An Online Questionnaire Survey on the Sexual Life and Sexual Function of Chinese Adult Men During the Coronavirus Disease 2019 Epidemic

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ABSTRACT

Introduction: There has been no report regarding the impact on male sexual life or sexual function by changes in lifestyle during the coronavirus disease 2019 (COVID-19) epidemic.

Aim: To investigate the changes in sexual life and sexual function of Chinese men during the COVID-19 epidemic.

Methods: An online questionnaire was created and the survey was administered through social media to Chinese adult men.

Main Outcome Measure: The main end point was the deteriorated erectile function or ejaculatory control ability, defined by self-evaluation or by decreased International Index of Erectile Function-5 items (IIEF-5) scores or increased premature ejaculation diagnostic tool (PEDT) scores.

Results: Altogether, 612 questionnaires were collected. About 322 (52.6%) subjects were unmarried. About 8.4% and 8.5% subjects reported deteriorated erectile function or ejaculation control ability by self-evaluation, whereas 31.9% and 17.9% subjects showed decreased IIEF-5 scores or increased PEDT scores. Subjects with deteriorated erectile function by self-evaluation and decreased IIEF-5 scores had higher General Anxiety Disorder-7 (P < .001 and P = .001) and higher Patient Health Questionnaire-9 score (P < .001 and P = .002) after the epidemic, decreased frequency of sexual life (P < .001 and P < .001) and physical exercise (P = .009 and .007) after the epidemic. Subjects with deteriorated ejaculation control ability by self-evaluation and increased PEDT scores had higher General Anxiety Disorder-7 (P < .001 and P < .001) and higher Patient Health Questionnaire-9 score (P < .001 and P = .002) after the epidemic. Subjects with decreased frequency of sexual life had reduced income (P < .001), increased anxiety (P < .001) and depression (P < .001). Married subjects had higher proportion of improved depression (P = .048) and increased frequency of sexual life (P = .010).

Conclusion: During the COVID-19 epidemic, decreased sexual function was present in a certain proportion of adult men, and the risk factors include increased anxiety and depression, and decreased frequency of sexual life.

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Key Words: Coronavirus Disease 2019 (COVID-19); Erectile Dysfunction; Premature Ejaculation; Questionnaire; Sexual Function; Sexual Life

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has spread across the world, leading to more than 10 million infections and 500 thousand deaths as of July 1, 2020.1 The World Health Organization declared the virus to be pandemic on March 11, 2020.2 The pathogenic virus, named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been reported to invade cells of various organs through angiotensin I-converting enzyme 2 receptors.3 The most affected individuals and those with the most severe infections were elderly people or people with
comorbidities. It is notable that although young or middle-aged men were also at risk of being infected by SARS-CoV-2, there are currently few studies focusing on the reproductive system in this cohort: A study found a higher serum luteinizing hormone value and a lower ratio of testosterone to luteinizing hormone in male patients with COVID-19; one study indicated that SARS-CoV-2 was detectable in semen specimens of male patients with COVID-19, but two teams reported the absence of SARS-CoV-2 in semen from male patients with COVID-19 in the recovery stage. There is no report about the impact of the virus on the reproductive system.

During the epidemic, however, the daily life of most men was significantly changed owing to the disease-prevention measures. A series of measures were enacted in most countries, including restrictions on transport, restrictions on entertainment, social distancing measures, and so on. Changes in lifestyle might impact sexual life and possibly sexual function, even for healthy men. A few studies have reported decreased frequency of sexual life, decreased sexual satisfaction, and deteriorated partner relationships between sexual partners. Most studies were focused on women or a mixture of women and men, while the sexual function of men has not been investigated.

With strict management, China declared the end of the first wave of the epidemic on March 12, 2020. To answer whether the COVID-19 epidemic had a negative impact on the sexual life and sexual function of Chinese men, we performed an online questionnaire survey.

METHODS

Subjects Inclusion

This online questionnaire was created using a professional system (Wenjuanxing, www.wjx.cn), and the survey was administered through social media including WeChat (version 7; Tencent, Shenzhen, China), Chunyuyisheng (version 9; Beijing Chunyu Software Co, Ltd, Beijing, China), Haodf (www.haodf.com), Zhihu (www.zhihu.com), and Weibo (weibo.com). To be included in this survey, subjects had to be Chinese men, aged 18 years or older, and had a history of sexual intercourse. Informed consent was obtained before participants completed the questionnaires (with declarations of privacy protection), and the survey was anonymous. Subjects completed the questionnaire using a mobile phone or personal computer. Ethical approval was obtained by the institutional review board.

Questionnaires

The questionnaire was composed of two parts. The first part contained items that participants were required to answer, including items assessing basic information (age, marital status, education level, occupation, smoking and alcohol addiction, history of previous sexual diseases, contact with COVID-19, and so on) and self-reported changes in work intensity, income, frequency of sexual life, erectile function, ejaculation, depression, anxiety, and partner time and intimacy behavior with sexual partners. Answers to most of the questions were classified into five levels. Habit of cigarette smoking was categorized as regular (at least 1 cigarette per day), occasional (not every day), and never (no smoke at all). Habit of alcohol drinking was categorized as regular (1 or more drinks per day), occasional (not every day), and never (no drink at all). “Sexual life” was defined as the penetration of the penis into the vagina; “partner time” was defined as subjects and sexual partners spending time together instead of alone; and “intimacy behavior” was defined as holding hands, hugging, and kissing.

The second part contained optional items, including scales such as the International Index of Erectile Function-5 items (IIEF-5), Premature Ejaculation Diagnostic Tool (PEDT), General Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire (PHQ-9), and the detailed frequency of sexual life and physical exercise. Subjects completed the questionnaires based on both their condition 3 months before the outbreak of COVID-19 (before January 23, 2020) and 3 months after the outbreak (after January 23, 2020). All the contents of the questionnaire (including the scales) were displayed and filled out in the Chinese language.

RESULTS

Baseline Characteristics

Altogether, 612 questionnaires were collected, and 251 (41.0%) respondents completed the second part of the questionnaire. The median age for all subjects was 28 years (interquartile range [IQR] 24–35). A total of 322 (52.6%) subjects were unmarried, 280 (45.8%) were married, and 10 (1.6%) were divorced or widowed.

Statistical Analysis

SPSS 20.0 (IBM Corp, Armonk, NY, USA) was used for statistical analysis. A two-sided P value of less than 0.05 indicated significant differences. A paired-sample t-test was used to compare continuous variables before and after the epidemic. Chi-square was used to compare the classified variables between different groups, and the Mann-Whitney U test was used to compare the continuous variables between different groups.
Most subjects had a highest academic degree of junior college (227 cases, 37.1%) or were undergraduates (206 cases, 33.7%). The largest proportion of occupation was company employee (170 cases, 27.8%), and 48 cases (7.8%) were medical staff. Subjects were distributed in different provinces of China, among which 11 cases (1.8%) were in Hubei Province, where the epidemic was most severe (Supplementary Table 1). There were 118 regular smokers (19.3%), 239 occasional smokers (39.1%), 255 never smokers (41.7%), 44 regular drinkers (7.2%), 447 occasional drinkers (73.0%), and 121 never drinkers (19.8%).

Three subjects had been diagnosed with COVID-19, and 2 subjects having family members who had been diagnosed with COVID-19. The rest of the subjects (607) had no close contacts with patients with COVID-19. Fifty-nine subjects participated in the control or treatment work for COVID-19. Forty-four patients (7.2%) had a history of sexual dysfunction, and 47 patients (7.7%) had previously taken related drugs, including sildenafil, tadalafil, dapoxetine, and traditional Chinese herbs (Fufang Xuanju capsule, Liuwei Dihuang pill, and so on).

Changes in Sexual Function After the Epidemic

As per the self-evaluation, the majority of patients had no changes in their erectile function (511 cases, 83.5%) or ejaculation control ability (507 cases, 82.8%). As shown in Figure 1 and Supplementary Table 2, approximately 8.1% of subjects and 8.7% of subjects reported improved erectile function or ejaculation control ability; while 8.4% and 8.5% of subjects reported deterioration in their erectile function or ejaculation control ability, respectively.

The IIEF-5 and PEDT scales were completed by 251 subjects. The median score of the IIEF-5 decreased from 21 (range 1–25, IQR 14–23) to 20 (range 1–25, IQR 11–23), and there is significant difference regarding the mean value (18.13 ± 6.74 vs 17.00 ± 7.15, t = 4.867, P < .001). There was no significant

| Table 1. Changes of some characteristics and scores of scales before and after the COVID-19 epidemic |
|---------------------------------------------------------------|
|                                                                 |
| | Before epidemic | After epidemic | Mean difference | P     |
|---------------------------------------------------------------|
| IIEF-5 | 18.13 ± 6.74 | 17.00 ± 7.15 | 1.13 ± 3.67 | .000* |
| PEDT  | 4.75 ± 4.24  | 4.88 ± 4.50  | –0.13 ± 2.15 | .334  |
| GAD-7 | 4.20 ± 4.65  | 5.09 ± 5.24  | –0.88 ± 2.98 | .000* |
| PHQ-9 | 4.44 ± 4.96  | 5.70 ± 6.14  | –1.27 ± 3.49 | .000* |
| Frequency of sexual life (per mo) | 5.32 ± 5.73 | 5.42 ± 6.40 | –0.10 ± 4.54 | .713  |
| Frequency of physical exercise (per wk) | 1.95 ± 1.03 | 1.85 ± 1.06 | 0.10 ± 0.94 | .061  |

Data was expressed as mean ± SD.
COVID-19 = coronavirus disease 2019; GAD-7 = General Anxiety Disorder-7; IIEF-5 = International Index of Erectile Function; PEDT = Premature Ejaculation Diagnostic Tool; PHQ-9 = Patient Health Questionnaire.
*Statistically significant.
|                                      | All  | Absent | Present | \( P \) |
|--------------------------------------|------|--------|---------|---------|
| All                                  | 612  | 561 (91.7) | 51 (8.3) |         |
| Marriage status                      |      |         |         |         |
| Unmarried                            | 322  | 295 (91.6) | 27 (8.4) | .628    |
| Married                              | 280  | 256 (91.4) | 24 (8.6) |         |
| Divorced or widowed                  | 10   | 10 (100.0) | 0 (0.0)  |         |
| Highest academic degree              |      |         |         |         |
| Junior middle school or lower        | 36   | 32 (88.9)  | 4 (11.1) | .187    |
| Senior middle school                 | 90   | 81 (90.0)  | 9 (10.0) |         |
| Junior college                       | 227  | 211 (93.0) | 16 (7.0) |         |
| Undergraduate                        | 206  | 193 (93.7) | 13 (6.3) |         |
| Master                               | 36   | 30 (83.3)  | 6 (16.7) |         |
| Doctor                               | 17   | 14 (82.4)  | 3 (17.6) |         |
| Cigarette smoking                    |      |         |         |         |
| Regular                              | 118  | 106 (89.8) | 12 (10.2) | .117    |
| Occasional                           | 239  | 226 (94.6) | 13 (5.4) |         |
| Never                                | 255  | 229 (89.8) | 26 (10.2) |         |
| Alcohol drinking                     |      |         |         |         |
| Regular                              | 44   | 41 (93.2)  | 3 (6.8)  | .894    |
| Occasional                           | 447  | 410 (91.7) | 37 (8.3) |         |
| Never                                | 121  | 110 (90.9) | 11 (9.1) |         |
| History of sexual dysfunction        |      |         |         |         |
| Present                              | 44   | 30 (68.2)  | 14 (31.8) | <.001†  |
| Absent                               | 568  | 531 (93.5) | 37 (6.5) |         |
| History of consuming relevant drugs  |      |         |         |         |
| Present                              | 47   | 34 (72.3)  | 13 (27.7) | <.001†  |
| Absent                               | 565  | 527 (93.3) | 38 (6.7) |         |
| Subject or family members diagnosed with COVID-19 | | | | |
| Present                              | 5    | 4 (80.0)  | 1 (20.0) | .343    |
| Absent                               | 607  | 557 (91.8) | 50 (8.2) |         |
| Changes in intensity of work after the epidemic | | | | |
| Increased                            | 116  | 101 (87.7) | 15 (12.3) | .185    |
| Unchanged                            | 232  | 218 (94.0) | 14 (6.0) |         |
| Decreased                            | 165  | 151 (91.5) | 14 (8.5) |         |
| No work                              | 99   | 91 (91.9)  | 8 (8.1)  |         |
| Participated in the control or treatment work for COVID-19 | | | | |
| No                                   | 553  | 508 (91.9) | 45 (8.1) | .591    |
| Yes                                  | 59   | 53 (89.8)  | 6 (10.2) |         |
| Changes in income after the epidemic |      |         |         |         |
| Increased                            | 17   | 17 (100.0) | 0 (0.0)  | .648    |
| Unchanged                            | 207  | 190 (91.8) | 17 (8.2) |         |
| Decreased (within 30%)               | 133  | 120 (90.2) | 13 (9.8) |         |
| Decreased (30—50%)                   | 90   | 81 (90.0)  | 9 (10.0) |         |
| Decreased (more than 50%)            | 165  | 153 (92.7) | 12 (7.3) |         |
| Changes in anxiety after the epidemic|      |         |         |         |
| Significantly improved               | 55   | 55 (100.0) | 0 (0.0)  | .001†   |
| Slightly improved                    | 97   | 91 (93.8)  | 6 (6.2)  |         |
| Unchanged                            | 273  | 256 (93.8) | 17 (6.2) |         |
| Slightly deteriorated                | 133  | 115 (86.5) | 18 (13.5) |         |
| Significantly deteriorated           | 54   | 44 (81.5)  | 10 (18.5) |         |
| GAD-7 score before the epidemic*     | 3.97 ± 4.52 | 6.45 ± 5.35 | .025†   |
| GAD-7 score after the epidemic*      | 4.62 ± 4.92 | 9.50 ± 6.29 | <.001†  |

(continued)
change in the mean PEDT scores before and after the epidemic (4.75 ± 4.24 vs. 4.88 ± 4.50, t = −0.968, P = .334), with median values of 4 (range 0–20, IQR 1–7) and 4 (range 0–20, IQR 1–8), respectively (Table 1).

### Characteristics of Subjects with Deteriorated Sexual Function

As shown in Table 2, subjects with “deteriorated erectile function by self-evaluation” had a higher proportion of history of sexual dysfunction (P < .001), a history of consuming relevant drugs (P < .001), increased anxiety after the epidemic (P = .001), a higher GAD-7 score before and after the epidemic (P = .025 and P < .001), increased depression after the epidemic (P < .001), a higher PHQ-9 score before and after the epidemic (P = .002 and P < .001), a decreased frequency of sexual life (P < .001), a decreased frequency of physical exercise (P = .009) after the epidemic, decreased partner time (P < .001), and decreased intimacy behavior (P = .001) after the epidemic.

As shown in Table 3, 31.9% of subjects had decreased IIEF-5 scores after the epidemic, and they had a higher GAD-7 score (P = .001), a higher PHQ-9 score (P = .002) after the epidemic, higher proportion of decreased frequency of sexual life (P < .001), a lower frequency of sexual life (P = .025), and a lower frequency of physical exercise (P = .007) after the epidemic.

As shown in Table 4, subjects with “deteriorated ejaculation control ability by self-evaluation” were more frequent smokers (P = .046), had a higher proportion of history of sexual dysfunction (P < .001) and history of consuming relevant drugs (P < .001), increased anxiety after the epidemic (P < .001), a higher GAD-7 score (P < .001) after the epidemic, increased depression after the epidemic (P < .001), a higher PHQ-9 score before and after the epidemic (P = .022 and P < .001), decreased frequency of sexual life (P < .001) and physical exercise (P = .027) after the epidemic, and decreased partner time (P < .001) and intimacy behavior (P < .001) after the epidemic.

| Table 2. Continued |
|---------------------|
| All | Absent | Present | P |
| --- | --- | --- | --- |
| **Changes in depression after the epidemic** |
| Significantly improved | 75 | 73 (97.3) | 2 (2.7) | <.001† |
| Slightly improved | 74 | 68 (91.9) | 6 (8.1) | |
| Unchanged | 323 | 306 (94.7) | 17 (5.3) | |
| Slightly deteriorated | 107 | 89 (83.2) | 18 (16.8) | |
| Significantly deteriorated | 33 | 25 (75.8) | 8 (24.2) | |
| PHQ-9 score before the epidemic | 4.07 ± 4.73 | 7.99 ± 5.73 | .002† |
| PHQ-9 score after the epidemic | 5.00 ± 5.50 | 12.36 ± 7.94 | <.001† |
| **Changes in frequency of sexual life after the epidemic** |
| Significantly increased | 39 | 38 (97.4) | 1 (2.6) | <.001† |
| Slightly increased | 77 | 73 (94.8) | 4 (5.2) | |
| Unchanged | 335 | 322 (96.1) | 13 (3.9) | |
| Slightly decreased | 65 | 50 (76.9) | 15 (23.1) | |
| Significantly decreased | 96 | 78 (81.3) | 18 (18.8) | |
| Frequency of sexual life before the epidemic (per mo)* | 5.14 ± 5.63 | 6.35 ± 6.29 | .197 |
| Frequency of sexual life after the epidemic (per mo)* | 5.42 ± 6.19 | 5.03 ± 8.07 | .143 |
| Frequency of physical exercise before the epidemic (per mo)* | 1.93 ± 1.02 | 2.25 ± 1.12 | .142 |
| Frequency of physical exercise after the epidemic (per mo)* | 1.91 ± 1.08 | 1.38 ± 0.78 | .009† |
| **Changes in partner time with sexual partner after the epidemic** |
| Significantly increased | 70 | 67 (95.7) | 3 (4.3) | <.001† |
| Slightly increased | 42 | 37 (88.1) | 5 (11.9) | |
| Unchanged | 104 | 96 (92.3) | 8 (7.7) | |
| Slightly decreased | 23 | 14 (60.9) | 9 (39.1) | |
| Significantly decreased | 26 | 21 (80.8) | 5 (19.2) | |
| **Changes in intimacy behavior with sexual partner after the epidemic** |
| Significantly increased | 38 | 36 (94.7) | 2 (5.3) | .001† |
| Slightly increased | 49 | 45 (91.8) | 4 (8.2) | |
| Unchanged | 123 | 113 (91.9) | 10 (8.1) | |
| Slightly decreased | 33 | 22 (66.7) | 11 (33.3) | |
| Significantly decreased | 22 | 19 (86.4) | 3 (13.6) | |

COVID-19 = Coronavirus disease 2019; GAD-7 = General Anxiety Disorder-7; PHQ-9 = Patient Health Questionnaire.

*Data are expressed as mean ± SD. Other data are expressed as number (percentage).

†Statistically significant.
Table 3. Comparison of characteristics between subjects with or without deteriorated erectile function by IIEF-5

|                                      | All    | Absent | Present | P    |
|--------------------------------------|--------|--------|---------|------|
| **All**                              | 251    | 171 (68.1) | 80 (31.9) |      |
| **Marriage status**                  |        |        |         |      |
| Unmarried                            | 107    | 75 (70.1)  | 32 (29.9)  | .803 |
| Married                              | 139    | 93 (66.9)   | 46 (33.1)   |      |
| Divorced or widowed                  | 5      | 3 (60.0)    | 2 (40.0)    |      |
| **Highest academic degree**         |        |        |         |      |
| Junior middle school or lower        | 13     | 9 (69.2)    | 4 (30.8)    | .121 |
| Senior middle school                 | 35     | 26 (74.3)   | 9 (25.7)    |      |
| Junior college                       | 89     | 58 (65.2)   | 31 (34.8)   |      |
| Undergraduate                        | 88     | 64 (72.7)   | 24 (27.3)   |      |
| Master                               | 18     | 12 (66.7)   | 6 (33.3)    |      |
| Doctor                               | 8      | 2 (25.0)    | 6 (75.0)    |      |
| **Cigarette smoking**                |        |        |         |      |
| Regular                              | 46     | 32 (69.6)   | 14 (30.4)   | .803 |
| Occasional                           | 93     | 61 (65.6)   | 32 (34.4)   |      |
| Never                                | 112    | 78 (69.6)   | 34 (30.4)   |      |
| **Alcohol drinking**                 |        |        |         |      |
| Regular                              | 19     | 15 (78.9)   | 4 (21.1)    | .379 |
| Occasional                           | 185    | 127 (68.6)  | 58 (31.4)   |      |
| Never                                | 47     | 29 (61.7)   | 18 (38.3)   |      |
| **History of sexual dysfunction**    |        |        |         |      |
| Present                              | 17     | 9 (52.9)    | 8 (47.1)    | .164 |
| Absent                               | 234    | 162 (69.2)  | 72 (30.8)   |      |
| **History of consuming relevant drugs** |      |        |         |      |
| Present                              | 27     | 15 (55.6)   | 12 (44.4)   | .138 |
| Absent                               | 224    | 156 (69.6)  | 68 (30.4)   |      |
| **Subject or family members diagnosed with COVID-19** |      |        |         |      |
| Present                              | 2      | 1 (50.0)    | 1 (50.0)    | .581 |
| Absent                               | 249    | 170 (68.3)  | 79 (31.7)   |      |
| **Changes in intensity of work after the epidemic** |      |        |         |      |
| Increased                            | 50     | 34 (68.0)   | 16 (32.0)   | .829 |
| Unchanged                            | 88     | 63 (71.6)   | 25 (28.4)   |      |
| Decreased                            | 77     | 50 (64.9)   | 27 (35.1)   |      |
| No work                              | 36     | 24 (66.7)   | 12 (33.3)   |      |
| **Participated in the control or treatment work for COVID-19** |      |        |         |      |
| No                                   | 230    | 158 (68.7)  | 72 (31.3)   | .523 |
| Yes                                  | 21     | 13 (61.9)   | 8 (38.1)    |      |
| **Changes in income after the epidemic** |      |        |         |      |
| Increased                            | 6      | 5 (83.3)    | 1 (16.7)    | .264 |
| Unchanged                            | 92     | 69 (75.0)   | 23 (25.0)   |      |
| Decreased (within 30%)               | 60     | 37 (61.7)   | 23 (38.3)   |      |
| Decreased (30–50%)                   | 42     | 25 (59.5)   | 17 (40.5)   |      |
| Decreased (more than 50%)            | 51     | 35 (68.6)   | 16 (31.4)   |      |
| **Changes in anxiety after the epidemic** |      |        |         |      |
| Significantly improved               | 17     | 13 (76.5)   | 4 (23.5)    | .320 |
| Slightly improved                    | 37     | 25 (67.6)   | 12 (32.4)   |      |
| Unchanged                            | 127    | 91 (71.7)   | 36 (28.3)   |      |
| Slightly deteriorated                | 50     | 32 (64.0)   | 18 (36.0)   |      |
| Significantly deteriorated            | 20     | 10 (50.0)   | 10 (50.0)   |      |
| **GAD-7 score before the epidemic**  | 3.81 ± 4.48 | 5.01 ± 4.91 | .053 |
| **GAD-7 score after the epidemic**   | 4.18 ± 4.59 | 6.95 ± 5.99 | .001 |

(continued)
As shown in Table 5, 17.9% of subjects had increased PEDT scores, and they had a higher GAD-7 score before and after the epidemic (\(P = .048\) and \(P < .001\)) and a higher PHQ-9 score (\(P = .002\)) after the epidemic.

**Other Characteristics**

More than 40% of the subjects had decreased work intensity (Supplementary Table 2), while some subjects had increased partner time and intimacy behavior with their sexual partners. Approximately half of the subjects reported stable anxiety and depression, but the GAD-7 and PHQ-9 scores were slightly increased (\(P < .001\) and \(P < .001\), Table 1).

The characteristics of subjects with a decreased frequency of sexual life were also analyzed (Supplementary Table 3). They had a higher proportion of decreased work intensity (\(P = .011\)) and reduced income (\(P < .001\)), increased anxiety (\(P < .001\)) and depression (\(P < .001\)), and less partner time (\(P < .001\)) and less intimate behavior after the epidemic (\(P < .001\)).

In addition, a comparison of characteristics between married subjects and others (unmarried, divorced, widowed) was performed (Supplementary Table 4). Married subjects had a lower proportion of smoking (\(P = .006\)), a higher proportion of increased work intensity (\(P < .001\)) and higher income (\(P < .001\)), a higher proportion of improved depression (\(P = .048\)), and an increased frequency of sexual life (\(P = .010\),
Table 4. Comparison of characteristics between subjects with or without deteriorated ejaculation control ability by self-evaluation

|                               | All   | Absent | Present | P      |
|-------------------------------|-------|--------|---------|--------|
| All                           | 612   | 560 (91.5) | 52 (8.5) |        |
| **Marriage status**           |       |        |         |        |
| Unmarried                     | 322   | 290 (90.1) | 32 (9.9) | .294   |
| Married                       | 280   | 260 (92.9) | 20 (7.1) |        |
| Divorced or widowed           | 10    | 10 (100.0) | 0 (0.0)  |        |
| **Highest academic degree**   |       |        |         | .145   |
| Junior middle school or lower | 36    | 33 (91.7)  | 3 (8.3)  |        |
| Senior middle school          | 90    | 85 (94.4)  | 5 (5.6)  |        |
| Junior college                | 227   | 212 (93.4) | 15 (6.6) |        |
| Undergraduate                 | 206   | 186 (90.3) | 20 (9.7) |        |
| Master                        | 36    | 29 (80.6)  | 7 (19.4) |        |
| Doctor                        | 17    | 15 (88.2)  | 2 (11.8) |        |
| **Cigarette smoking**         |       |        |         | .046†  |
| Regular                       | 118   | 106 (89.8) | 12 (10.2) |        |
| Occasional                    | 44    | 40 (90.9)  | 4 (9.1)  |        |
| Never                         | 239   | 227 (95.0) | 12 (5.0) |        |
| **Alcohol drinking**          |       |        |         | .986   |
| Regular                       | 44    | 40 (91.1)  | 4 (8.9)  |        |
| Occasional                    | 444   | 409 (91.5) | 35 (8.5) |        |
| Never                         | 121   | 111 (91.7) | 10 (8.3) |        |
| **History of sexual dysfunction** |     |        |         | <.001† |
| Present                       | 44    | 32 (72.7)  | 12 (27.3) |        |
| Absent                        | 568   | 528 (93.0) | 40 (7.0) |        |
| **History of consuming relevant drugs** | | | | <.001† |
| Present                       | 47    | 33 (70.2)  | 14 (29.8) |        |
| Absent                        | 565   | 527 (93.3) | 38 (6.7) |        |
| **Subject or family members diagnosed with COVID-19** | | | | .011† |
| Present                       | 5     | 3 (60.0)  | 2 (40.0) |        |
| Absent                        | 607   | 557 (91.8) | 50 (8.2) |        |
| **Changes in intensity of work after the epidemic** | | | | .424   |
| Increased                     | 116   | 102 (87.9) | 14 (12.1) |        |
| Unchanged                     | 232   | 216 (93.1) | 16 (6.9) |        |
| Decreased                     | 165   | 152 (92.1) | 13 (7.9) |        |
| No work                       | 99    | 90 (90.9)  | 9 (9.1)  |        |
| **Participated in the control or treatment work for COVID-19** | | | | .142   |
| No                            | 553   | 509 (92.0) | 44 (8.0) |        |
| Yes                           | 59    | 51 (86.4)  | 8 (13.6) |        |
| **Changes in income after the epidemic** | | | | .455   |
| Increased                     | 17    | 15 (88.2)  | 2 (11.8) |        |
| Unchanged                     | 207   | 192 (92.8) | 15 (7.2) |        |
| Decreased (within 30%)        | 133   | 125 (94.0) | 8 (6.0)  |        |
| Decreased (30–50%)            | 90    | 82 (91.1)  | 8 (8.9)  |        |
| Decreased (more than 50%)     | 165   | 146 (88.5) | 19 (11.5) |        |
| **Changes in anxiety after the epidemic** | | | | .617   |
| Significantly improved        | 55    | 54 (98.2)  | 1 (1.8)  | <.001† |
| Slightly improved             | 97    | 92 (94.8)  | 5 (5.2)  |        |
| Unchanged                     | 273   | 257 (94.1) | 16 (5.9) |        |
| Slightly deteriorated         | 133   | 117 (88.0) | 16 (12.0) |        |
| Significantly deteriorated    | 54    | 40 (74.1)  | 14 (25.9) |        |
| **GAD-7 score before the epidemic** | | | | .072   |
| GAD-7 score before the epidemic | 3.99 ± 4.43 | 6.63 ± 6.30 |        |        |
| **GAD-7 score after the epidemic** | | | | <.001† |
| GAD-7 score after the epidemic | 4.57 ± 4.75 | 10.84 ± 6.99 |        |        |
DISCUSSION

We evaluated the change in sexual function among participants based on both self-evaluations and the scale scores. More than 80% of the subjects reported unchanged erectile function and ejaculatory control ability by self-evaluation. However, although no significant change in the PEDT score was observed, there was a small but significant change in the IIEF-5 scores. We could conclude that the sexual function of most subjects was stable during the epidemic.

The most obvious factors related to the deterioration of sexual function were anxiety and depression. Most subjects in the present study reported increases in anxiety and depression, especially in those with deteriorated sexual function. Our previous investigation on outpatients in the Department of Andrology found that many patients with erectile dysfunction, premature ejaculation and other diseases had anxiety and depression.26 Besides, within many previous studies that investigated possible influencing factors for erectile dysfunction or premature ejaculation, there were plenty of studies that reported the relationship between “depression/anxiety and changes of sexual function,” which have similar conclusion as the present study.27–31 The significance of the results of our study is that during a pandemic disease, even with low mortality rate, decline in sexuality was associated with depression and anxiety by the disease and worse life satisfaction and quality.

There have been several literatures regarding the possible mechanisms, including the disturbance on the hypothalamic–pituitary–adrenocortical axis,32 the direct inhibition of the spinal erection center from the nervous system, the excessive sympathetic outflow or increased levels of peripheral catecholamine,33 and the possible regulation of short (s) allele in the promoter region of the serotonin transporter (5-HTTLPR) gene.34–37 During the epidemic, anxiety and depression were

Table 4. Continued

| Changes in depression after the epidemic | All | Absent | Present | P       |
|-----------------------------------------|-----|--------|---------|---------|
| Significantly improved                  | 75  | 74 (98.7) | 1 (1.3) | <.001†  |
| Slightly improved                       | 74  | 70 (94.6) | 4 (5.4) |         |
| Unchanged                               | 323 | 306 (94.7) | 17 (5.3) |         |
| Slightly deteriorated                   | 107 | 90 (84.1) | 17 (15.9) |         |
| Significantly deteriorated              | 33  | 20 (60.6) | 13 (39.4) |         |
| PHQ-9 score before the epidemic         |     | 4.12 ± 4.64 | 8.00 ± 6.83 | .022†  |
| PHQ-9 score after the epidemic          |     | 4.93 ± 5.24 | 14.37 ± 8.60 | <.001†  |

| Changes in frequency of sexual life after the epidemic | All | Absent | Present | P       |
|---------------------------------------------------------|-----|--------|---------|---------|
| Significantly increased                                  | 39  | 36 (92.3) | 3 (7.7) | <.001†  |
| Slightly increased                                       | 77  | 70 (90.9) | 7 (9.1) |         |
| Unchanged                                                | 335 | 327 (97.6) | 8 (2.4) |         |
| Slightly decreased                                       | 65  | 47 (72.3) | 18 (27.7) |         |
| Significantly decreased                                  | 96  | 80 (83.3) | 16 (16.7) |         |
| Frequency of sexual life before the epidemic (per mo)*   |     | 5.18 ± 5.80 | 6.08 ± 4.49 | .074  |
| Frequency of sexual life after the epidemic (per mo)*   |     | 5.42 ± 6.29 | 4.96 ± 7.57 | .270  |
| Frequency of physical exercise before the epidemic (per mo)* |     | 1.94 ± 1.02 | 2.20 ± 1.15 | .276  |
| Frequency of physical exercise after the epidemic (per mo)* |     | 1.89 ± 1.07 | 1.42 ± 0.83 | .027†  |

| Changes in partner time with sexual partner after the epidemic | All | Absent | Present | P       |
|-----------------------------------------------|-----|--------|---------|---------|
| Significantly increased                      | 70  | 64 (91.4) | 6 (8.6) | <.001†  |
| Slightly increased                           | 42  | 37 (88.1) | 5 (11.9) |         |
| Unchanged                                    | 104 | 99 (95.2) | 5 (4.8) |         |
| Slightly decreased                           | 23  | 15 (65.2) | 8 (34.8) |         |
| Significantly decreased                      | 26  | 20 (76.9) | 6 (23.1) |         |

| Changes in intimacy behavior with sexual partner after the epidemic | All | Absent | Present | P       |
|---------------------------------------------------------------|-----|--------|---------|---------|
| Significantly increased                                     | 38  | 35 (92.1) | 3 (7.9) | <.001†  |
| Slightly increased                                           | 49  | 45 (91.8) | 4 (8.2) |         |
| Unchanged                                                    | 123 | 115 (93.5) | 8 (6.5) |         |
| Slightly decreased                                           | 33  | 22 (66.7) | 11 (33.3) |         |
| Significantly decreased                                      | 22  | 18 (81.8) | 4 (18.2) |         |

COVID-19 = Coronavirus disease 2019; GAD-7 = General Anxiety Disorder-7; PHQ-9 = Patient Health Questionnaire.

*Data are expressed as Mean ± SD. Other data are expressed as number (percentage).
†Statistically significant.
Table 5. Comparison of characteristics between subjects with or without deteriorated ejaculation control ability by PEDT

|                                | All     | Absent | Present |   P   |
|--------------------------------|---------|--------|---------|-------|
| **All**                        | 251     | 206 (82.1) | 45 (17.9) |       |
| **Marriage status**            |         |         |         |       |
| Unmarried                      | 107     | 89 (83.2) | 18 (16.8) | .418  |
| Married                        | 139     | 114 (82.0) | 25 (18.0) |       |
| Divorced or widowed            | 5       | 3 (60.0) | 2 (40.0) |       |
| **Highest academic degree**    |         |         |         |       |
| Junior middle school or lower  | 13      | 11 (84.6) | 2 (15.4) | .090  |
| Senior middle school           | 35      | 30 (85.7) | 5 (14.3) |       |
| Junior college                 | 89      | 74 (83.1) | 15 (16.9) |       |
| Undergraduate                  | 88      | 75 (85.2) | 13 (14.8) |       |
| Master                         | 18      | 12 (66.7) | 6 (33.3) |       |
| Doctor                         | 8       | 4 (50.0) | 4 (50.0) |       |
| **Cigarette smoking**          |         |         |         |       |
| Regular                        | 46      | 37 (80.4) | 9 (19.6) | .922  |
| Occasional                     | 93      | 76 (81.7) | 17 (18.3) |       |
| Never                          | 112     | 93 (83.0) | 19 (17.0) |       |
| **Alcohol drinking**           |         |         |         |       |
| Regular                        | 19      | 14 (73.7) | 5 (26.3) | .548  |
| Occasional                     | 185     | 152 (82.2) | 33 (17.8) |       |
| Never                          | 47      | 40 (85.1) | 7 (14.9) |       |
| **History of sexual dysfunction** |       |         |         |       |
| Present                        | 17      | 12 (70.6) | 5 (29.4) | .201  |
| Absent                         | 234     | 194 (82.9) | 40 (17.1) |       |
| **History of consuming relevant drugs** |      |         |         |       |
| Present                        | 27      | 20 (74.1) | 7 (25.9) | .251  |
| Absent                         | 224     | 186 (83.0) | 38 (17.0) |       |
| **Subject or family members diagnosed with COVID-19** |    |         |         |       |
| Present                        | 2       | 1 (50.0) | 1 (50.0) | .235  |
| Absent                         | 249     | 205 (82.3) | 44 (17.7) |       |
| **Changes in intensity of work after the epidemic** | | | | |
| Increased                      | 50      | 42 (84.0) | 8 (16.0) | .961  |
| Unchanged                      | 88      | 72 (81.8) | 16 (18.2) |       |
| Decreased                      | 77      | 62 (80.5) | 15 (19.5) |       |
| No work                        | 36      | 30 (83.3) | 6 (16.7) |       |
| **Participated in the control or treatment work for COVID-19** | | | | |
| No                             | 230     | 187 (81.3) | 43 (18.7) | .294  |
| Yes                            | 21      | 19 (90.5) | 2 (9.5) |       |
| **Changes in income after the epidemic** | | | | |
| Increased                      | 6       | 6 (100.0) | 0 (0.0) | .578  |
| Unchanged                      | 92      | 77 (83.7) | 15 (16.3) |       |
| Decreased (within 30%)         | 60      | 47 (78.3) | 13 (21.7) |       |
| Decreased (30–50%)             | 42      | 36 (85.7) | 6 (14.3) |       |
| Decreased (more than 50%)      | 51      | 40 (78.4) | 11 (21.6) |       |
| **Changes in anxiety after the epidemic** | | | | |
| Significantly improved          | 17      | 17 (100.0) | 0 (0.0) | .144  |
| Slightly improved              | 37      | 31 (83.8) | 6 (16.2) |       |
| Unchanged                      | 127     | 106 (83.5) | 21 (16.5) |       |
| Slightly deteriorated          | 50      | 37 (74.0) | 13 (26.0) |       |
| Significantly deteriorated      | 20      | 15 (75.0) | 5 (25.0) |       |
| **GAD-7 score before the epidemic** | | | | |
| Present                        | 3.99 ± 4.68 | 5.14 ± 4.48 | <.001 |
| Absent                         | 4.52 ± 4.99 | 7.64 ± 5.67 | <.001 |

(continued)
likely to increase owing to a fear of infection, concerns about work and financial burden, and so on. Notably, the increases in anxiety and depression may have been due to the deterioration of sexual function; the direction of this relationship needs to be carefully examined in clinical work.

Several studies have focused on the changes in the frequency of sexual life during the epidemic, while the present study is firstly reported the relationship with the sexual function of men. The frequency of sexual life was significantly related to changes in erectile function and ejaculatory control ability, and subjects with a low frequency of sexual life had less partner time and less intimacy behavior with sexual partners. Owing to the restrictions on social activity and transport during the epidemic, partners who do not live together would have less chance for sexual life. We also found that married subjects had a significantly higher frequency of sexual life and increased partner time and intimacy behavior with sexual partners. The changes in lifestyle during the epidemic might be beneficial for the sexual life of those with stable sexual partners (especially wives) but harmful to unmarried individuals. The mechanisms of the impact or partners’ relationships by social distancing, as per the current reports, are mainly related to mental stress and frequency of sexual life. Because of social distancing and other measurements, people have worry about the uncertainty about the future, and psychological problems including depression, anxiety, and frustration would be present. The lack of privacy and the decrease in psychological stimuli would lead to decreased frequency of sexual life, which significantly impact the partner relationships.

Several subjects had previous experience visiting clinics or taking relevant drugs owing to sexual dysfunction, and they were more likely to have decreased erectile function and ejaculation control ability in this study. During the epidemic period, the management of chronic diseases, including sexual dysfunction, might be affected by traffic management and medical resource

| Table 5. Continued |
|-------------------|----------------|----------------|------|
| Changes in depression after the epidemic | All | Absent | Present | P |
| Significantly improved | 26 | 23 (88.5) | 3 (11.5) | .109 |
| Slightly improved | 27 | 22 (81.5) | 5 (18.5) |
| Unchanged | 140 | 120 (85.7) | 20 (14.3) |
| Slightly deteriorated | 47 | 34 (72.3) | 13 (27.7) |
| Significantly deteriorated | 11 | 7 (63.6) | 4 (36.4) |
| PHQ-9 score before the epidemic | 4.27 ± 4.96 | 5.17 ± 4.94 | .156 |
| PHQ-9 score after the epidemic | 5.15 ± 5.87 | 8.21 ± 6.77 | .002† |
| Changes in frequency of sexual life after the epidemic | | | |
| Significantly increased | 20 | 15 (75.0) | 5 (25.0) | .230 |
| Slightly increased | 43 | 34 (79.1) | 9 (20.9) |
| Unchanged | 119 | 104 (87.4) | 15 (12.6) |
| Slightly decreased | 33 | 27 (81.8) | 6 (18.2) |
| Significantly decreased | 36 | 26 (72.2) | 10 (27.8) |
| Frequency of sexual life before the epidemic (per mo)* | 5.20 ± 5.60 | 5.76 ± 5.78 | .371 |
| Frequency of sexual life after the epidemic (per mo)* | 5.05 ± 5.86 | 6.30 ± 6.80 | .128 |
| Frequency of physical exercise before the epidemic (per mo)* | 1.92 ± 1.02 | 2.09 ± 0.97 | .194 |
| Frequency of physical exercise after the epidemic (per mo)* | 1.80 ± 1.07 | 2.00 ± 0.98 | .110 |
| Changes in partner time with sexual partner after the epidemic | | | |
| Significantly increased | 34 | 28 (82.4) | 6 (17.6) | .365 |
| Slightly increased | 19 | 16 (84.2) | 3 (15.8) |
| Unchanged | 37 | 32 (86.5) | 5 (13.5) |
| Slightly decreased | 11 | 7 (63.6) | 4 (36.4) |
| Significantly decreased | 14 | 13 (92.9) | 1 (7.1) |
| Changes in intimacy behavior with sexual partner after the epidemic | | | |
| Significantly increased | 18 | 15 (83.3) | 3 (16.7) | .480 |
| Slightly increased | 27 | 21 (77.8) | 6 (22.2) |
| Unchanged | 46 | 41 (89.1) | 5 (10.9) |
| Slightly decreased | 14 | 10 (71.4) | 4 (28.6) |
| Significantly decreased | 10 | 9 (90.0) | 1 (10.0) |

COVID-19 = Coronavirus disease 2019; GAD-7 = General Anxiety Disorder-7; PEDT = Premature Ejaculation Diagnostic Tool; PHQ-9 = Patient Health Questionnaire.

*Data was expressed as Mean ± SD. Other data was expressed as number (percentage).
†Statistically significant.
allocation. In addition, the frequency of sports exercises would be decreased, which would lead to the decline of physical function, including the decline of sexual function.

Based on the present study, there are some recommendations that might help to maintain sexual function during the epidemic. First, it would be helpful to maintain a regular frequency of sexual life when possible, both for married and unmarried men. In addition, physical exercise should be maintained when possible; it is notable that even patients with mild cases of COVID-19 in Fangcang Hospitals in Wuhan, China, performed physical exercises in the form of dancing, which was beneficial for their recovery. Moreover, a healthy mental status is extremely important, and it should be known that the epidemic as well as the relevant restrictions were only temporary, and short-term unsatisfactory sexual life might be temporary because of the expectation of change of lifestyle and remission of psychogenic ED after COVID-19. Last but not least, communication with doctors should be maintained through social networks, and the consumption of relevant medicines should be maintained owing to the importance of regular treatment.

There are certain limitations to this study. Selection bias was inevitable, and the sample size was small. Further validation and larger sample size are required to provide a more accurate description of the characteristics. Considering the subjects’ desire to fill in a long questionnaire during the epidemic, we made the questions regarding the scales optional. The incomplete data and the possibility of recall bias might have affected the results. The lack of information on intravaginal ejaculatory latency time, sleeping status, and financial burden also limited further analysis. Nevertheless, this is the first study regarding the impact of the COVID-19 epidemic on sexual function. It should be noted that currently, owing to epidemic-related restrictions, it is difficult to perform a high-quality clinical study. A large-scale investigation could be expected in the near future.

CONCLUSION

During the COVID-19 epidemic, decreased sexual function was present in a certain proportion of adult men, and the risk factors include increased anxiety and depression, and decreased frequency of sexual life.

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STATEMENT OF AUTHORSHIP

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.esxm.2020.100293.