Quality & Quantity (2021) 55:1239–1259
https://doi.org/10.1007/s11135-020-01057-8

Analyses the effects of COVID-19 outbreak on human sexual behaviour using ordinary least-squares based multivariate logistic regression

Chandrakanta Mahanty[1] · Raghvendra Kumar[1] · Brojo Kishore Mishra[1]

Accepted: 10 October 2020 / Published online: 18 October 2020

Abstract
This study aimed to evaluate the impact of COVID-19 on sexual, mental and physical health. There were 262 respondents included in this study (38% female and 62% male) above 18 years of age from India. Statistical analysis was performed using Ordinary Least Squares (OLS) based on multivariate logistic regression analysis. The numerical tests were performed by using Python 3 engine and R-squared (coefficient of multiple determinations for multiple regressions) for prediction and P value > 0.5 is considered to be statistically significant. The study outcomes were obtained using a study-specific questionnaire to assess the quality of sex life, changes in sexual behavior and mental health. Frequency of sexual intercourse, frequency of watching porn, sexual hygiene, frequency of physical activity, depression, desire for parenthood in female respondents have more significant R^2 (0.903, 0.976, 0.973, 0.989, 0.985, 0.862) value respectively as compared to male respondents. Financial anxiety, Smoking and drinking habits in male respondents have more significant R^2 (0.917, 0.964) value respectively as compared to female respondents. The aim of this study is to understand quality of sex life, sexual behavior, reproductive planning, mental health, physical health and adult coping during the COVID-19 pandemic, as well as how past experiences have affected. Many respondents had a broad variety of problems concerning their sexual and reproductive well being. Measures should be set in order to safeguard the mental and sexual health of people during the pandemic.

Keywords COVID-19 · Sexual behavior · Mental health · Physical health · Ordinary least squares · Multivariate logistic regression · Depression · Anxiety

✉ Raghvendra Kumar
raghvendraagrawal7@gmail.com

Chandrakanta Mahanty
chandra.mahanty@gmail.com

Brojo Kishore Mishra
bkmishra@giet.edu

[1] Department of Computer Science and Engineering, GIET University, Gunupur, India

1 Introduction

SARS-CoV-2 (Severe acute respiratory syndrome coronavirus-2) was identified in feces, digestive tract, urine and saliva samples and a little quantity in semen (Li et al. 2020). Till date, there has been no report to show whether SARS-CoV-2 can be transmitted via sexual transmission. Consequently, on the basis of the SARS-CoV-2 transmission route, current preventive measures, including the maintenance of personal and environmental health and the implementation of strict community contact and droplet preventive strategies, can probably stop coronavirus spread. SARS-CoV-2 has been shown to occur in the feces of COVID-19 patients, suggesting that SARS-CoV-2 can be transmitted through orally. Governments all over the world have imposed more or less stringent isolation measures in an attempt to stop the spread of the virus. The outbreak of COVID-19 and a sequence of government-adopted strict regulation strategies had many adverse effects on people and society. People may encounter activity restrictions, poor mental health, distress, life-threatening circumstances, and loss of jobs, unemployment, lower earnings, and detachment from their families or partners (Duan and Gang 2020). Under these unusual circumstances, people will also undergo remarkable changes in their sexual behaviors. If lockdown and social isolation in terms of physical confinement have proven to be very successful, mental health appears to be compromised by the emergence of feelings such as anxiety, depression and fear. Mental health workers will undoubtedly be called upon in the near future to confront a parallel epidemic of acute stress disorders, sleep disturbances, depressive syndromes, emotional instability and ultimately suicides. As the restrictions associated with coronavirus became more widespread, the news media began reporting on prospective changes in sexual behavior, increasing online pornography searches, dating app downloads, sex toy purchases and pornographic social media posts (Lehmiller et al. 2020). Lockdown in India drives couples into a long, inescapable proximity. Prolonged contact may also have a negative impact. Interpersonal tension may escalate during lockdown, since couples in prolonged, forced proximity have enough time and ability to identify deficiencies in each other and in their relationships. This might lead to conflicts that could intensify into marital disharmony. Disharmony may decrease the sexual appeal of the partner and result in serious sexual problems, partner violence and sexual abuse (Sathyanarayana Rao and Andrade 2020). Forced proximity, lockdown, uncertainty about work and money, and other tension may cause new psychological disorders. Twitter's sentiment analysis has shown that India's lockdown incites anger, fear and negativity (Barkur and Vibha 2020). Healthy sexual functioning requires sound environment, a sound body and a sound mind. Recent studies have reported the impact of the COVID-19 pandemic on sexual and mental health discussed in Table 1.

There are relatively few studies on the effect of sexual and mental health on COVID-19 on the Indian population. The main objective of this paper is

- Impact of the COVID-19 pandemic on sexual and mental health, its associated lifestyle habits and the quality of sex life among Indian adults.
- Statistical analysis was performed using Ordinary Least Squares (OLS) based on multivariate logistic regression analysis.
- Outcomes were obtained using a study-specific questionnaire to assess the quality of sex life, changes in sexual behavior and mental health. Frequency of sexual

Table 1 Effect of COVID-19 Pandemic on Sexual and Mental Health

Authors	Objective	Methods	Outcomes
Jacob et al. (2020)	Investigate the sexual activity in UK during COVID-19 outbreak.	Online Survey	Clinical and demographic data were gathered during self-isolation. The relationship between various factors and sexual behaviors was analyzed using a multivariate logistic regression model.
Yuksel and Faruk (2020)	Investigate the sexual activity in Turkey during COVID-19 outbreak.	They compared desire for parenthood, intercourse frequency for female.	Before the pandemic, 32.7% respondents wanted to become pregnant and its increases by 5.1% during the pandemic as per FSFI report.
Chatterjee et al. (2020)	They researched doctors' behavior during the pandemic, and how it affected their levels of depression and anxiety.	They used depression and Stress Scale-21 to measure mental health. 152 respondents completed an online questionnaire survey.	32.9% were stressed and 34.9%, 39.5% were having depression and anxiety respectively. Multivariable logistic regression was found to be important in most variables related.
Rehman et al. (2020)	They aimed to examine stress during the COVID-19 Pandemic.	403 respondents were completed an online questionnaire survey regarding mental health. They used Anova, SPSS v 21, t-test methods for data analysis.	Depression and stress levels were found to be mild while anxiety levels among males and females were low. Their results showed that young students and health workers require extra care because of their heightened psychological distress.
Micelli et al. (2020)	They assessed the impact COVID-19 pandemic on married peoples.	A quantitative co-relational of Italian women (944) and men (538) between 18 and 46 years.	There was a significant trend towards decreased 18.1% of participants planning, 37.3% abandoned their intention, economic difficulties (58%) and pregnancy (58%) during the COVID-19 Pandemic.
Jin et al. (2020)	Compared the severity and mortality during COVID-19 for both male and female patients.	Chi square (Š2) test, student t-test for male and female survival.	Males tend to be more severe than females ($P=0.035$). The number of people in the deceased ($P=0.015$).
Li et al. (2020)	Discussed the magnitude of the mental and physical health during the COVID-19 Pandemic.	They gathered demographic data of staff at 34 hospitals. Health care staffs were registered for COVID-19 hospitals fitted with fever wards.	Symptoms anxiety (560, 46%), insomnia (427, 34.0%), and distress (899, 71.5%) and depression (634, 50.4%).

intercourse, frequency of watching porn, sexual hygiene, frequency of physical activity, depression, desire for parenthood in male and female.
- Analysis of Sexual behavior before and during the COVID-19 Pandemic for both male and female.

2 Materials and methods

2.1 Data collection

The questionnaire answer has been forwarded to the associates of both investigators and the respondents have been asked to forward or share connections to their contact groups. A brief discussion of this survey was displayed on the screen by clicking on the questionnaire button, circulated during the study, followed by the consent form. Participation is available to all adults who live in India, aged 18 and over. In addition, during the pandemic phase, including before and during COVID-19, they were forced to stay in India (14 October 2019- 16 January 2019, and 10 February 2020- 28 June 2020). Participants were asked to complete online surveys about their background details (e.g., age, occupation, economic status, gender, and chronic medical illness), sexual behavior, quality of sex life, sexual hygiene, depression, financial anxiety and stress experiences before and during the COVID-19 pandemic. A total of 262 responses be analyzed from the respondents lived in India. Socio-economic and demographic characteristics of respondents are represented in "Appendix 1". List of questionnaires related to changes in sexual behavior, quality of sex life, sexual health, and mental wellbeing is presented "Appendix 2". The questions with serial numbers used in "Appendix 2" are categorized into female, male, general respondents represented in "Appendix 3". Subset selection, descriptive statistics of respondents' sexual, mental, physical health before and during the COVID-19 outbreak is presented in "Appendix 4". The complete work flow model is illustrated in Fig. 1. At first we collect the data using online survey from the respondents. We prepossess the data and categorize the data into similar groups. Then we apply the OLS statistical model for fitting analysis. Then we analyze and estimate the data and predicted the output.

2.2 Statistical analysis

Statistical analysis was carried out using Ordinary Least-Squares (OLS) based on multivariate logistic regression analysis. The numerical tests were performed by using Python 3 engine with panda and GPU as backend with system RAM 12 GB. OLS regression is a mathematical analytical technique that forecasts the association between one or more

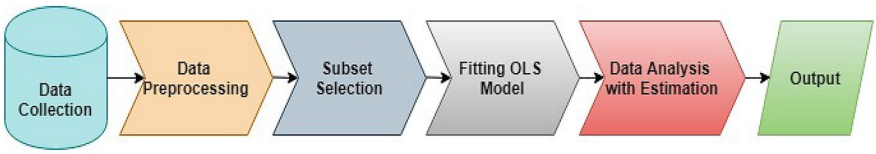


Fig. 1 Work flow adopted to obtain results

independent variables and a dependent variable and multivariate regression (Alexopoulos 2020) is an extended form of the normal OLS regression (Eq. 1).

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots \beta_p x_{ip} + \in \tag{1}$$

Here, y_i and x_i is denoted as dependent and explanatory variables. β_0 and β_p represented as y-intercept for each explanatory variables. Models error terms or residuals denoted as $\in$.

Regression is a strong technique that can concurrently evaluate several variables to address specific testing questions. R-squared (R^2) (Miles 2014) is known as the coefficient of multiple determinations for multiple regressions represented in Eq. 2. Here, $\hat{y}_i$ is represented as fitted value. y_i denoted as observed value of the dependent variable and $\bar{y}$ as its mean. The numerator of the equation represents sum of squares for the regression. The denominator of the equation is equivalent to the sample variance multiplied by $n - 1$.

$$R^2 = \frac{\sum(\hat{y}_i - \bar{y})^2}{\sum(y_i - \bar{y})^2} \tag{2}$$

R^2 (quotient of the variances) can only be between 0 and 1, where 0 indicates that none of the independent variables can predict the outcome and 1 indicates that the independent variables can predict the outcome without error and P-value > 0.5 considered for statistically significant.

3 Experimental results and analysis

There were 262 respondents included in this study (38% female and 62% male) above 18 years of age from India. The respondents filled all compulsory questionnaires regarding demographic data, changes in sexual behavior, quality of sex life, stress, depression and financial anxiety data. We applied the OLS model to the most relevant questions and analyze the data. We compared the data between male and female. The variables which have p-value (probability of obtaining results) greater than 0.5 that variables are more significant as compared to others. The dependent variables with OLS regression results are presented in (Tables 2, 3, 4, 5, 6, 7, 8 and 9). Co-relation factor for female and male are illustrated in "Appendix 5".

3.1 Desire for parenthood before and during COVID-19 outbreak

Desire of parenthood in case of male respondents is much significant as compared to female before COVID-19 (Table 2). The R^2 value of Female respondents (0.862) is much higher than male respondents during COVID-19. Financial anxieties, smoking and drinking habits for male respondents are increased during the outbreak. Thus, Male respondents have less desire of parenthood during outbreak. Frequency of sexual intercourse for female is more significant as compared to male during the pandemic. Safe sexes, frequency of watching porn variables are having low values. Female use less contraception so that their desire of being parenthood probability increases.

Table 2 Dependent variable (Desire for parenthood during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	−0.2023	0.757	1.6255	0.232
Occupation	−0.4125	0.228	1.3349	0.015
Economic status	−1.068	0.304	0.2627	0.262
Chronic medical illness	0.177	0.72	0.2381	0.627
Under which zone does your (town/city) lie?	0.1645	0.672	−0.4658	0.111
Frequency of sexual intercourse (Before)	−0.0506	0.793	−0.2809	0.239
Frequency of sexual intercourse (During)	−0.13	0.462	−0.0468	0.856
Smoking and drinking habits (Before)	0.1143	0.572	0.1017	0.75
Smoking and drinking habits (During)	−0.3176	0.653	0.3555	0.36
Frequency of watching porn (Before)	0.2149	0.181	0.0485	0.815
Frequency of watching porn (During)	0.0351	0.818	0.2839	0.156
Sexual hygiene (Before)	0.0392	0.793	−0.195	0.408
Sexual hygiene (During)	0.0147	0.917	−0.1382	0.566
Safe sex (Before)	−0.0331	0.857	−0.2716	0.381
Safe sex (During)	−0.0261	0.819	−0.2054	0.262
Financial anxiety (Before)	−0.1145	0.765	−0.1941	0.584
Financial anxiety (During)	−0.2173	0.874	0.0163	0.461
Desire for parenthood (Before)	−0.2369	0.562	0.4102	0.172

3.2 Depression, anxiety, farness, mental stress during COVID-19 outbreak

Depression level in male is less as compared to female before the COVID-19 outbreak (Table 3). Depression, anxiety, farness, mental stress in case of female respondents is much significant as compared to male during outbreak. The R^2 value of Female respondents (0.985) is much higher than male respondents during COVID-19. Smoking and drinking habits, financial anxiety, disconnect from social media, frequency of sexual intercourse variables are more significant in female during COVID-19. For female work from home culture is very difficult to implement. They have to manage family as well as work. Thus, female respondents felt more mental stress, feeling down and hopeless as compare to male during pandemic.

3.3 Sexual hygiene during COVID-19 outbreak

The R^2 value of Female respondents (0.973) is much higher than male respondents during COVID-19 (Table 4). Female washes their hands and body thoroughly with soap and water before and after sexual intercourse to avoid COVID-19 infection. They also uses mask during kissing. Thus, female respondents are obeying sexual hygiene more as compared to male during the pandemic.

Table 3 Dependent variable (Depression, anxiety, farness, mental stress during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	−0.2482	0.443	−0.1325	0.814
Occupation	0.3179	0.056	−0.4936	0.029
Economic status	−0.0856	0.87	−0.1014	0.281
Chronic medical illness	0.1864	0.447	0.0868	0.659
Under which zone does your (town/city) lie?	−0.2101	0.272	0.1647	0.165
Frequency of sexual intercourse (Before)	0.1089	0.251	0.2152	0.012
Frequency of sexual intercourse (During)	0.0061	0.945	−0.0225	0.827
Smoking and drinking habits (Before)	−0.0139	0.891	−0.0155	0.904
Smoking and drinking habits (During)	0.2379	0.255	−0.0243	0.878
Frequency of physical activity (Before)	0.1276	0.039	0.0752	0.551
Frequency of physical activity (During)	−0.1112	0.147	−0.2927	0.023
Depression, anxiety, farness, mental stress (Before)	0.5985	0.001	0.7428	0.011
Financial anxiety (Before)	−0.1236	0.516	0.1527	0.272
Financial anxiety (During)	0.1311	0.496	0.057	0.664
Disconnect from social media, electronic gadgets, family and friends (Before)	0.18	0.188	−0.0904	0.677
Disconnect from social media, electronic gadgets, family and friends (During)	-0.0324	0.757	0.0988	0.544
Work from home culture (Before)	0.3276	0.019	0.142	0.116
Work from home culture (During)	−0.3492	0.006	0.0115	0.904

Table 4 Dependent variable (Sexual hygiene during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	−1.5745	0.113	2.2966	0.18
Occupation	0.4772	0.377	0.2785	0.727
Economic status	2.9657	0.06	−0.1996	0.511
Chronic medical illness	−1.0771	0.154	0.7706	0.201
Under which zone does your (town/city) lie?	−1.2598	0.028	−0.095	0.809
Frequency of sexual intercourse (Before)	−0.3353	0.26	−0.2732	0.375
Frequency of sexual intercourse (During)	0.1763	0.524	0.0415	0.899
Sexual hygiene (Before)	0.5211	0.017	0.7205	0.005
Safe sex (Before)	0.3967	0.157	0.098	0.807
Safe sex (During)	0.0504	0.778	0.0581	0.808

3.4 Smoking and drinking habits during COVID-19 outbreak

The R^2 value of male respondents is predicted as 0.964 (Table 5). Financial anxiety, depression, frequency of sexual intercourse, stress is affected by drinking habits. Drinking alcohol

Table 5 Dependent variable (Smoking and drinking habits during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	0.8284	0.008	−1.1454	0.282
Occupation	0.0438	0.808	−1.0062	0.02
Economic status	−1.4084	0.005	−0.0982	0.599
Chronic medical illness	0.6702	0.004	−0.6873	0.05
Under which zone does your (town/city) lie?	0.5693	0.001	−0.0388	0.872
Frequency of sexual intercourse (Before)	−0.0348	0.728	0.0431	0.822
Frequency of sexual intercourse (During)	0.1076	0.236	0.3297	0.077
Smoking and drinking habits (Before)	0.3182	0.501	0.1146	0.044
Frequency of watching porn (Before)	0.1522	0.062	0.0134	0.934
Frequency of watching porn (During)	0.1384	0.069	−0.0808	0.619
Frequency of physical activity (Before)	−0.0758	0.254	−0.1844	0.449
Frequency of physical activity (During)	0.1944	0.01	0.0488	0.862
Depression, anxiety, farness, mental stress (Before)	−0.062	0.722	−0.3767	0.562
Depression, anxiety, farness, mental stress (During)	0.2573	0.255	−0.0917	0.878
Financial anxiety (Before)	0.2248	0.251	0.1859	0.499
Financial anxiety (During)	−0.3181	0.102	−0.0441	0.863
Desire for parenthood (Before)	−0.2354	0.262	−0.2238	0.35
Desire for parenthood (During)	−0.0855	0.453	0.2155	0.36

Table 6 Dependent variable (Frequency of physical activity during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	−1.7127	0.051	1.4329	0.215
Occupation	0.184	0.706	−0.9498	0.054
Economic status	2.7116	0.055	−0.0389	0.85
Chronic medical illness	−0.7708	0.259	0.4668	0.252
Under which zone does your (town/city) lie?	−0.8806	0.095	0.382	0.127
Frequency of sexual intercourse (Before)	0.1883	0.485	0.4373	0.018
Frequency of sexual intercourse (During)	0.0908	0.715	0.0793	0.717
Frequency of watching porn (Before)	−0.2977	0.186	−0.277	0.096
Frequency of watching porn (During)	−0.3451	0.096	−0.288	0.084
Frequency of physical activity (Before)	0.4833	0.003	0.6297	0.006
Depression, anxiety, farness, mental stress (Before)	0.3321	0.479	1.3424	0.039
Depression, anxiety, farness, mental stress (During)	−0.8786	0.147	−1.3259	0.023

and smoking affect blood pressure, cholesterol and heart health and sexual health. Frequency of physical activity is decreased and frequency of watching porn increased.

Table 7 Dependent variable (Financial anxiety during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	0.231	0.533	−0.5852	0.656
Occupation	−0.0973	0.623	0.0543	0.927
Economic status	−0.8806	0.131	0.2073	0.35
Chronic medical illness	0.2317	0.407	−0.0385	0.934
Under which zone does your (town/city) lie?	−0.0718	0.745	0.1069	0.712
Smoking and drinking habits (Before)	0.0322	0.78	−0.1726	0.562
Smoking and drinking habits (During)	−0.3832	0.102	−0.064	0.863
Frequency of physical activity (Before)	−0.0885	0.224	−0.0286	0.923
Frequency of physical activity (During)	0.1364	0.117	0.1596	0.636
Depression, anxiety, farness, mental stress (Before)	−0.1305	0.493	0.3127	0.691
Depression, anxiety, farness, mental stress (During)	0.1707	0.496	0.3125	0.664
Financial anxiety (Before)	0.855	0.01	0.0286	0.932
Desire for parenthood (Before)	−0.0735	0.753	−0.2628	0.363
Desire for parenthood (During)	−0.0704	0.574	0.0143	0.961

Table 8 Dependent variable (Frequency of sexual intercourse during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	P>|t|	coef	P>|t|
Age	−1.1173	0.159	0.6121	0.715
Occupation	−0.2675	0.535	0.9076	0.212
Economic status	−0.585	0.654	0.2357	0.407
Chronic medical illness	0.4394	0.472	0.2442	0.678
Under which zone does your (town/city) lie?	−0.7325	0.118	−0.0073	0.984
Frequency of sexual intercourse (Before)	0.4323	0.06	−0.0696	0.814
Smoking and drinking habits (Before)	−0.4723	0.05	−0.3737	0.318
Smoking and drinking habits (During)	0.6165	0.236	0.78	0.077
Frequency of physical activity (Before)	−0.139	0.385	−0.1712	0.651
Frequency of physical activity (During)	0.0712	0.715	0.1564	0.717
Financial anxiety (Before)	−0.5198	0.268	−0.3925	0.349
Financial anxiety (During)	−0.0961	0.842	−0.1429	0.716
Disconnect from social media, electronic gadgets, family and friends (Before)	−0.1906	0.582	−0.3686	0.568
Disconnect from social media, electronic gadgets, family and friends (During)	0.6734	0.005	−0.2682	0.582
Work from home culture (Before)	0.216	0.559	0.44	0.102
Work from home culture (During)	−0.4493	0.182	0.1422	0.614
Desire for parenthood (Before)	−0.2595	0.61	−0.2222	0.551
Desire for parenthood (During)	−0.2005	0.462	−0.0671	0.856

Table 9 Dependent variable (Frequency of watching porn during COVID-19 outbreak) with OLS Regression Results

Variables	Male		Female	
	Coef	$P>\|t\|$	Coef	$P>\|t\|$
Age	−1.4547	0.113	0.7632	0.711
Occupation	0.4902	0.325	−1.4909	0.084
Economic status	0.7734	0.61	−0.0054	0.988
Chronic medical illness	−0.1013	0.887	−0.0425	0.953
Under which zone does your (town/city) lie?	−1.3777	0.008	0.6055	0.164
Frequency of sexual intercourse (Before)	−0.0408	0.884	0.3265	0.358
Frequency of sexual intercourse (During)	0.01	0.969	−0.1549	0.681
Frequency of watching porn (Before)	0.2112	0.369	−0.157	0.606
Sexual hygiene (Before)	−0.1513	0.482	0.5373	0.105
Sexual hygiene (During)	−0.3565	0.069	−0.1127	0.752
Safe sex (Before)	0.4482	0.079	0.723	0.097
Safe sex (During)	−0.1452	0.375	0.559	0.023
Depression, anxiety, farness, mental stress (Before)	0.7792	0.098	2.5492	0.02
Depression, anxiety, farness, mental stress (During)	−1.3667	0.023	−1.7537	0.099

3.5 Frequency of physical activity during COVID-19 outbreak

Frequency of physical activity in female is having more significant as compared to male before and during COVID-19 (Table 6). The R^2 value of female respondents is predicted as 0.989. Depression, anxiety Frequency of watching porn decreases in male and female. Frequency of sexual intercourse, sexual health increases due to the physical exercise. Physical activity can improve muscle strength, reduce anxiety and boost sexual endurance.

3.6 Financial anxiety during COVID-19 outbreak

Male having severe panic to financial anxiety as compared to female during COVID-19 (Table 7). The R^2 value of male respondents is predicted as 0.917. Fear of losing job, financially unstable and worries of future economic difficulties in male lead to high financial anxiety during COVID-19. It affects mental health, physical health and desire for parenthood.

3.7 Frequency of sexual intercourse during COVID-19 outbreak

Frequency of sexual intercourse in female has significant improvement as compared to male (Table 8). The R^2 value of female respondents is predicted as 0.903. Desire for parenthood, work from home culture, disconnect from social media, financial anxiety, very much active in physical activity and less smoking and drinking habits in female lead better sexual satisfaction. Quality of sex life and mental wellbeing also improved. Financial anxiety, stress and drinking habits in male lead to degradation in sexual life.

Table 10 Changes in sexual behavior, quality of sex life before and during COVID-19 Outbreak in percentage

Domain	Before COVID-19 (M) %	During COVID-19 (M) %	Before COVID-19 (F) %	During COVID-19 (F) %
Changes in sexual behavior before and during COVID-19 Outbreak				
Sexual desire or interest	45	44	51	63
Sexual excitement	46	45	50	60
Lubrication	41	42	41	50
Orgasm or climax	44	47	43	51
Pain	26	35	34	40
Quality of sex life before and during COVID-19 Outbreak				
Satisfaction	69	67	66	73
Sexual hygiene	69	61	40	64
Safe sex	56	55	51	61
Frequency of sexual intercourse	39	32	43	61
Sexual intimacy and role-play	26	25	33	45

Table 11 Changes in mental, sexual and physical health before and during COVID-19 Outbreak in percentage

Domain	Before COVID-19 (M) %	During COVID-19 (M) %	Before COVID-19 (F) %	During COVID-19 (F) %
Smoking and drinking habits	19	26	17	24
Frequency of watching porn	30	34	33	50
Frequency of Masturbation	36	32	–	–
Erectile dysfunction problem	26	25	–	–
Frequency of physical activity	59	64	60	62
Depression, anxiety, farness, mental stress	24	21	22	23
Financial anxiety	14	13	12	13
Disconnect from social media, electronic gadgets, family and friends	38	36	32	27
Work from home culture	32	41	35	25

3.8 Frequency of watching porn during COVID-19 outbreak

Frequency of watching porn in female has more as compared to male (Table 9). The R^2 value of female respondents is predicted as 0.976.

3.9 Changes in sexual behavior, quality of sex life before and during COVID-19 Outbreak

Changes in sexual behavior mostly depend on sexual desire or interest, sexual excitement lubrication orgasm or climax and sexual pain. Quality of sex life mostly depends on sexual satisfaction, sexual hygiene, and safe sex, frequency of sexual intercourse and sexual intimacy and role-play. The changes in sexual behavior, quality of sex life for male and female are represented in Table 10.

Presence of penile infection in male penis increased from 21 to 35% before and during COVID-19 outbreak. Presence of vaginal infection in female vagina increased from 6 to 8% before and during pandemic. Menstrual abnormalities also increased from 47 to 57% before and during COVID-19 epidemic (Table 11).

4 Discussion

COVID-19 is not an infection that is sexually transmitted, but can be transmitted by kissing and close contact, including having sex. Coronavirus not transmitted via anal or vaginal intercourse. Contact of nose and mouth droplets, infected person's saliva can lead to the transmission of coronavirus through close contact with others. It is also shown that the virus exists in faces, which also allows the virus to be transmitted by licking around the anal areas. If partner have COVID-19 symptoms, we should not kiss or have sex. If partner is having sex with other people who don't live with the partner, then this increases risk of getting COVID-19. We should avoid sexual activities which include licking around the anus. We should take a shower and fully wash your hand and body before and after sex with soap and water. Hand sanitizers should not apply to a penis or vagina, but should only be employed on the hands to kill bacteria. Hand sanitizer includes ingredients including glycerin, alcohol with isopropyl and other harsh compounds. Hand sanitizer may kill the sperm cells. If we use sex toys, wash them thoroughly with soap and water and do not share with others. There are other ways to have sexual satisfaction without physical touch, such as having fun with masturbation, vibrators and phone or webcam sex to prevent the spread of COVID-19.

Lockdowns and self-quarantine initiatives around the world have increased the burden of women, as more people are home-bound for a continuous period of time, and work-related care has increased. It shows that Indian women work for almost 6 h or work unpaid every day. The OECD data indicate that the work of women has been completed almost 6 h. In contrast, Indian men spend on average less than an hour doing the same thing. Indian women filed more complaints of domestic violence during the first four phases of the COVID-19-related lockdown than had been recorded in the last 10 years during a similar period. Women made 1477 allegations of domestic abuse between 25 March 2020 and 31 May 2020. Sexual and gender-based violence is the hidden consequence of the pandemic of COVID-19. Across the world, cases of increased domestic abuse and intimate partner violence have been reported, including Brazil, France, India, China, the United States, the United Kingdom and others. Women who get COVID-19 while pregnant are expected to experience mild to moderate symptoms, similar to cold or flu. Most women will have a full recovery without any risk to the unborn child.

Across the world, a number of health experts have warned against drinking and smoking in the face of the coronavirus pandemic. Many studies show that both alcohol and smoking

have a serious effect on the immune system, and that, given the current health emergency, doctors and medical staffs are advising people to reduce their tobacco and alcohol use. Closer to India, numerous states have imposed a ban on the sale of alcohol and tobacco products in the middle of the lockdown, as health professionals have advised. Chewing smokeless tobacco products increases the production of saliva followed by a strong urge to spit. Spitting in public locations could increase the spread of the COVID-19 virus. The India Child Protection Fund (ICPF) report showed that online child pornography traffic during the COVID-19 pandemic lockdown in India has increased by 95% compared to the average before the lockdown. Lockdowns implemented worldwide as a result of the COVID-19 pandemic have had a negative impact on diet, sleep and physical activity among obese children. Regular exercise is excellent for our immune system. Estimates from the Center for Indian Economy Monitoring (CMIE) showed that just April 2020 saw 122 million people losing their jobs. Around 75% of this is a daily wage earner and a small trader. During a pandemic situation such as COVID-19 with a rapid rise in cases in India on a daily basis, losing one's job is likely to lead to anxiety and depression. In a recent survey by the Indian Psychiatric Society a 20% increase in cases with at least one in five Indians has been found.

As mentioned in the recent review (Brooks et al. 2020), it is possible to identify five main causes of quarantine depressive symptoms, namely: fear of infection, duration of lockdown, lack of supplies, feelings of frustration and lack of information. Regarding the severe psychosocial effect of COVID-19 on individuals, there is a need for extensive mental health services. This can be achieved through services such as tele-mental health care, where psychiatrists are required to play a key role in encouraging psychological and emotional well-being, improving problem-solving and promoting behaviors in patients. Social media sites, news media such as televisions, media websites, etc. may take efforts to encourage positive mental health in the fight against further COVID-19 suicides. More psychologists, psychiatrists, psychiatric rehabilitators, nursing staff and other skilled personnel should be decided to hire immediately in hospitals and health centers to deal with this urgent situation in the medium to long term, along with dedicated and suitable intervention strategies and care models. Institutions and universities around the world allowed online consultation to facilitate psychological support for people in need through social media channels and e-mails or e-mails (Xiao et al. 2020). Comparative analysis of COVID-19 Pandemic effect on Sexual and Mental Health is represented in Table 12.

5 Conclusion

The aim of this study is to understand quality of sex life, sexual behavior, reproductive planning, mental health, physical health and adult coping during the COVID-19 pandemic. Understanding how people feel and act in this situation is important, so we can plan for both good and bad outcomes, build adequate resources and prepare for such events in the future. Qualities of sexual life, sex hygiene, desire for parenthood in female respondents are higher as compared to male respondents. Male respondents have more financial anxiety stress as compared to female. Female respondents have high depression, anxiety and mental stress as compared to male. This study can help educate and target psychological therapies for those battling with epidemic mental health issues and to develop preventive approaches to keeping patients safe and healthy in the event of future disasters. Future research can discuss the challenges and solutions for different groups of peoples by using

Table 12 Comparative analysis of COVID-19 Pandemic effect on Sexual and Mental Health

Authors	Objective	Methods	Results
Li et al. (2020)	This study aimed to measure the effect of COVID-19 pandemic and associated measures on sexual health.	Cross-sectional online survey was conducted to obtain the aspects of reproductive and sexual health.	41% of respondents reported a decrease in sexual activity; 22% reported a decrease in sexual pleasure; 31% of participants reported a decline in the intimate relationship during the pandemic; 30% reported a rise in masturbation activity and 20% reported a reduction in alcohol intake before or after the pandemic.
Lai et al. (2020)	Discusses the changes of Sexual activity before and during the COVID-19.	Men (270) and Women (189) completed through online survey related to Sexual behavior.	Multiple regressions analysis showed that sexual frequency is closely related to age, relationship and sexual desire decreases by 37% and 44% respectively.
Micelli et al. (2020)	The aim was to see how sexual practices between couples changed during the epidemic.	Their research was carried out using an online survey using the Google form and analyze by using IBM SPSS version 26.	Nearly 76.7% of those interviewed said they had sex 1-5 times a week before their wedding and affected their sexual life 45%.
Li et al. (2020)	Studied COVID-19 stressing and sexual compulsive symptom, and social support.	Online recruitment of 3219 undergraduate students to accomplish all the surveys.	The regression analyzes showed that COVID-19-stressing and perceiving social supports were significantly predicted in the case of the sexual compulsive symptom of the persons.
Proposed work	This analysis aimed to analyze the effect of COVID-19 pandemic on sexual, mental and physical health.	Ordinary Least Squares (OLS) based on multivariate logistic regression analysis and The numerical tests were performed by using Python 3 engine. R-squared (coefficient of multiple determinations for multiple regressions) are used for prediction (P-value > 0.5).	Frequency of sexual intercourse, frequency of watching porn, sexual hygiene, frequency of physical activity, depression, desire for parenthood in female respondents have more significant R2 (0.903, 0.976, 0.973, 0.989, 0.985, 0.862) value respectively as compared to male respondents. Financial anxiety, Smoking and drinking habits in male respondents have more significant R2 (0.917, 0.964) value respectively as compared to female respondents.

the machine leaning and artificial intelligence algorithms related to COVID-19 and other viruses.

Appendix 1

Socio-economic and demographic characteristics of respondents are represented below.

	General		Male	Female
Responses received	117 (F-51 & M-66)		97	48
Age group	F%	M%	M%	F%
18–25	12	0	0	19
26–30	12	0	20	29
31–35	44	2	32	17
36–40	20	32	28	17
41–45	12	44	18	6
46–50	0	20	1	4
51 and above	2	2	1	8
Country				
India	117		97	48
Occupation				
Retired personnel	2	0	4	6
Professional/technical staff	33	74	53	52
Agricultural worker	8	20	19	15
Business/service worker	57	6	25	27
Economic status				
High	25	8	26	30
Middle	75	84	64	60
Low	0	8	10	10
Chronic medical illness				
Coronary heart disease	16	18	5	15
Hypertension	10	10	26	16
Diabetes	50	24	30	19
Lymphoma	0	0	1	2
No	24	48	38	48
Under which zone does your (town/city) lie?				
Red	37	29	23	19
Orange	39	38	37	62
Green	24	33	40	19

Appendix 2

List of questionnaires related to changes in sexual behavior, quality of sex life, sexual health, and mental wellbeing is presented below.

Questions with serial number	Response options
1. How many times have you felt sexual desire? 2. How much have you felt sexual excitement during intercourse? 3. How often have you been lubricated in sexual intercourse? 4. How often did you get climax during consensual sex? 5. How often have you experienced pain during vaginal penetration? 6. How often have you experienced pain during penetration?	0 → Never 1 → Only a few times 2 → Sometimes 3 → Most times 4 → Almost every day
7. How are you going to measure your sexual desire? 8. How are you going to measure your sexual excitement? 9. How are you going to measure your degree of pain during vaginal penetration? 10. How are you going to measure your degree of pain during penetration?	0 → None at all or Very low 1 → Low 2 → Medium 3 → Medium–high 4 → High
11. How satisfied would you be with the level of emotional connection with your partner during sexual activity? 12. How satisfied did you feel your sexual relationship with your partner? 13. How satisfied were you with your sex life overall?	0 → dissatisfied 1 → Mostly dissatisfied 2 → Neutral or mixed 3 → Mostly satisfied 4 → Very satisfied
14. Washing hands and body thoroughly with soap and water before sex 15. Washing hands and body thoroughly with soap and water after sex 16. Use of contraception during sexual intercourse 17. Frequency of sexual intercourse 18. Usage of sex toys 19. Having sex in a new position or location 20. Trying an erotic game or role-play 21. Spooning, cuddling and intimate conversation during sexual intimacy 22. Licking around the anus/penis 23. Intimate partner violence during sex 24. Use of pills to avoid pregnancy 25. Taking of alcohol, cigarettes before sexual intercourse 26. Taking of alcohol, cigarettes after sexual intercourse 27. Watching porn, visiting X-rated website, visiting virtual-reality strip clubs, Cybersex 10. Licking around the anus/vagina 11. Use of Viagra to prevent erectile dysfunction 12. Masturbation 13. Usage of mask during kissing and sexual intercourse 14. You have COVID-19 positive and have safe sex 15. You recovered from COVID-19 and have safe sex 16. Frequency of exercise, yoga, meditation	0 → almost never 1 → some of the time 2 → half of the time 3 → most of the time 4 → always
17. When you had erections, how often were they firm enough to have sex? 18. Problem with ejaculation	0 → No problem 1 → Very small 2 → Small 3 → Medium 4 → Big
19. How hard you got to get an erection?	0 → No erections 1 → A lot of difficulty 2 → Some difficulty 3 → Little difficulty 4 → No difficulty

Questions with serial number	Response options
20. Level of depression and anxiety 21. Level of Feeling down and hopeless 22. Level of mental stress	0 → Not at all 1 → A little bit 2 → Moderately 3 → Quite a bit 4 → Extremely
23. Be infected with COVID-19 virus 24. Be less financially stable 25. Loss of jobs 26 Worries of future economic difficulties	0 → Not worried 1 → little worried 2 → somewhat worried 3 → Usually worried 4 → Extremely worried
27 Disconnect from news, email, and social media 28 Disconnect from Mobile, TV and other electronic gadgets 29 Working from home culture 30 Avoid visiting friends or family	0 → very easy 1 → somewhat easy 2 → neutral 3 → Somewhat difficult 4 → Very difficult
31 Presence of vaginal infection	Y/N or 0/1
32 Menstrual abnormalities	Y/N or 0/1
33 Desire for parenthood	Y/N or 0/1
34 Presence of penile infection	Y/N or 0/1

Appendix 3

The questions with serial numbers used in "Appendix 2" are categorized into female, male, general respondents.

Category	Question Numbers (before COVID-19)	Question Numbers (during COVID-19)
Female	1-5, 7-9, 10, 11-27, 49-51	1-5, 7-9, 10, 11-27, 31-33, 49-51
Male	1-4, 6, 7, 8, 10, 11-21, 23, 25-30, 35-37, 51, 52	1-4, 6, 7, 8, 10, 11-21, 23, 25-33, 35-37, 51, 52
General	14-17, 25-27, 34, 38-48, 51	14-17, 25-27, 31, 34, 38-48, 51

Appendix 4

Subset selection and descriptive statistics of respondents' sexual, mental and physical health before and during the COVID-19 outbreak is presented below.

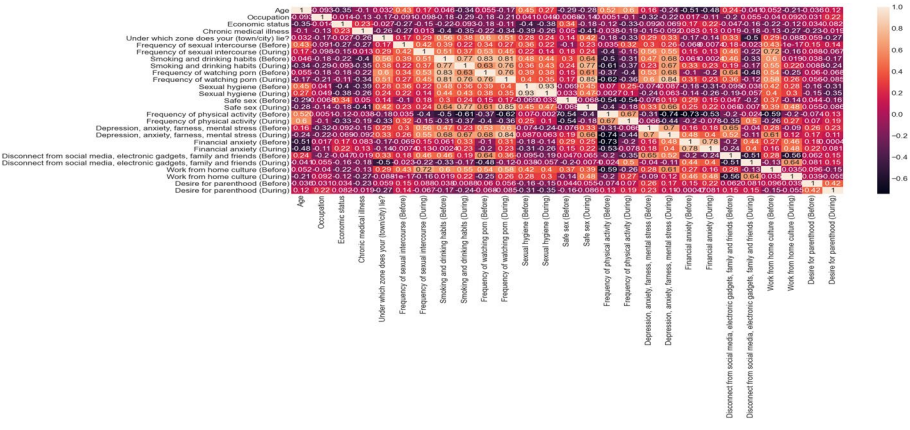
Sl. No.	Domain	Question Numbers	Response (Before)	M (%)	F (%)	Response (During)	M (%)	F (%)
1	Sexual desire or interest	1, 7	**0** →	15	4	**0** →	15	4
			1 →	34	29	**1** →	37	15
			2 →	34	46	**2** →	23	29
			3 →	12	21	**3** →	19	48
			4 →	5	0	**4** →	6	4

Sl. No.	Domain	Question Numbers	Response (Before)	M (%)	F (%)	Response (During)	M (%)	F (%)
2	Sexual excitement	2,8	**0** →	5	6	**0** →	16	8
			1 →	41	33	**1** →	34	12
			2 →	40	35	**2** →	28	38
			3 →	12	24	**3** →	16	38
			4 →	2	2	**4** →	6	4
3	Lubrication	3	**0** →	20	17	**0** →	11	10
			1 →	19	31	**1** →	30	21
			2 →	38	27	**2** →	38	29
			3 →	22	23	**3** →	21	38
			4 →	1	2	**4** →	0	2
4	Orgasm or climax	4	**0** →	10	10	**0** →	6	8
			1 →	37	27	**1** →	25	19
			2 →	25	44	**2** →	53	40
			3 →	21	19	**3** →	9	29
			4 →	7	0	**4** →	7	4
5	Pain	5 & 9- (F) 6 & 10 –(M)	**0** →	33	29	**0** →	18	17
			1 →	46	25	**1** →	43	23
			2 →	21	42	**2** →	39	54
			3 →	0	4	**3** →	0	6
			4 →	0	0	**4** →	0	0
6	Satisfaction	11, 12, 13	**0** →	11	0	**0** →	9	0
			1 →	2	13	**1** →	9	4
			2 →	30	46	**2** →	20	38
			3 →	36	35	**3** →	52	46
			4 →	21	6	**4** →	10	12
7	Sexual hygiene	14, 15	**0** →	12	22	**0** →	21	10
			1 →	9	0	**1** →	5	14
			2 →	9	4	**2** →	11	0
			3 →	26	20	**3** →	28	31
			4 →	44	54	**4** →	35	45
8	Safe sex	16	**0** →	29	27	**0** →	55	27
			1 →	35	53	**1** →	18	20
			2 →	10	12	**2** →	3	0
			3 →	20	6	**3** →	14	18
			4 →	6	2	**4** →	10	35
9	Frequency of sexual intercourse	17	**0** →	8	10	**0** →	24	12
			1 →	38	20	**1** →	21	25
			2 →	39	54	**2** →	44	63
			3 →	12	16	**3** →	0	0
			4 →	3	0	**4** →	11	0
10	Sexual intimacy and role-play	18-21, 22 (F), 28 (M)	**0** →	55	33	**0** →	59	23
			1 →	29	40	**1** →	31	29
			2 →	16	23	**2** →	8	23
			3 →	0	4	**3** →	2	25
			4 →	0	0	**4** →	0	0

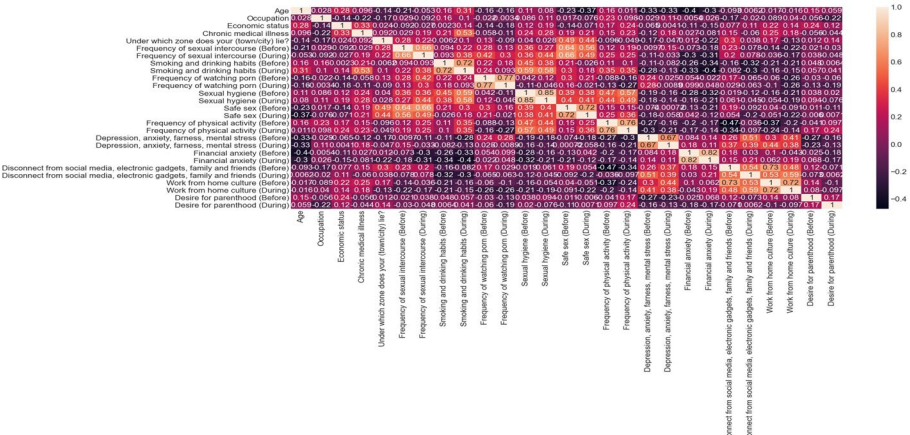
Sl. No.	Domain	Question Numbers	Response (Before)	M (%)	F (%)	Response (During)	M (%)	F (%)
11	Smoking and drinking habits	25, 26	**0** →	41	35	**0** →	48	24
			1 →	44	27	**1** →	32	41
			2 →	10	22	**2** →	20	35
			3 →	5	16	**3** →	0	0
			4 →	0	0	**4** →	0	0
12	Frequency of watching porn	27	**0** →	44	48	**0** →	52	33
			1 →	38	24	**1** →	24	27
			2 →	2	6	**2** →	6	0
			3 →	8	4	**3** →	12	0
			4 →	8	18	**4** →	6	40
13	Frequency of Masturbation	30	**0** →	30	–	**0** →	29	–
			1 →	20	–	**1** →	30	–
			2 →	26	–	**2** →	27	–
			3 →	22	–	**3** →	11	–
			4 →	2	–	**4** →	3	–
14	Erectile dysfunction problem	29, 35, 36, 37	**0** →	52	–	**0** →	47	–
			1 →	25	–	**1** →	31	–
			2 →	22	–	**2** →	22	–
			3 →	1	–	**3** →	0	–
			4 →	0	–	**4** →	0	–
15	Frequency of physical activity	34	**0** →	20	0	**0** →	6	12
			1 →	15	33	**1** →	21	24
			2 →	14	24	**2** →	18	2
			3 →	12	12	**3** →	20	29
			4 →	39	31	**4** →	35	33
16	Depression, anxiety, farness, mental stress	37-40	**0** →	52	45	**0** →	56	49
			1 →	40	55	**1** →	42	49
			2 →	5	0	**2** →	2	2
			3 →	3	0	**3** →	0	0
			4 →	0	0	**4** →	0	0
17	Financial anxiety	41-43	**0** →	72	67	**0** →	74	63
			1 →	26	33	**1** →	20	37
			2 →	0	0	**2** →	4	0
			3 →	2	0	**3** →	2	0
			4 →	0	0	**4** →	0	0
18	Disconnect from social media, electronic gadgets, family and friends	44, 45, 47	**0** →	21	16	**0** →	30	31
			1 →	40	60	**1** →	35	55
			2 →	33	24	**2** →	30	14
			3 →	3	0	**3** →	2	0
			4 →	3	0	**4** →	3	0
19	Work from home culture	46	**0** →	26	18	**0** →	21	51
			1 →	30	25	**1** →	26	14
			2 →	38	57	**2** →	33	25
			3 →	3	0	**3** →	8	6
			4 →	3	0	**4** →	12	4

Appendix 5

Co-relation factor for Female



Co-relation factor for Male



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