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

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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

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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
| 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 (Ś2) 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
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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.
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.
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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...
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 5  Dependent variable (Smoking and drinking habits during COVID-19 outbreak) with OLS Regression Results

| Variables                                      | Male                      |       | Female                     |       |
|------------------------------------------------|---------------------------|-------|----------------------------|-------|
|                                                | Coef | $P > | Coef | $P >$ |
| 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 | $P >$ | Coef | $P >$ |
| 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 |
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### 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 |
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.
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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.

| Responses received | General (F-51 & M-66) | Male | Female |
|--------------------|------------------------|------|--------|
| Age group          |                        |      |        |
| 18–25              | 12 F% 0 M% 0 M% 19 F% |      |        |
| 26–30              | 12 F% 0 M% 20 M% 29 F%|      |        |
| 31–35              | 44 F% 2 M% 32 M% 17 F%|      |        |
| 36–40              | 20 F% 32 M% 28 M% 17 F%|      |        |
| 41–45              | 12 F% 44 M% 18 M% 6 F% |      |        |
| 46–50              | 0 F% 20 M% 1 M% 4 F%  |      |        |
| 51 and above       | 2 F% 2 M% 1 M% 8 F%  |      |        |
| Country            |                        |      |        |
| India              | 117 F% 97 M% 48 M% 48 F%|      |        |
| Occupation         |                        |      |        |
| Retired personnel  | 2 F% 0 M% 4 M% 6 F%  |      |        |
| Professional/technical staff | 33 F% 74 M% 53 M% 52 F% |   |        |
| Agricultural worker| 8 F% 20 M% 19 M% 15 F%|      |        |
| Business/service worker | 57 F% 6 M% 25 M% 27 F% |   |        |
| Economic status    |                        |      |        |
| High               | 25 F% 8 M% 26 M% 30 F%|      |        |
| Middle             | 75 F% 84 M% 64 M% 60 F%|      |        |
| Low                | 0 F% 8 M% 10 M% 10 F%  |      |        |
| Chronic medical illness |                |      |        |
| Coronary heart disease | 16 F% 18 M% 5 M% 15 F%|      |        |
| Hypertension       | 10 F% 10 M% 26 M% 16 F%|      |        |
| Diabetes           | 50 F% 24 M% 30 M% 19 F%|      |        |
| Lymphoma           | 0 F% 0 M% 1 M% 2 F%  |      |        |
| No                 | 24 F% 48 M% 38 M% 48 F%|      |        |
| Under which zone does your (town/ city) lie? |      |        |
| Red                | 37 F% 29 M% 23 M% 19 F%|      |        |
| Orange             | 39 F% 38 M% 37 M% 62 F%|      |        |
| Green              | 24 F% 33 M% 40 M% 19 F%|      |        |
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? | 0 → Never |
| 2. How much have you felt sexual excitement during intercourse? | 1 → Only a few times |
| 3. How often have you been lubricated in sexual intercourse? | 2 → Sometimes |
| 4. How often did you get climax during consensual sex? | 3 → Most times |
| 5. How often have you experienced pain during vaginal penetration? | 4 → Almost every day |
| 6. How often have you experienced pain during penetration? | |
| 7. How are you going to measure your sexual desire? | 0 → None at all or Very low |
| 8. How are you going to measure your sexual excitement? | 1 → Low |
| 9. How are you going to measure your degree of pain during vaginal penetration? | 2 → Medium |
| 10. How are you going to measure your degree of pain during penetration? | 3 → Medium–high |
| 11. How satisfied would you be with the level of emotional connection with your partner during sexual activity? | 4 → High |
| 12. How satisfied did you feel your sexual relationship with your partner? | 0 → dissatisfied |
| 13. How satisfied were you with your sex life overall? | 1 → Mostly dissatisfied |
| 14. Washing hands and body thoroughly with soap and water before sex | 2 → Neutral or mixed |
| 15. Washing hands and body thoroughly with soap and water after sex | 3 → Mostly satisfied |
| 16. Use of contraception during sexual intercourse | 4 → Very satisfied |
| 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 | |
| 17. When you had erections, how often were they firm enough to have sex? | 0 → No problem |
| 18. Problem with ejaculation | 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 | 0 → Not at all
21. Level of Feeling down and hopeless | 1 → A little bit
22. Level of mental stress | 2 → Moderately
23. Be infected with COVID-19 virus | 3 → Quite a bit
24. Be less financially stable | 4 → Extremely
25. Loss of jobs | 0 → Not worried
26. Worries of future economic difficulties | 1 → little worried
27. Disconnect from news, email, and social media | 2 → somewhat worried
28. Disconnect from Mobile, TV and other electronic gadgets | 3 → Usually worried
29. Working from home culture | 4 → Extremely worried
30. Avoid visiting friends or family | 0 → not easy
31. Presence of vaginal infection | 1 → somewhat easy
32. Menstrual abnormalities | 2 → neutral
33. Desire for parenthood | 3 → Somewhat difficult
34. Presence of penile infection | 4 → Very difficult

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) | Response (During) |
|---|---|---|---|---|
| 1 | Sexual desire or interest | 1, 7 | 15 | 15 |
| | | | 4 | 4 |
| | | 1 → | 34 | 37 |
| | | | 29 | 15 |
| | | 2 → | 34 | 23 |
| | | | 46 | 29 |
| | | 3 → | 12 | 19 |
| | | | 21 | 48 |
| | | 4 → | 5 | 6 |
| | | | 0 | 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     |
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| 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 →              | 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        | 37-40            | 0 →              | 52    | 45    | 0 →              | 56    | 49    |
|        | stress                                     |                  | 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    | 44, 45, 47       | 0 →              | 21    | 16    | 0 →              | 30    | 31    |
|        | gadgets, family and friends                |                  | 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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