmental and private reproductive health services before and during the COVID19 pandemic (Table 4).

### Discussion

The COVID-19 pandemic, as a current major health crisis and its associated lockdown, has

**Table 3:** Reproductive history and reproductive health (during the COVID-19 pandemic) of the studied participants (n= 409)

<b>Reproductive history</b>	
<b>Age of menarche</b>	
Mean $\pm$ SD.	13.3 $\pm$ 1.4
Median (Min. – Max.)	13 (11 – 24)
<b>Parity</b>	
Mean $\pm$ SD.	2 $\pm$ 1.2
Median (Min. – Max.)	2 (0–7)
<b>Number of vaginal deliveries</b>	
Mean $\pm$ SD.	1 $\pm$ 1.2
Median (Min. – Max.)	0 (0–5)
<b>Number of abortion</b>	
Mean $\pm$ SD.	0.6 $\pm$ 0.9
Median (Min. – Max.)	0 (0 – 4)
<b>Reproductive health during the COVID-19 pandemic</b>	
<b>Presence of current pregnancy (n= 409)</b>	
	<b>No. (%)</b>
No	223 (54.5%)
Yes	186 (45.5%)
<b>Duration of current pregnancy in months (n = 186)</b>	
Mean $\pm$ SD.	6.2 $\pm$ 2.3
Median (Min. – Max.)	6 (1 – 9)
<b>Having the desire to be pregnant (n = 186)</b>	
	<b>No. (%)</b>
No	129 (69.4%)
Yes	57 (30.6%)
<b>The duration between the current pregnancy and the last one (n = 186)</b>	
Mean $\pm$ SD.	2.6 $\pm$ 2.4
Median (Min. – Max.)	2 (0–11)
<b>Making follow-up for the current pregnancy (n = 186)</b>	
	<b>No. (%)</b>
No	17 (9.1%)
Yes	169 (90.9%)
<b>Place of follow-up (n = 169)</b>	
	<b>No. (%)</b>
Private sector	82 (48.5%)
Governmental sector	87 (51.5%)
<b>Number of follow-up visits (n = 169)</b>	
Mean $\pm$ SD.	3.6 $\pm$ 1.7
Median (Min. – Max.)	3 (1 – 11)
<b>The month of the first follow-up visit (n = 169)</b>	
Mean $\pm$ SD.	2.5 $\pm$ 1.5
Median (Min. – Max.)	2 (1–10)
<b>What was the reason for the non-follow-up? (n = 17)</b>	
	<b>No. (%)</b>
The fear of catching COVID-19 infection	13 (76.5%)
Other causes	4 (23.5%)

SD: standard deviation; Min. – Max.: minimum to maximum

**Table 4:** Comparison between the participants' reproductive health before and during the COVID-19 pandemic (n = 409)

<b>Data on reproductive health</b>	<b>Before the pandemic</b>	<b>the</b>	<b>During the pandemic</b>	<b><math>\chi^2</math></b>	<b>McNp</b>
Having vaginal infections	154 (37.7%)		176 (43%)	7.603*	0.006*
Suffering from menstrual disorders	95 (23.2%)		129 (31.5%)	14.329*	<0.001*
Utilization of public reproductive health-related services	235 (57.5%)		110 (26.9%)	86.870*	<0.001*
Utilization of private reproductive health-related services	249 (60.9%)		151 (36.9%)	56.681*	<0.001*

$\chi^2$ : Chi-Square test

McN: McNemar test

p-value for comparing between **before the pandemic** and **during the pandemic**

\*: Statistically significant at  $p < 0.05$

caused global disturbances to health, healthcare, social life, and business<sup>1,5</sup>. Few earlier reports with conflicting results investigated the impact of the COVID-19 pandemic on sexual behavior, quality of sexual life, and reproductive health, especially in females<sup>23-24</sup>.

The present study revealed a significant decrease in the overall FSFI score during the pandemic compared with the score before it. Additionally, there were significant reductions in the six domains of sexual life. These findings powerfully indicate the effect of the COVID-19 pandemic and its related lockdown measures on the deterioration of the quality of female sexual life. Besides, the accompanying psychological influences and hormonal disturbances (such as increased cortisol level inhibiting the hypothalamic-pituitary-gonadal axis) may be responsible for the sexual dysfunction, particularly decreased arousal<sup>25</sup>. Similarly, Omar *et al.*<sup>26</sup> conducted a survey in Egypt, including married men (289) and women (484), and assessed sexual performance, satisfaction, the prevalence of anxiety and depression, and their correlation with sexual dysfunction. Regarding female participants, they used the Arabic validated FSFI and showed that during the pandemic, 71.6% had total FSFI scores <26.5. However, they didn't analyze the FSFI score before the pandemic; therefore, it is unclear if the reduction in total FSFI was caused by the COVID-19 pandemic and accompanying lockdown measures or was already present before the pandemic. They did not exclude females with chronic illness from the survey, and 19.4% of the female participants had chronic diseases, such as cardiovascular disease and rheumatoid arthritis<sup>26</sup>. Chronic medical conditions, especially cardiovascular diseases<sup>27-28</sup>, rheumatic diseases<sup>29</sup>, and hypothyroidism<sup>30</sup>, can directly and indirectly impair the six domains of the female sexual functions due to the blockage of neurovascular pathways, the hormonal imbalance caused by diseases, and the associated depression<sup>31</sup>.

The results of the present study were in agreement with Hriday *et al.*, who demonstrated a significant reduction in the total FSFI score during the pandemic with specified reductions in arousal, lubrication, and satisfaction among enrolled females in the United States<sup>32</sup>. Similar findings were reported by another study that investigated the effect of the COVID-19 pandemic on female sexual

health among women in Poland<sup>33</sup>. Likewise, Li *et al.* found a decline in the frequency of sexual intercourse and desire due to the COVID-19 pandemic among young people in China<sup>34</sup>. Yuksel *et al.* found a significant reduction in the overall FSFI total score among women in Turkey during the COVID-19 pandemic compared to the pre-pandemic total scores. In contrast, they reported an increase in sexual desire and frequency of intercourse during the lockdown<sup>24</sup>. An observational study in Italy that included sexually active females was performed during the period of applying the quarantine measures and showed a significant decrease in the rate of sexual intercourse and the overall FSFI score and a significant increase in female sexual dysfunction<sup>9</sup>.

Conversely, Cocco *et al.* reported an increased desire in up to 40% of their participants in Italy during the COVID-19 pandemic. However, they did not use a validated questionnaire to assess the desire, and there was a significant decrease in sexual satisfaction among their participants during the lockdown compared to before<sup>17</sup>. Likewise, a survey conducted in Italy during the pandemic over more than 1,500 adults revealed that the majority of respondents had no change in sexual desire. Nevertheless, there was a significant decrease in the number of sexual intercourse during the lockdown measures compared to the number before it. In contrast to our study, they didn't assess the sexual functions and didn't use a validated questionnaire<sup>35</sup>. In a study performed in India, Bangladesh, and Nepal, most participants did not consider that pandemic quarantines had altered their sexual lives. Only 21.7% of the respondents were females, and their respondents had characteristics that might separately impact their sexual lives, such as chronic illness, psychiatric disorders, taking medications, and being addicts. Furthermore, they did not use a validated questionnaire<sup>36</sup>.

Regarding reproductive health, many governments were restricting people's movements to minimize the COVID-19 spread, and providers were forced to suspend some reproductive health services. Consequently, there were increases in unintended pregnancy and maternal and newborn mortality in low-and middle- income countries<sup>8</sup>.

This study described how pregnant women managed to cope with the lockdown in Egypt. We found that nearly half of the participants were

pregnant (45.5%, 186/409). However, about 70% (129/186) of pregnant women intended not to have this current pregnancy because they were afraid of delivering alone, the inadequacy of health care services in Egypt, and the possible effects of the virus on their newborns. Thus, there was an increase in the rate of unwanted pregnancy during the pandemic. Like the participants of this study, most women in Turkey intended to avoid pregnancy during the pandemic<sup>24</sup>.

The pregnancy rate during the pandemic in this study was considered high when compared with that of Coombe *et al.*, who investigated the effect of the COVID-19 pandemic on the reproductive health of Australian women and reported a few pregnancy rate (1.9%, 10/516)<sup>23</sup>. This study suggested an interruption in reproductive health services due to the COVID-19 pandemic. About 9% (17/186) of women did not follow up on their current pregnancy. Among them, 76.5% (13/17) reported the fear of getting an infection with the COVID-19 pandemic as the cause of missing follow-up. The median number of antenatal care visits was only three, where most women first received antenatal care in the second month of pregnancy. Nearly half of pregnant women (82/169) received antenatal care visits in the private sector. A small number of participants (7.3%, 30/409) reported abortion during the pandemic, and only five (16.7%) received care after abortion. These findings were in line with previous findings in Guinea after the Ebola epidemic, where the number of antenatal care visits and reproductive facility deliveries were reduced<sup>37</sup>.

This study showed a significant reduction in access to public and private reproductive health services during the pandemic compared with before (26.9% vs. 57.5%,  $P < 0.001$ , and 36.9% vs. 60.9%,  $P < 0.001$ , respectively). In line with these results, even in China – a country with a sound drug supply system – Li *et al.* described interruptions in reproductive health services due to the COVID-19 pandemic, such as prenatal and postnatal examination, delivery and abortion services, and availability of contraceptive aids<sup>34</sup>.

Among the participants of this study, there was a significant increase in the proportion of women who complained of menstrual disorders and vaginal infections during the pandemic compared with before the pandemic (43% versus 37.7%,  $P < 0.001$  and 31.5% vs. 23.2%,  $P 0.006$ , respectively)

due to reduced access to reproductive health services. These findings were consistent with previous reports, which noted that disasters increase the rate of vaginal infections due to decreased personal hygiene, difficulty in accessing health institutions, and unsanitary living conditions<sup>38-39</sup>. In contrast, Yuksel found no significant difference in vaginal infection rates before and after the COVID-19 pandemic in Turkey, but menstrual abnormalities significantly increased during the pandemic<sup>24</sup>.

This study showed that 41.6% of women used contraception methods before the pandemic. More than a quarter of the women (27.5%) stopped using contraception methods during the COVID-19 pandemic for different reasons. These findings are similar to Yuksel *et al.*<sup>24</sup> and Kissinger *et al.*<sup>39</sup>, who reported a significant decrease in the rate of contraception use by women during the COVID-19 pandemic in Turkey and Hurricane Katrina disaster in New Orleans respectively.

## Limitations

The findings of this study were based on an observational retrospective online survey, and data were collected using a purposive sample due to the COVID-19 pandemic lockdown measures. Also, only women with internet access and active social accounts could participate in this study.

## Strength

The study used standardized valid questionnaires to assess sexual and reproductive health among women in the context of the COVID-19 pandemic in Egypt.

## Ethical considerations

In line with the guidelines of the Helsinki Declaration and items of the STROBE statement, approval was granted by the Institutional Review Board and the Research Ethics Committee, Faculty of Medicine, Suez Canal University, Ismailia, Egypt, on 5/7/2020 with the approval code: 4238

## Conclusion

COVID-19 pandemic and its related lockdown were associated with an elevated risk for female sexual dysfunction. Women's reproductive health

was also affected as there were increased unwanted pregnancies, decreased use of contraception, and increased menstrual disorders. Health system should therefore develop new methods to provide basic reproductive health and family planning services, and to ameliorate the female sexual function during pandemics including consults with physicians, counsellors, and psychologists, as well as health education programs, either in person or virtually via telemedicine.

## Recommendations

Additional large-scale studies are required to investigate women's reproductive and sexual health in the context of the pandemic, including all population groups. The health system should continue providing basic reproductive health services, such as antenatal care, post-abortion care, and family planning services during the pandemic. Health authorities should introduce new methods to provide basic reproductive health services, such as telemedicine (voice or video calls) for low-risk women to decrease the spread of the COVID-19 pandemic. Moreover, the government must maintain the supply of different contraception methods and make them available for all women.

## Consent to participate

Written informed consent was obtained from all individual participants included in the study.

## Consent to publish

The participant has consented to the submission of the case report to the journal.

## Conflict of interest

The authors declare that they have no conflict of interest.

## Data availability

Data are available upon request.

## Authors' contributions

Noha M Abu Bakr Elsaid: Protocol/project development, Data collection and management; manuscript writing/editing. Heba Saber Mohammed: Protocol/project development; data

collection and management; manuscript writing/editing. Asmaa Abobakr Ibrahim:; data collection, and management and analysis. Radwa El- Sayed Mahmoud Marie: Data collection and management; manuscript writing/editing. Radwa El- Sayed Mahmoud Marie: Data collection and analysis. Zeinab F Abdel-Fatah: manuscript writing and revision. Hanan H Soliman: Data collection and management; analysis; manuscript writing/editing. All authors read and approved the final manuscript.

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