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ROZPRAWA DOKTORSKA

# Wpływ pandemii COVID-19 na występowanie zaburzeń depresyjnych i seksualnych u kobiet i mężczyzn

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# Spis treści

## WYKAZ SKRÓTÓW UŻYTYCH W PRACY

| | |
|---|---|
| **BDI** (Beck Depression Inventory) | Skala Depresji Becka |
| **COVID-19** (Coronavirus Disease 2019) | choroba koronawirusa roku 2019 |
| **ED** (Erectile Dysfunction) | zaburzenia erekcji |
| **FSFI** (Female Sexual Function Index) | Skala Funkcjonowania Seksualnego Kobiet |
| **IIEF** (International Index of Erectile Function) | Międzynarodowy Indeks Funkcji Erekcyjnej |
| **IQR** (Interquartile Range) | rozstęp ćwiartkowy |
| **NO** (Nitric oxide) | tlenek azotu |
| **p** (Probability) | poziom istotności |
| **SARS-CoV-2** (Severe Acute Respiratory Syndrome Coronavirus 2) | drugi koronawirus ciężkiego ostrego zespołu oddechowego |
| **WHO** (World Health Organization) | Światowa Organizacja Zdrowia |

**STRESZCZENIE**

**Wstęp**

Pandemia COVID-19 spowodowała liczne powikłania zdrowotne zarówno somatyczne, jak i problemy psychiczne. Niepewność co do dalszych obostrzeń i rozwoju sytuacji epidemiologicznej miała negatywny wpływ na codzienne funkcjonowanie. Znalezienie się w nowej sytuacji, strach o własne zdrowie oraz stan zdrowia bliskich, a także poczucie osamotnienia w związku z lockdownem były przyczynami obniżonego nastroju i czynnikami ryzyka wystąpienia zaburzeń depresyjnych. Stres i brak poczucia bezpieczeństwa to również potencjalne źródła wystąpienia zaburzeń seksualnych. Seksualność jest istotnym aspektem życia człowieka, mającym wpływ na samopoczucie oraz relacje z partnerem. Określenie zależności między pandemią COVID-19, a dysfunkcjami seksualnymi i zaburzeniami depresyjnymi może ułatwić ich diagnostykę oraz umożliwić wprowadzanie działań prewencyjnych i leczniczych.

**Cel pracy**

Ocena wpływu pandemii COVID-19 i jej następstw - lockdownu, izolacji, kwarantanny i infekcji wirusem SARS-Cov-2 na ryzyko wystąpienia zaburzeń depresyjnych oraz seksualnych wśród kobiet i mężczyzn w Polsce. Zbadanie wpływu negatywnych emocji związanych z pandemią i wpływu doniesień medialnych na wyżej wymienione dysfunkcje. Ocena zmian nasilenia zaobserwowanych zaburzeń seksualnych i depresyjnych w grupie kobiet podczas drugiej fali pandemii.

**Materiały i metody**

Dane zbierane były w okresie kwiecień 2020 r. - luty 2021 r. w postaci anonimowych ankiet, udostępnionych on-line wśród pełnoletnich mężczyzn i kobiet. Średni wiek ankietowanych wynosił w grupie kobiet 25,11 lat ± 7,09 w I fali pandemii oraz 23,23 ± 5,34 lata w II fali pandemii. Średni wiek w grupie mężczyzn wyniósł w 28,46 ± 9,17 lat. Respondenci mieli możliwość zadawania pytań autorom oraz poproszenia o wskazanie miejsc oferujących pomoc psychologiczną i seksuologiczną podczas pandemii – ankieta miała wymiar badawczy oraz społeczno-edukacyjny. Ankieta zawierała m.in. pytania dotyczące kwarantanny, izolacji, odczuć związanych z pandemią i lockdownem, chorób przewlekłych i ich leczenia oraz stosowania używek. W badaniu wykorzystano także polskie wersje Skali Funkcjonowania Seksualnego Kobiet (FSFI), Międzynarodowego Indeksu Funkcji Erekcyjnej (IIEF) oraz Skali

Depresji Becka (BDI). Sumarycznie analizie statystycznej poddano 2970 ankiet (1644 kobiety na początku pandemii, 720 kobiet w trakcie pandemii, 606 mężczyzn na początku pandemii).

**Wyniki**

Wykazano istotny spadek poziomu libido podczas pandemii, w porównaniu z czasami przed lockdownem w grupie kobiet ($p<0,001$) oraz mężczyzn ($p=0,002$). Ryzyko zaburzeń depresyjnych zwiększało prawdopodobieństwo wystąpienia dysfunkcji seksualnych ($p<0,001$). Nasilenie zaburzeń depresyjnych w grupie kobiet wzrosło podczas II fali pandemii, natomiast dysfunkcje seksualne utrzymywały się na podobnym poziomie. Kwarantanna nie miała wpływu na zaburzenia depresyjne w grupie kobiet w I fali pandemii ($p=0,41$), natomiast w II fali powodowała wzrost ryzyka wystąpienia depresji ($p=0,041$). Występowanie chorób przewlekłych, strach przed zakażeniem, poczucie osamotnienia oraz śledzenie informacji na temat pandemii w mediach miały negatywny wpływ na funkcjonowanie seksualne kobiet, co wyrażone było przez niższe wyniki w FSFI ($p<0,001$). W obu grupach (kobiet i mężczyzn) zauważalny był istotny związek między negatywnymi emocjami wywołanymi pandemią a dysfunkcjami seksualnymi i ryzykiem wystąpienia zaburzeń depresyjnych. W grupie mężczyzn średni wynik w kwestionariuszu IIEF wyniósł 22,27, co wskazywało na łagodne zaburzenia erekcji. Ryzyko zaburzeń depresyjnych wzrastało wraz z wiekiem ankietowanych mężczyzn, natomiast ryzyko wystąpienia zaburzeń seksualnych obniżało się.

**Wnioski**

1. Pandemia COVID-19 miała negatywny wpływ na stan psychiczny i zdrowie seksualne wśród kobiet i mężczyzn.
2. Ryzyko wystąpienia zaburzeń depresyjnych w grupie kobiet w II fali pandemii istotnie wzrosło w porównaniu z I falą.
3. Nie zaobserwowano istotnych zmian w funkcjonowaniu seksualnym kobiet pomiędzy I a II falą pandemii.
4. Strach o zdrowie bliskich, śledzenie doniesień medialnych i odczuwana samotność to czynniki mające negatywny wpływ na funkcjonowanie seksualne oraz występowanie zaburzeń depresyjnych.
5. Niezależnie od płci, poziom libido i częstotliwość podejmowania aktywności seksualnej istotnie spadły w czasie pandemii COVID-19 w porównaniu z czasami przed pandemią.
6. Wzrost ryzyka wystąpienia zaburzeń depresyjnych skorelowany był ze wzrostem ryzyka dysfunkcji seksualnych we wszystkich badanych grupach.

**ABSTRACT**

**Introduction**

The COVID-19 pandemic has changed the daily functioning of people from all over the world. Feeling uncertain about possible restrictions and development of the epidemiological situation has had a negative impact on people's lives. A new situation, fear of the infection, anxiety of relatives' health condition as well as perceived loneliness were the possible sources of decreased mood and risk factors of depression. What is more, stress and lack of sense of security were potential causes of sexual dysfunction. Sexuality influences human well-being and relations. Determining the relationship between the COVID-19 pandemic, sexual dysfunction and depressive disorders may develop preventive and intervention measures to alleviate negative overall health effects.

**Aim of the study**

Determining the impact of the COVID-19 pandemic and its consequences (lockdown, isolation, quarantine, and infection) on the risk of depressive and sexual disorders among women and men in Poland. Investigating the impact of negative emotions related to the pandemic and the impact of following the media reports on the above-mentioned dysfunctions. Assessment of changes in the severity of observed sexual and depressive disorders in a group of women during the second wave of the pandemic.

**Material and methods**

The data was collected between April 2020 and February 2021. The anonymous questionnaire was spread to social media. In our study we enrolled adult men and women. The mean age of the first wave study women population was 25.11 ± 7.09 years, and the second wave study population had a mean age of 23.23 ± 5.34 years. The mean age of men was 28,46 ± 9.17 years. Respondents could ask questions to the authors and ask about institutions which could provide psychological and sexological help during the pandemic. The questionnaire included questions about quarantine, isolation, feelings related to the pandemic or lockdown, chronic diseases, drugs, and use of stimulants. We also have used the Polish versions of the Female Sexual Function Index (FSFI), the International Index of Erectile Function (IIEF) and the Beck Depression Inventory (BDI). The statistical analysis included 2970 questionnaires (1644 women at the beginning of the pandemic, 720 women during the pandemic, 606 men at the beginning of the pandemic).

**Results**

There was a significant decrease in libido level during the pandemic compared to the times before the lockdown among women ($p<0.001$) and men ($p=0.002$). The risk of depressive disorders increased the intensity of sexual dysfunction ($p<0.001$). The severity of depressive disorders increased during the second wave of the pandemic, while sexual dysfunctions remained at the similar level. We found no impact of quarantine on women's depressive disorders in the first wave of the pandemic ($p=0.41$), whereas in the second wave it increased the risk of depression ($p=0.041$). The occurrence of chronic diseases, fear of the infection, feeling of loneliness and following the media has had a negative impact on women's sexual functioning, which was expressed by lower FSFI scores ($p<0.001$). In both groups (women and men), a significant relationship was found between negative emotions caused by the pandemic and sexual dysfunction as well as the risk of depressive disorders. In the group of men, the average score on the IIEF questionnaire was 22.27, which indicated mild erectile dysfunction. The risk of depressive disorders increased with the age of the surveyed men, while the risk of sexual disorders decreased.

**Conclusions**

1. The COVID-19 pandemic has had a negative impact on mental and sexual health among both women and men.
2. The risk of depressive disorders among women in the second wave of the pandemic intensified in comparison to the first wave.
3. We have observed no significant differences in women sexual functioning between the first and second wave of the pandemic.
4. Worrying about the health condition of loved ones, following the media and perceived loneliness caused sexual dysfunction and higher occurrence of depression.
5. Libido level and frequency of sexual activity have decreased significantly in the times of COVID-19 pandemic.
6. Higher occurrence of depressive disorders was correlated with higher risk of sexual dysfunction among all study groups.

## WSTĘP

Choroba COVID-19 budzi zainteresowanie wielu lekarzy i naukowców, którzy odkrywają kolejne warianty wirusa SARS-Cov-2 i możliwe powikłania infekcji. Konsekwencje wynikające z zakażeniem tym koronawirusem mogą dotyczyć licznych narządów i układów. Znane są, m.in., powikłania pulmonologiczne, kardiologiczne, neurologiczne, angiologiczne, dermatologiczne czy gastrologiczne [1]. Istotnymi następstwami pandemii są powikłania natury psychicznej i seksualnej, które nie zawsze zgłaszane są przez pacjentów w pierwszej kolejności, natomiast stanowią istotny aspekt problematyki związanej z wirusem SARS-Cov-2.

Pierwszy przypadek zakażenia SARS-Cov-2 odnotowano w Polsce 4 marca 2020 r.[2] Pandemia spowodowała diametralne zmiany w funkcjonowaniu wielu instytucji, a także życiu codziennym ludzi na całym świecie, niezależnie od wieku, wykształcenia i czynników ekonomicznych. W celu ograniczenia rozprzestrzeniania się wirusa wprowadzono nauczanie zdalne, a wiele firm wprowadziło możliwość pracy z domu. Zamknięto siłownie, restauracje i galerie handlowe. Poprzez zakaz zgromadzeń, ograniczono możliwości spotykania się z innymi ludźmi – także rodziną i przyjaciółmi. Wprowadzono obowiązkową kwarantannę dla osób podejrzanych o kontakt z osobą zakażoną, przekraczających granice kraju oraz izolację osób z potwierdzoną infekcją COVID-19. Samotność i brak możliwości spędzania czasu z bliskimi osobami to istotne czynniki, mające negatywny wpływ na stan psychiczny człowieka. Według Światowej Organizacji Zdrowia (WHO) zdrowie seksualne jest zdefiniowane jako stan fizycznego, emocjonalnego, psychicznego i społecznego dobrostanu w odniesieniu do seksualności [3]. Można więc przypuszczać, że zachwianie poczucia bezpieczeństwa, poprzez znalezienie się w obliczu ogólnoświatowej pandemii, było istotnym czynnikiem pogarszającym funkcjonowanie seksualne. Lockdown związany był z brakiem możliwości spotkań lub zacieśniania relacji. Wspólne wyjścia do restauracji, kina lub teatru były niemożliwe. Zakaz zgromadzeń ograniczył organizację imprez rodzinnych i okolicznościowych. Zdalna praca i nauka mogły powodować konflikty w związkach i negatywnie wpływać na relacje ze względu na frustrację i ograniczone możliwości spędzania wolnego czasu. Nowa sytuacja, niepewność dotycząca dalszych obostrzeń, strach o zdrowie własne i bliskich, ryzyko utraty zatrudnienia mogły negatywnie wpłynąć nie tylko na relacje interpersonalne, ale także na stan psychiczny. Należy również zwrócić uwagę na szerokie konsekwencje zachorowania na COVID-19, które mogą obejmować liczne narządy i układy,

w tym układ krążenia, dokrewny i nerwowy. Wszystkie wymienione biorą udział w prawidłowym funkcjonowaniu seksualnym człowieka.

Depresja dotyka ok 350 milionów osób na świecie, a w Polsce szacuje się, że choruje na nią 1,5 miliona ludzi [4]. W badaniach analizujących stan psychiczny w pandemii, 60% Polaków podało, że pandemia ma negatywny wpływ na ich samopoczucie [5]. Badania wskazują na związek pomiędzy zaburzeniami nastroju a dysfunkcjami seksualnymi zarówno wśród mężczyzn, jak i kobiet [6,7]. Depresja negatywnie wpływa również na relacje międzyludzkie, co powoduje poczucie osamotnienia. Z pewnością lockdown i brak możliwości swobodnego spotykania innych ludzi może potęgować negatywne implikacje depresji i kontaktów społecznych. Pomimo możliwości prowadzenia rozmów telefonicznych lub wideo, media społecznościowe nigdy nie zastąpią osobistej rozmowy i fizycznego spotkania z drugim człowiekiem. Badacze wskazują na pojawianie się zaburzeń depresyjnych związanych z pandemią również wśród pacjentów bez przeszłości psychiatrycznej [8].

Z tego powodu bardzo ważne jest zbadanie wpływu nadzwyczajnych sytuacji, takich jak pandemia, na stan psychiczny i zdrowie seksualne ludzi. Podczas prowadzenia badań i pisania publikacji, stwierdzono niewiele doniesień na temat seksualności i depresji w pandemii. Biorąc pod uwagę brak danych na temat powiązań pandemii z jakością życia seksualnego i stanu psychicznego ludzi, przeprowadzono badania, na podstawie których powstał cykl trzech publikacji, stanowiących podstawę niniejszej rozprawy doktorskiej.

## CEL PRACY

Określenie wpływu zachorowania na COVID-19 oraz konsekwencji wynikających z pandemii (lockdown, izolacja, wpływ prasy i mediów) jest niezwykle istotną kwestią, która nie została wcześniej zbadana w polskiej populacji. Prezentowana rozprawa, stanowiąca zbiór trzech publikacji, prezentuje wyniki analiz korelacji między uwarunkowaniami sytuacji pandemicznej w Polsce a zaburzeniami depresyjnymi i seksualnymi u osób ankietowych.

Cele szczegółowe:

1. Analiza wpływu zachorowania na COVID-19 na stan psychiczny młodych osób.
2. Ocena wpływu negatywnych odczuć związanych z pandemią na występowanie zaburzeń depresyjnych i seksualnych u ankietowanych Polaków.
3. Ocena tendencji do nasilenia zaobserwowanych dysfunkcji seksualnych oraz zaburzeń depresyjnych podczas drugiej fali pandemii.
4. Określenie subpopulacji najbardziej narażonej na powikłania natury psychicznej i seksualnej podczas pandemii COVID-19.
5. Ocena występowania i natężenia zaburzeń seksualnych wśród ankietowanych mężczyzn i kobiet.

## MATERIAŁY I METODY

Podczas badania respondenci zostali poproszeni o wypełnienie anonimowej ankiety, składającej się z autorskiego formularza przygotowanego przez zespół badawczy oraz polskich wersji walidowanych kwestionariuszy, stosowanych w psychiatrii i seksuologii.

Ankieta składała się z 4 części:

I – kwestionariusz dotyczący danych socjoekonomicznych, demograficznych, chorób przewlekłych oraz przyjmowanych leków.

II – kwestionariusz dotyczący infekcji COVID-19, izolacji, kwarantanny, używek oraz negatywnych odczuć związanych z pandemią.

III – Skala Depresji Becka (BDI).

IV – Skala Funkcjonowania Seksualnego Kobiet (FSFI)/ Międzynarodowy Indeks Funkcji Erekcyjnej (IIEF).

Zastosowanie powyższych kwestionariuszy dostarczyło istotnych danych dotyczących funkcjonowania seksualnego oraz zdrowia psychicznego ankietowanych w kontekście lockdownu oraz licznych obostrzeń wprowadzonych z powodu wybuchu światowej pandemii.

Na przeprowadzenie badań uzyskano zgodę Komisji Bioetycznej przy Uniwersytecie Medycznym im. Piastów Śląskich we Wrocławiu (KB-424/2021).

Uzyskane dane przedstawiono jako liczby, procenty, średnie z odchyleniem standardowym, mediany i rozstępy ćwiartkowe (IQR). W celu analizy rozkładu danych użyto testu Shapiro-Wilka. Za pomocą testu Chi-kwadrat oceniono różnice w częstości podejmowania aktywności seksualnej i libido przed pandemią oraz w jej trakcie. Przy porównaniu zmiennych ilościowych pomiędzy grupami zastosowano Test Manna-Whitneya oraz Kruskal–Wallisa z testem post-hoc. Do porównania średnich dla danych o rozkładzie normalnym zastosowano test t-Studenta. Siłę zależności między FSFI/IIEF, BDI i pytaniami dotyczącymi pandemii wyrażono za pomocą współczynnika korelacji rang Spearmana. Za istotne statystycznie przyjmowano wartości $p<0,05$. W celu oceny spójności wewnętrznej kwestionariuszy, dla wszystkich pytań z sekcji BDI oraz IIEF zastosowano współczynnik alfa Cronbacha. Wyniki powyżej 0,7 wskazują na dobrą spójność wewnętrzną. Dla kwestionariusza wynik ten wykazał łącznie wartość 0,83, natomiast po obliczeniu współczynnika oddzielnie dla obu jego części, wyniósł on dla BDI 0,92 i FSFI 0,93.

Analizę statystyczną przeprowadzono przy użyciu programu R Project for Statistical Computing v. 3.4.1 (R Foundation for Statistical Computing, Vienna, Austria) oraz Statistica software v. 13.3 (StatSoft, Tulsa, OK, USA).

**GRUPA BADANA**

Badanie w I fali pandemii przeprowadzone zostało w okresie od kwietnia 2020 r. do lutego 2021 r. w postaci anonimowych ankiet, udostępnionych on-line wśród pełnoletnich mężczyzn i kobiet. Dane dotyczące II fali pandemii zbierano w okresie listopad 2020 – luty 2021. Średni wiek ankietowanych wynosił w grupie kobiet 25,11 lat ± 7,09 w I fali pandemii oraz 23,23 ± 5,34 lata w II fali pandemii. Średni wiek w grupie mężczyzn wyniósł w 28,46 ± 9,17 lat. Respondenci mieli możliwość zadawania pytań autorom oraz poproszenia o wskazanie miejsc, gdzie mogą w trakcie pandemii otrzymać pomoc psychologiczną i seksuologiczną – ankieta miała wymiar badawczy oraz społeczno-edukacyjny. W badaniu wykorzystano polskie wersje Skali Funkcjonowania Seksualnego Kobiet (FSFI), Międzynarodowego Indeksu Funkcji

Erekcyjnej (IIEF) oraz Skali Depresji Becka (BDI). W badaniu udział wzięło 2970 ankietowanych (1644 kobiety na początku pandemii, 720 kobiet w trakcie pandemii, 606 mężczyzn na początku pandemii). Kryteriami włączenia do badania był wiek powyżej 18. roku życia oraz bycie aktywnym seksualnie. Niekompletne kwestionariusze wyłączono z analizy statystycznej.

Ze względu na lockdown ankiety udostępniano w formie on-line, zapewniając respondentom anonimowość. Przed przystąpieniem do wypełniania kwestionariusza ankietowani wyrażali świadomą zgodę na udział w badaniu. Za udział w badaniu nie przysługiwało wynagrodzenie.

**WYKAZ PUBLIKACJI WCHODZĄCYCH W SKŁAD CYKLU**

1. **Mental and Sexual Health of Polish Women of Reproductive Age During the COVID-19 Pandemic - An Online Survey**

   Szuster E, Kostrzewska P, Pawlikowska A, Mandera A, Biernikiewicz M, Kałka D. Sex Med. 2021 Aug;9(4):100367. doi: 10.1016/j.esxm.2021.100367. Epub 2021 Jun 16. PMID: 34146832; PMCID: PMC8360924.

   IF: 2,54

   Pkt MEiN: 70

2. **Depressive and Sexual Disorders during the First and Second Wave of the COVID-19 Pandemic among Young Polish Women**

   Szuster E, Kostrzewska P, Pawlikowska A, Mandera A, Biernikiewicz M, Sobieszczańska M, Rożek-Piechura K, Jarząbek-Bielecka G, Rusiecka A, Kałka D. Int J Environ Res Public Health. 2022 Feb 8;19(3):1887. doi: 10.3390/ijerph19031887. PMID: 35162908; PMCID: PMC8835018.

   IF: 4,614

   Pkt MEiN: 140

3. **Mental and Sexual Health of Men in Times of COVID-19 Lockdown**

   Szuster E, Pawlikowska-Gorzelańczyk A, Kostrzewska P, Mandera-Grygierzec A, Rusiecka A, Biernikiewicz M, Brawańska K, Sobieszczańska M, Rożek-Piechura K, Kałka D. Int J Environ Res Public Health. 2022 Nov 20;19(22):15327. doi: 10.3390/ijerph192215327. PMID: 36430046; PMCID: PMC9690699.

   IF: 4,614

   Pkt MEiN: 140

**Łączny IF: 11,768**

**Łączne punkty MEiN: 350**

## WYNIKI POSZCZEGÓLNYCH PRAC Z CYKLU

### Mental and Sexual Health of Polish Women of Reproductive Age During the COVID-19 Pandemic - An Online Survey

Praca zawiera wyniki badań oceniające związek między pandemią COVID-19 a zdrowiem psychicznym i seksualnym kobiet. Badanie objęło grupę 1644 kobiet. Średnia wieku ankietowanych wynosiła 25,11 lat ± 7,09 lat. Ankietę przeprowadzono między kwietniem i majem 2020 roku.

Wykazano istotne statystycznie obniżenie poziomu libido w trakcie pandemii, w porównaniu z czasami przed lockdownem ($p<0,001$) i w konsekwencji rzadszą częstotliwość aktywności seksualnej w trakcie pandemii ($p<0,001$). Ponadto ponad połowa ankietowanych (57,5%) zgodziła się z twierdzeniem, że strach o stan zdrowia bliskich osób jest u nich źródłem stresu i obniżonego nastroju. Średni wynik BDI wynosił 11 (IQR 5-18), co może być interpretowane jako brak zaburzeń depresyjnych. Na podstawie pytań dotyczących postrzegania własnego wyglądu oraz popełniania błędów u ponad 10% kobiet można podejrzewać niską samoocenę i zaburzenia w poczuciu własnej atrakcyjności. Stwierdzono istotną statystycznie korelację pomiędzy wynikiem FSFI i BDI ($p<0,001$), co świadczy o tym, że obecność zaburzeń seksualnych było istotnie związane z większym ryzykiem wystąpienia zaburzeń depresyjnych. Występowanie chorób przewlekłych, strach przed zakażeniem, poczucie osamotnienia oraz śledzenie informacji na temat pandemii w mediach miały negatywny wpływ na funkcjonowanie seksualne kobiet, co wyrażone było obniżeniem wyniku FSFI w tych grupach ($p<0,001$). Ryzyko wystąpienia obniżonego nastroju wzrastało wraz z wiekiem ankietowanych ($r=-0,03261$; $p<0,001$). Strach przed zakażeniem, stres w związku z możliwym zachorowaniem wśród najbliższych, samotność, śledzenie wiadomości na temat pandemii w mediach oraz częstsze stosowanie używek także powodowały gorsze wyniki w Skali Depresji Becka.

### Depressive and Sexual Disorders during the First and Second Wave of the COVID-19 Pandemic among Young Polish Women

W pracy omówiono zmiany w częstości występowania zaburzeń depresyjnych i seksualnych wśród kobiet, porównując I i II falę pandemii. Dane zbierano między kwietniem i majem 2020 r. (I fala) oraz między listopadem 2020 r. i lutym 2021 r. (II fala). W badaniu

wzięły udział 2364 kobiety – 1644 podczas I fali pandemii oraz 720 podczas II fali. Średnia wieku ankietowanych wyniosła 25,11 lat ± 7,09 lat w I fali oraz 23,23 ± 5,34 lata w II fali.

W przeciwieństwie do I fali pandemii, w późniejszym okresie znacznie więcej kobiet miało styczność z wirusem SARS-Cov-2. Więcej respondentek było objętych kwarantanną, zdiagnozowano u nich COVID-19 lub doświadczyły choroby lub śmierci wśród bliskich z powodu COVID-19. Zaobserwowano istotne statystycznie różnice pomiędzy częstością praktykowania aktywności seksualnej przed pandemią, podczas I fali pandemii ($p<0,001$), jak i w czasie II fali pandemii ($p=0,028$). Podobne wnioski dotyczą obniżenia libido podczas I i II fali pandemii, w porównaniu z czasami sprzed lockdownu ($p<0,001$). Podczas II fali pandemii średni wynik BDI wyniósł 12, co można zinterpretować jako łagodne zaburzenia depresyjne. Nasilenie zaburzeń depresyjnych wzrosło w porównaniu z okresem I fali pandemii. Ponadto w przeciwieństwie do I fali pandemii, objęcie kwarantanną w II fali było związane z większym prawdopodobieństwem wystąpienia depresji ($p=0,041$).

**Mental and Sexual Health of Men in Times of COVID-19 Lockdown**

W opisanym badaniu wzięło udział 606 mężczyzn ze średnią wieku 28,46 ± 9,17 lat. Ankiety zbierano w miesiącach kwiecień i maj 2020 roku. Pandemia COVID-19 spowodowała obniżenie poziomu libido ($p=0,002$) oraz spadek częstości podejmowania stosunków seksualnych ($p<0,001$) w porównaniu z okresem sprzed lockdownu.

Średni wynik IIEF wyniósł 22,27 punktów, co wskazuje na łagodne zaburzenia erekcji. Podobne wyniki obserwuje się dla domen orgazmu, pożądania i satysfakcji. Uśredniona punktacja w domenie ogólnej satysfakcji wskazywałła na dysfunkcje łagodne do średnich. Ponadto zaburzenia seksualne były związane z występowaniem zaburzeń depresyjnych ($p<0,001$), śledzeniem informacji w mediach, strachem i samotnością. Starsi mężczyźni mieli mniejsze prawdopodobieństwo wystąpienia zaburzeń seksualnych ($p<0,001$). Analizując stan psychiczny, wraz z wiekiem ankietowanych wzrastało prawdopodobieństwo wystąpienia depresji ($p<0,001$). Wykształcenie i miejsce zamieszkania nie wpływały na funkcje seksualne oraz zaburzenia depresyjne u mężczyzn. Warto zwrócić uwagę na fakt, że mężczyźni w związkach mieli istotnie niższe ryzyko wystąpienia depresji, niż samotni mężczyźni ($p<0,001$). Co więcej, ankietowanych pozostających w związkach małżeńskich cechował lepszy stan psychiczny, w porównaniu z respondentami w związkach nieformalnych ($p<0,001$).

## PODSUMOWANIE

W badaniach opublikowanych w cyklu trzech prac, stanowiących podstawę rozprawy doktorskiej, przeanalizowano problematykę, która rzadko stanowi przedmiot dyskusji na temat negatywnych zdrowotnych skutków pandemii COVID-19. Wykazano, że zarówno konsekwencje wynikające z lockdownu (ograniczone możliwości spotkań, spędzania wolnego czasu, poznawania nowych osób), jak i sam fakt poczucia zagrożenia w związku z możliwą infekcją, mogą mieć negatywny wpływ na stan psychiczny. Zidentyfikowano czynniki ryzyka obniżonego nastroju i zachowania, które mogą nasilać destrukcyjne skutki pandemii.

Katastrofy naturalne i wojny, wpływając na organizację życia ludzkiego, zaburzają poczucie bezpieczeństwa i niejednokrotnie możliwość decydowania o przebiegu sytuacji dotyczących życia i zdrowia. Wiele ważnych zmian nie jest możliwych do przewidzenia i zaplanowania. Taki stan negatywnie wpływa na wiele sfer życia, w tym funkcje seksualne. Obserwacje wskazują, że trzęsienia ziemi i tsunami obniżają jakość funkcjonowania seksualnego [9,10]. Z kolei badacze z Turcji zaobserwowali, że przechorowanie COVID-19 wiąże się z zaburzeniami w funkcjonowaniu seksualnym [11]. Wyniki naszych badań potwierdzają te doniesienia i wskazują na zaburzenia seksualne, występujące zarówno w grupie kobiet, jak i mężczyzn. Fakt ten potwierdza także meta-analiza opublikowana w 2022 roku [12].

Ponadto potwierdzają się nasze obserwacje o obniżeniu poziomu libido podczas pandemii COVID-19. Depresja jest czynnikiem oddziałującym znacząco na funkcjonowanie seksualne. Wykazano, że anhedonia związana z zaburzeniami depresyjnymi może być źródłem dyspareunii [13]. Omar i wsp. donosili, że pandemia COVID-19 negatywnie wpłynęła na funkcje kobiet i mężczyzn, natomiast kobiety były grupą bardziej narażoną na depresję i uczucie lęku, co potęgowało dysfunkcje seksualne [14]. W innym badaniu analizowano grup ludzi młodych, którzy mają mniejsze ryzyko rozwinięcia zaburzeń seksualnych. Lockdown i izolacja powodowały, że więcej czasu spędzano w domu, co stwarzało dużo okazji do aktywności seksualnej. Mimo to, częstość odbywania stosunków zmniejszyła się. Przypuszczalną przyczyną był spadek libido i mniejsza potrzeba realizowanie potrzeb seksualnych. Obserwowana rzadsza aktywność seksualna podczas pandemii w związkach innych niż małżeńskie może wiązać się z mniejszą ilością czasu spędzonego z partnerem lub partnerką, co negatywnie wpłynęło na relacje [15].

Bliskość i intymność poprawiają relacje między partnerami oraz zwiększają poczucie bezpieczeństwa, niwelując stres i poczucie osamotnienia. W obliczu ogólnoświatowej

pandemii ludzie skupili się na zapewnieniu sobie bezpieczeństwa, środków do życia i ochrony przed możliwym zakażeniem. Dbanie o relacje i seksualność zeszły na dalszy plan. Mniejsza częstość odbywania stosunków seksualnych mogła być też wynikiem utrudnień dotyczących przemieszczania się i brakiem spotkań osób, które nie mieszkały z partnerem lub partnerką.

Należy zwrócić uwagę, że wyniki naszego badania przeprowadzonego w drugiej fali pandemii sugerują, że zdiagnozowane zaburzenia seksualne utrzymywały się w grupie kobiet na tym samym poziomie, natomiast zaburzenia nastroju pogłębiły się. Ekspozycja na przedłużony stres i niepewność odnośnie do kolejnych obostrzeń to czynniki, które intensyfikowały ryzyko zaburzeń depresyjnych. Zasadniczy wpływ na obniżony nastrój miał także niepokój dotyczący stanu zdrowia własnego i bliskich. Natężenie dysfunkcji seksualnych nie pogłębiło się  natomiast istotnie. Seksualność i relacje intymne mogły być pewnym mechanizmem obronnym w tej trudnej sytuacji. Śledzenie informacji w mediach to kolejny czynnik, mający negatywny wpływ na poczucie bezpieczeństwa u ankietowanych. Osoby, które śledziły statystyki prezentujące liczbę zachorowań i zgonów, manifestowały silniejsze zaburzenia w funkcjach psychicznych i seksualnych. Nasze badania wykazały także, że ankietowani negatywnie oceniali swój wygląd. Ograniczone możliwości spędzania czasu poza domem oraz praca zdalna nie stwarzały okazji do zadbania o wygląd zewnętrzny. Prawdopodobnie spędzając czas w domu, respondenci nie przywiązywali wagi do swojego wizerunku. Takie zachowania mogą wynikać także z obecności zaburzeń depresyjnych, gdy wygląd staje się mniej ważny dla chorego [16].

Ograniczone możliwości spędzania wolnego czasu i stres mogły sprzyjać większemu ryzyku sięgania po używki. Częstsze spożycie alkoholu i palenie tytoniu nasilały zaburzenia erekcji u mężczyzn. Związek ten potwierdzają też inni badacze [17]. Należy zwrócić uwagę na to, że stres psychiczny to tylko jeden z czynników ryzyka wystąpienia  zaburzeń erekcji. Aby lepiej zrozumieć problematykę zaburzeń erekcji, warto poznać mechanizmy jej powstawania. Śródbłonek naczyniowy odpowiada, m.in. za utrzymanie homeostazy oraz wazodylatację [18]. Jego uszkodzenie wiąże się także z upośledzoną produkcją tlenku azotu (NO). Do wystąpienia erekcji konieczne jest poszerzenie obwodu naczynia o ok. 80%. Z tego więc powodu spadek zdolności naczyniorozszerzających utrudnia lub uniemożliwia wzwód prącia. Wykazano, że przechorowanie COVID-19 może wiązać się z zaburzeniami funkcji śródbłonka. [19]. Co więcej, choroba uszkadza także układ krążenia, oddechowy i dokrewny, od których również zależy funkcja erekcyjna. Niepokój, mniejsza częstotliwość odbywania stosunków seksualnych oraz depresja to czynniki ryzyka zaburzeń erekcji, na które uwagę zwracają także inni autorzy

[15]. Zjawiska te negatywnie wpływają na oś podwzgórze – przysadka - nadnercza i mogą doprowadzić do hiperkortyzolemii, która skutkuje pogorszeniem funkcji erekcyjnej [20].

Zaburzenia seksualne to nie jedyny skutek pandemii, który był obserwowany w grupach kobiet. Inni autorzy podają, że pandemia miała wpływ na cykl miesięczny, powodując wzrost obfitości krwawień, bóle menstruacyjne, nieregularne miesiączki lub ich zatrzymanie [21]. Zaobserwowano wzrost częstości występowania tych dolegliwości w porównaniu z czasami przed pandemią [22]. Wyniki te sugerują zmiany w układzie endokrynnym kobiet i zaburzenia w syntezie hormonów płciowych. Wraz z rozwojem pandemii zaobserwowano wzrost liczby kobiet korzystających z opieki psychiatrycznej i psychologicznej. Może mieć to związek z bardziej nasilonymi zaburzeniami depresyjnymi, ale także z wdrażaniem rozwiązań, które poprawiły dostępność takiej opieki. Z biegiem czasu proponowano nowe możliwości pomocy psychologicznej, przede wszystkim porady zdalne, które nie były aż tak rozpowszechnione przed pandemią COVID-19.

W zapobieganiu negatywnym skutkom trudnych sytuacji i katastrof, w tym pandemii COVID-19, istotne jest szybkie wprowadzenie strategii prewencyjnych. Przestrzeganie zasad higieny pracy podczas pracy zdalnej stanowi podstawę zdrowego i zbalansowanego stylu życia. Ponadto kampanie społeczne, informujące na temat strategii radzenia sobie ze stresem w obliczu pandemii mogą załagodzić ewentualne zaburzenia nastroju i ograniczyć ich rozpowszechnienie. Pacjenci zagrożeni wystąpieniem depresji powinni mieć świadomość ryzyka związanego z następstwami choroby i wiedzieć, gdzie mogą otrzymać pomoc. Zdrowie seksualne to równie istotny element życia człowieka. W związku z silnymi korelacjami między zaburzeniami depresyjnymi a zaburzeniami w funkcjonowaniu seksualnym, lekarze w rozmowach z pacjentami powinni poruszać tematykę zdrowia seksualnego. W relacji lekarz -pacjent zwykle to lekarz dominuje w rozmowie i często od niego zależy przebieg dialogu na temat seksualności [23].

Odpowiednie, delikatne i efektywne, poruszanie tych tematów zwiększa otwartość pacjenta na temat jego intymności i seksualności. Warto podkreślić, że pacjenci powinni otrzymywać profesjonalne materiały psychologiczne i seksuologiczne. Należy zwrócić uwagę na to, że coraz częściej to Internet jest pierwszym źródłem informacji na temat zarówno sytuacji na świecie, jak i zdrowia. Istotną rolą lekarzy jest popularyzacja oficjalnych źródeł danych dotyczących pandemii i metod ograniczenia rozprzestrzeniania się wirusa. Pomoże to uniknąć dezinformacji i szerzenia teorii spiskowych, które potęgują uczucie niepewności i stresu.

Interpretując wyniki zaprezentowanych w niniejszej rozprawie publikacji, należy pamiętać o ograniczeniach przeprowadzonych badań. Po pierwsze, ze względu na sytuację

epidemiczną, zastosowane kwestionariusze publikowane były on-line i samodzielnie wypełniane przez uczestników. Ich wyniki nie mogą być więc interpretowane jako pełna diagnoza psychiatryczno - seksuologiczna. Ponadto, ze względu na małe rozpowszechnienie korzystania z Internetu przez ludzi starszych, badania dotyczą przede wszystkim osób młodych, a więc nie są reprezentatywne dla całej populacji mężczyzn i kobiet.

Uzyskane wyniki dowodzą, że zaburzenia psychiczne oraz seksualne są powszechnie występującym skutkiem pandemii. Zaobserwowane zjawiska mogą posłużyć jako wskazówka dla lekarzy, aby uwzględniać wyżej wymienione zaburzenia podczas wywiadu i badania związanego z następstwami pandemii. Wykazane korelacje należy również uwzględnić w diagnostyce różnicowej jako potencjalne źródło obserwowanych dysfunkcji. Ponadto wykazany wpływ pandemii na aktywność seksualną osób w wieku rozrodczym może mieć wpływ na problemy z prokreacją, pogłębiając już i tak niski poziom dzietności w Polsce.

**WNIOSKI**

1. Pandemia COVID-19 wywarła negatywny wpływ na stan psychiczny i zdrowie seksualne wśród kobiet i mężczyzn.
2. W grupie kobiet ryzyko wystąpienia zaburzeń depresyjnych podczas drugiej fali pandemii, w porównaniu ze stanem w czasie pierwszej fali, istotnie wzrosło.
3. Nie zaobserwowano istotnych zmian w seksualnym funkcjonowaniu kobiet pomiędzy okresami pierwszej i drugiej fali pandemii.

**PIŚMIENNICTWO**


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# PUBLIKACJE WCHODZĄCE W SKŁAD CYKLU

COVID-19

# Mental and Sexual Health of Polish Women of Reproductive Age During the COVID-19 Pandemic – An Online Survey



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## ABSTRACT

**Introduction:** The COVID-19 pandemic can cause emotional distress, which can in turn lead to the development of mental and physical symptoms.

**Aim:** We examined the association of the COVID-19 outbreak and the mental, physical and sexual health of the female Polish population.

**Methods:** Data were collected in an online survey distributed on social media from April 22, 2020 through to May 7, 2020. The data collection began one month after the start of lockdown in Poland.

**Main Outcome Measure:** Women were asked to complete the Beck Depression Inventory (BDI) and the Female Sexual Function Index (FSFI) questionnaires.

**Results:** Overall, 1644 women (median age 23 years) took part in the survey. They reported a lower frequency of sexual activity ($P < .001$) and a lower libido level ($P < .001$) during the pandemic then before it. 57.5% of the study group (n = 944) strongly agreed or agreed that fear of the health condition of loved ones was a source of stress and depressed mood. The average BDI-II total score was 11 (range 0-51; IQR 5-18), which corresponds to minimal depression. The average FSFI total score was 27.01 ± 7.61 (range 2-36). The FSFI and BDI scores were significantly correlated ($P < .001$). The FSFI score was significantly correlated with the presence of any comorbid chronic disease, the intensity of the fear of infection and fear of health conditions, perceived loneliness, and the being up to date with media news. The BDI score was significantly correlated with age, the intensity of the fear of infection and fear of health conditions, perceived loneliness, being up to date with media news, and the more frequent use of stimulants.

**Conclusions:** The COVID-19 lockdown setting was associated with a high occurrence of depressive symptoms and increased risk of sexual dysfunction with decreased libido and lower sexual frequency the most commonly reported issues. **Szuster E, Kostrzewska P, Pawlikowska A, et al. Mental and Sexual Health of Polish Women of Reproductive Age During the COVID-19 Pandemic – An Online Survey. Sex Med 2021;9:100367.**



**Key Words:** COVID-19 Pandemic; Sexual Dysfunction; Mental Health; Polish Population; Female Health

## INTRODUCTION

A stressful event such as warfare, sexual assault and life-threatening events are a source of strong stress and anxiety that can have long-term effects on health. It has been estimated that 2/3 of the population can witness or participate in a traumatic event, but only 20% of them will develop post-traumatic stress disorder (PTSD).[1] The definition of PTSD is still under debate; however, PTSD is one of the most widely used diagnoses in mental health care. According to the International Classification of Diseases (ICD-11), PTSD "develops following exposure to an extremely threatening or horrific event". This disorder includes reexperiencing the traumatic event, avoidance behaviour, and

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hypervigilance phenomena.[1,2] Clinically, PSTD translates into the occurrence of a wide variety of physical and emotional symptoms that include the impairment of sexual health.[3,4] The Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM−5), which is often used in clinical trials as well, defines PTSD a bit differently. According to DSM-5, PTSD is a disorder characterized by anhedonic and/or dysphoric and externalizing phenotypes with symptoms including persistent negative evaluation of self or others, elevated self-blame, a negative emotional state, and reckless or self-destructive behavior.[5] It is worth noting that groups of patients diagnosed using the two systems do not overlap completely. On top of this, about 50% of victims experience posttraumatic and depressive symptoms.[6]

Reports from the literature suggest that PTSD can be linked with impaired sexual functioning. Breyer et al. investigated sexual health among warzone-deployed veterans who returned from the Iraq and Afghanistan conflicts. The study included 794 women and 787 men. In the study group, 12.7% of women were diagnosed with sexual dysfunction and/or were on prescription treatment for sexual dysfunction. Moreover, PTSD women were less likely to be sexually active when compared to non-PTSD women (58.7% vs 72.1%, $P < .001$).[7] O'Loughlin and Brotto compared women with and without hypoactive sexual desire disorder (HSDD). They found that women with HSDD were more likely to experience current PTSD (OR = 5.50, 95% CI [1.18, 25.61]) and lifetime PTSD (OR = 2.78, 95% CI [1.56, 4.94]). HSDD women also reported the more frequent occurrence of, and more severe symptoms of, PTSD.[3]

Traumatic nature of the pandemic and compulsory isolation may cause illness or flare existing symptoms because infectious disease outbreaks evoke strong emotions and a fear of contracting a deadly disease. The severity of anxiety increases if the isolation, due to the threatening disease, is prolonged. It can also be affected by domestic violence and the loss of earning opportunities. On February 11, 2020, the name of the disease known as COVID-19 was announced by the WHO.[8] An outbreak of severe pneumonia caused by the coronavirus SARS-Cov-2 was rapidly spreading around the world. At the time of writing this paper, COVID-19 was diagnosed in patients from 187 countries, it affected over 4 million patients and had caused almost 300 deaths worldwide.[9] To protect citizens, a lot of countries implemented many social distancing methods, closed schools and shops, put some travelling restrictions in place, and advised the extensive use of remote working and home-schooling. The COVID-19 pandemic is not only a cause of a health crisis, but it has also led to adverse mental health consequences. A recent review of the literature on the impact of the COVID-19 pandemic on mental health suggests that symptoms of anxiety and depression (16-28%) and self-reported stress (8%) are commonly reported in affected populations.[10] The study of Liu et al. showed that symptoms of PTSD were present in 7% of the population living in the areas of China hardest-hit by SARS-Cov-2. The researcher noted that women, when compared to men, much more frequently experienced repeated adverse changes in cognition or mood, as well as hyper-arousal.[11] Also, Omar et al. reported that the COVID-19 pandemic decreased sexual satisfaction and was a source of anxiety and depression particularly in women.[12]

Taking into account that the COVID-19 pandemic can cause emotional distress leading to the development of physical symptoms, we hypothesized that women would report subjective worsening of sexual symptomatology. In this study, we investigated an association between the COVID-19 outbreak and the mental and physical health of the vulnerable female population. This is the first study that addresses the quality of sexual health in the Polish population and correlates it with other variables including mental health.

## MATERIAL AND METHODS

An online survey based on Google Forms was put on social media (namely Facebook). The questionnaire has been sent to numerous groups on Facebook associating Polish users of every age and sex as well as groups only for women. It was also spread to groups for young adults and for middle age and older women. The aim of such distribution was to collect data on people infected with COVID-19, people suspected to be infected, people with a fear of contracting the infection, the use of stimulants, and perceived mental and sexual health. The questionnaires included additional demographic questions and general questions about participants' behavior during the lockdown (those question are described in Table 1 and Table 2). All women were asked to complete the Beck Depression Inventory (BDI) and the Female Sexual Function Index (FSFI) questionnaires. The study was conducted from April 22, 2020 through to May 7, 2020. The data collection began one month after the start of lockdown in Poland (March 25, 2020). Participation in the study was voluntary and anonymous. Participants were informed that by completing the questionnaire, they provided consent to participate in the survey. The exclusion criteria was age less than 18 years old. Also, incomplete questionnaires were excluded. The study was approved by the Commission of Bioethics at Wrocław Medical University, Wrocław, Poland.

The BDI is a 21-question multiple-choice self-report inventory, and is one of the most widely used psychometric tests for assessing depression.[13] Each answer is scored on a scale value of 0-3. Higher total scores indicate more severe depressive symptoms. The score ranges for the final results are: (i) 0−11 minimal depression, (ii) 12−19 mild depression, (iii) 20−25 moderate depression, (iv) 26−63 severe depression.

Sexual functioning was investigated using the FSFI questionnaire[14], which is a brief multidimensional questionnaire measuring sexual functioning in women. In the study, we used the Polish version of the Female Sexual Function Index. This version was developed and validated by Nowosielski at al.[15] It includes 19

**Table 1.** Study group characteristics

| Variable | N=1644 |
|---|---|
| Age, years | Mean 25.11 ± 7.09 |
| | Median 23 |
| | IQR (21-27) |
| Education, n (%) | |
| Primary | 88 (5.4) |
| Vocational | 74 (4.5) |
| Secondary | 780 (47.4) |
| Higher | 702 (42.7) |
| Employment status, n (%) | |
| Employed – working at work place | 407 (24.8) |
| Remote work | 331 (20.1) |
| Employment issues due to COVID-19 pandemic | 55 (3.3) |
| Sick leave | 60 (3.6) |
| Unemployed due to other reasons | 58 (3.5) |
| Full-time student | 637 (38.8) |
| Student-income lost | 24 (1.5) |
| Maternity leave/stay-at-home-mum | 58 (3.5) |
| Childcare due to COVID-19 pandemic | 9 (0.5) |
| Pensioner | 5 (0.3) |
| Marital status, n (%) | |
| Single | 278 (16.9) |
| Married | 302 (18.4) |
| In partnership | 1064 (64.7) |
| Place of living, n (%) | |
| Rural area | 311 (18.9) |
| City >50,000 inhabitants | 267 (16.2) |
| City from 50,000 to 100,000 inhabitants | 142 (8.6) |
| City from 100,000 to 250,000 inhabitants | 186 (11.3) |
| City above 250,000 inhabitants | 738 (44.9) |
| Comorbid chronic disease, n (%) | |
| No / Yes | 1306 (79.4) / 338 (20.6) |
| On treatment due to any disease, n (%) | |
| No / Yes | 1072 (65.2) / 572 (34.8) |
| In quarantine, n (%) | |
| No / Yes | 1590 (96.7) / 54 (3.3) |
| Friends/family in quarantine, n (%) | |
| No / Yes | 1351 (82.2) / 293 (17.8) |
| History of contact with infected with COVID-19, n (%) | |
| No / Yes | 1615 (98.2) / 29 (1.8) |
| Diagnosed with COVID-19, n (%) | |
| No / Yes | 1638 (99.6) / 6 (0.4) |
| Friends/family infected with COVID-19, n (%) | |
| No / Yes | 1544 (93.9) / 100 (6.1) |
| Friends/family died of COVID-19, n (%) | |
| No / Yes | 1620 (98.5) / 24 (1.5) |

**Table 2.** Psychological characteristics of the study group

| Variable | N=1644 |
|---|---|
| Under psychiatric / psychological care during COVID-19 pandemic, n (%); No / Yes | 1537 (93.5) / 107 (6.5) |
| On sedatives during COVID-19 pandemic, n (%); No / Yes | 1520 (92.5) / 124 (7.5) |
| Fear of infection with coronavirus has negative impact on my mental health, n (%) | |
| Strongly agree | 125 (7.6) |
| Agree | 410 (24.9) |
| Undecided | 382 (23.2) |
| Disagree | 393 (23.9) |
| Strongly disagree | 334 (20.3) |
| Fear of health condition of the loved ones is a source of stress and depressed mood, n (%) | |
| Strongly agree | 302 (18.4) |
| Agree | 642 (39.1) |
| Undecided | 234 (14.2) |
| Disagree | 305 (18.6) |
| Strongly disagree | 161 (9.8) |
| Following the media reports is a source of a significant deterioration of my mental state, n (%) | |
| Strongly agree | 344 (20.9) |
| Agree | 461 (28.0) |
| Undecided | 307 (18.7) |
| Disagree | 295 (17.9) |
| Strongly disagree | 237 (14.4) |
| Perceived loneliness caused by isolation from the world / loved ones, n (%) | |
| Strongly agree | 528 (32.1) |
| Agree | 191 (11.6) |
| Undecided | 176 (10.7) |
| Disagree | 191 (11.6) |
| Strongly disagree | 187 (11.4) |
| More frequent use of alcohol / cigarettes cause by pandemic, n (%) | |
| Strongly agree | 165 (10.0) |
| Agree | 235 (14.3) |
| Undecided | 154 (9.4) |
| Disagree | 257 (15.6) |
| Strongly disagree | 833 (50.7) |

(continued)

**Table 2.** Continued

| Variable | N=1644 | |
|---|---|---|
| Frequency of sexual activity before / during pandemic, n (%) | $P < .001$ (test statistic 1776.87) | |
| Several times a day | 27 (1.6) | 36 (2.2) |
| Every day | 93 (5.7) | 84 (5.1) |
| Several times a week | 749 (45.6) | 579 (35.2) |
| Once a week | 221 (13.4) | 228 (13.9) |
| Several times a month | 325 (19.8) | 320 (19.5) |
| Once a moth | 55 (3.3) | 84 (5.1) |
| Fewer than once a month | 174 (10.6) | 313 (19.0) |
| Libido level before / during pandemic, n (%) | $P < .001$ (test statistic 647.27) | |
| High | 521 (31.7) | 504 (30.7) |
| Moderate | 909 (55.3) | 747 (45.4) |
| Decreased libido | 214 (13.0) | 393 (23.9) |

questions covering 6 domain-structured areas (desire, arousal, lubrication, orgasm, satisfaction and pain and/or discomfort) evaluated during the last 4 weeks. The maximum score for each domain is 6.0. The total FSFI score is a sum of the domain scores and ranges from 2.0 to 36.0. A lower FSFI score is associated with a higher degree of sexual dysfunction. This questionnaire was created and validated for the assessment of female sexual function, quality of life in clinical trials, or epidemiological studies.[16]

The collected data were statistically analysed with the R Project for Statistical Computing v. 3.4.1 (R Foundation for Statistical Computing, Vienna, Austria). Data were presented as a medians and interquartile ranges and numbers and percentages. The Shapiro-Wilk test was used to test for normal distribution. Categorical variables were compared using the $Chi^2$ test. Spearman's rank correlation coefficient was used to measure the strength of the association between the FSFI and BDI scores and answers on questions about COVID-19. Differences were considered statistically significant at $P< .05$.

## RESULTS

Overall, 1724 questionnaires were collected; 80 questionnaires did not meet the inclusion criteria and therefore were not taken into account. Questionnaires from 1644 women with a median age of 23 years (mean 25.11 ± 7.09 years) who took part in the survey were analyzed. Incomplete questionnaires were no included. The characteristics of the study group are presented in Table 1. The results of the psychological characteristics of the study group are presented in Table 2. There was a statistically significant difference between the frequency of sexual activity before and during the pandemic ($P < .001$), as well as a difference in libido level before and during the pandemic ($P < .001$). Libido levels and the frequency of sexual activity were higher before the pandemic. Over half of the study group (n = 944; 57.5%) strongly agreed or agreed that a fear of the health condition of loved ones was a source of stress and depressed mood.

The average BDI-II total score for all participants was 11 (IQR 5-18), which corresponds to the classification of minimal depression. In question 8 (Self-criticalness) and question 14 (Worthlessness), more than 10% of participants obtained 3 points, which could indicate their low self-esteem due to a sense of guilt and a lack of sense of attractiveness. The observed mean values for depression outcomes are presented in Table 3. The average FSFI total score for all the participants was 27.01 ± 7.61 (range 2-36). The detailed results of the FSFI questionnaire are presented in Table 4, while the correlations between the analyzed scales and different variables are presented in Table 5. The table shows a statistically significant correlation between the FSFI and BDI scales ($r = -0.3261$; $P < .001$). Moreover, the FSFI score was significantly correlated with the presence of any comorbid chronic disease ($r = -0.08747$; $P < .001$), the intensity of the fear of infection and fear of health conditions ($r = -0.08848$; $P < .001$), perceived loneliness ($r = -0.1527$; $P < .001$), and being up to date with media news ($r = -0.1046$; $P < .001$). The BDI score was significantly correlated with age ($r = -0.3261$; $P < .001$), the intensity of the fear of infection and fear of health conditions ($r = 0.3047$; $P < .001$), perceived loneliness ($r = 0.3923$; $P < .001$), being up to date with media news ($r = 0.2738$; $P < .001$), and a more frequent use of stimulants ($r = 0.2308$; $P < .001$). However, based on the Guilford's classification, correlation coefficients below 0.3 has limited clinical relevance.

## DISCUSSION

The results of this study demonstrated that the pandemic was associated with a high occurrence of depressive symptoms and sexual functioning disorders in women. Fear of the infection, a worsening of health conditions, following the media news, and loneliness were the most stressful factors that affected psychical and sexual health.

Several limitations of this survey should be considered. First, social media is used mostly by young people, which is confirmed by the mean age of 25.11 ± 7.09 years of our study group. This was additionally narrowed by distribution only via Facebook. Using the computer and internet is still not very common among older people, so it is important to take into consideration that our findings are not representative of the whole population of women. Moreover, some other factors may have an impact on sexual functioning in women such as change in the amount of time partners spend together; change in the amount of time parents spend with their kids; relationship status; relationship quality and perceived stress resulting from these changes. Regarding marital status, there were only 16.9% of responders in our study who declared to be single. This percentage is not high to significantly change the result and they did not deny engaging in sexual activity so we decided not exclude singles from the study.

**Table 3.** Beck Depression Inventory results

| Question | Score 0 | Score 1 | Score 2 | Score 3 |
|---|---|---|---|---|
| Question 1, n (%) | 606 (36.9) | 780 (47.4) | 213 (13.0) | 45 (2.7) |
| Question 2, n (%) | 551 (33.5) | 828 (50.4) | 166 (10.1) | 99 (6.0) |
| Question 3, n (%) | 775 (47.1) | 373 (22.7) | 364 (22.1) | 132 (8.0) |
| Question 4, n (%) | 714 (43.4) | 651 (39.6) | 151 (9.2) | 128 (7.8) |
| Question 5, n (%) | 952 (57.9) | 371 (22.6) | 251 (15.3) | 70 (4.3) |
| Question 6, n (%) | 1391 (84.6) | 136 (8.3) | 70 (4.3) | 47 (2.9) |
| Question 7, n (%) | 841 (51.2) | 595 (36.2) | 146 (8.9) | 62 (3.8) |
| Question 8, n (%) | 842 (51.2) | 557 (33.9) | 58 (3.5) | 187 (11.4) |
| Question 9, n (%) | 1238 (75.3) | 369 (22.4) | 25 (1.5) | 12 (0.7) |
| Question 10, n (%) | 1042 (63.4) | 451 (27.4) | 92 (5.6) | 59 (3.6) |
| Question 11, n (%) | 544 (33.1) | 784 (47.7) | 266 (16.2) | 50 (3.0) |
| Question 12, n (%) | 939 (57.1) | 538 (32.7) | 133 (8.1) | 34 (2.1) |
| Question 13, n (%) | 857 (52.1) | 624 (38.0) | 126 (7.7) | 37 (2.3) |
| Question 14, n (%) | 812 (49.4) | 271 (16.5) | 365 (22.2) | 196 (11.9) |
| Question 15, n (%) | 852 (51.8) | 569 (34.6) | 177 (10.8) | 46 (2.8) |
| Question 16, n (%) | 768 (46.7) | 627 (38.1) | 158 (9.6) | 91 (5.5) |
| Question 17, n (%) | 808 (49.1) | 608 (37.0) | 193 (11.7) | 35 (2.1) |
| Question 18, n (%) | 1251 (76.1) | 214 (13.0) | 144 (8.8) | 34 (2.1) |
| Question 19, n (%) | 1332 (81.0) | 235 (14.3) | 62 (3.8) | 15 (0.9) |
| Question 20, n (%) | 1139 (69.3) | 432 (26.3) | 57 (3.5) | 16 (1.0) |
| Question 21, n (%) | 1186 (72.1) | 276 (16.8) | 121 (7.4) | 61 (3.7) |

Moreover, this survey study is at risk of recall bias resulting from the lack of pre-covid data to compare to post-covid data. Despite these facts, our study provides important information about serious COVID-19 pandemic effects such as sexual and psychological disorders. Public attention should be focused on the prevention of PTSD, depression, sexual functioning disorders and other mental disorders. Second, a part of the survey asked respondents to compare certain behavior before and during the pandemic, which can be subject to recall bias. And finally, the reliability of answers may be lower than in other forms of research due to subjective answers given by respondents.

FSFI is the gold standard for screening sexual disorders. It has been validated in more than 30 countries and used worldwide. In Poland, Nowosielski et al. in 2012 developed a Polish version of the FSFI (PL-FSFI) with Cronbach's $\alpha$ value of $> .70$ for the entire sample.[15] The optimal PL-FSFI cutoff score was 27.50, with 83.1% specificity and 87.1% sensitivity. Consequently, the PL-FSFI questionnaire is reliable with good psychometric and discriminative validity. In our study, the mean overall score was lower than the cutoff value suggested by Nowosielski. Desire was the

**Table 4.** Female Sexual Function Index results

| Domain | Score, mean ± SD | Range |
|---|---|---|
| Desire | 4.16 ± 1.17 | 1.2-6 |
| Arousal | 4.60 ± 1.52 | 0-6 |
| Lubrication | 4.90 ± 1.60 | 0-6 |
| Orgasm | 4.32 ± 1.69 | 0-6 |
| Satisfaction | 4.53 ± 1.55 | 0-6 |
| Pain | 4.49 ± 1.75 | 0-6 |
| Overall score | 27.01 ± 7.61 | 2-36 |

**Table 5.** Correlations between Beck Depression Inventory and Female Sexual Function Index scores and studied factors

| Variable | Variable | Correlation coef. | *P* value |
|---|---|---|---|
| BDI | FSFI | -0.3261 | < .001 |
| FSFI | Age | 0.04983 | .0434 |
| | In quarantine | 0.02175 | .3782 |
| | Diagnosed with COVID-19 | -0.01121 | .6496 |
| | Comorbid chronic disease | -0.08747 | <.001 |
| | Fear of infection | -0.08848 | <.001 |
| | Fear of health condition | -0.1016 | <.001 |
| | Following the media | -0.1046 | <.001 |
| | Perceived loneliness | -0.1527 | <.001 |
| | More frequent use of alcohol / cigarettes | -0.03532 | .152 |
| BDI | Age | -0.3261 | <.001 |
| | In quarantine | -0.02053 | .406 |
| | Diagnosed with COVID-19 | 0.01882 | .446 |
| | Comorbid chronic disease | 0.05604 | .023 |
| | Fear of infection | 0.2936 | <0.001 |
| | Fear of health condition | 0.3047 | <0.001 |
| | Following the media | 0.2738 | <0.001 |
| | Perceived loneliness | 0.3923 | <0.001 |
| | More frequent use of alcohol / cigarettes | 0.2308 | <0.001 |

BDI = Beck Depression Inventory; FSFI = Female Sexual Function Index.

domain with the lowest score of analyzed FSFI components. Having analyzed the comparison of libido levels before and during the pandemic, respondents declared a decreased libido level during the pandemic, which could lead to a lower FSFI score. Moreover, in Italy Schiavi et al. took into account the reproductive-age of women and examined the impact of social distancing on the quality of life and the intimate sphere. As it turned out, the quality of life and sexual functioning significantly worsened when compared to the period before the pandemic (FSFI score before: $29.2 \pm 4.2$ vs after: $19.2 \pm 3.3$).[17] Li et al. showed that the pandemic resulted in a reduced frequency of engaging in sexual activity, and also that alcohol consumption increased. It is connected, among other things, with the fact of staying at home with other family members, which results in limited intimacy and freedom. Additionally, with the fear of SARS-CoV-2 infection, people were more likely to masturbate to achieve sexual satisfaction.[18]

Our findings confirm those of Wang et al., who concluded that stress and depression were a very frequent reaction for the COVID-19 pandemic.[19] Moreover, in other studies, the higher ranks of depression, PTSD and anxiety were associated with the female gender.[10,11] Xiao et al. tentatively showed that symptoms of anxiety and depression (16-28%) and the feeling of stress (8%) are common responses to the COVID-19 pandemic, and their association with sleep disorders is also suggested.[20]

In our study, more than half of the participants reported sleep disorders, which confirms the finding of Xiao et al.[20] Numerous research papers emphasize the need to educate society about the common psychological effects of a pandemic; motivate society to disease prevention and health promotion strategies; teach problem-solving strategies to deal with the current epidemiological situation; provide psychiatric care for health professionals; train medical personnel in basic aspects of mental health care; use online questionnaires to assess the scope of mental health problems; develop online materials for mental health education; provide online counseling, self-help services and telepsychiatric consultations; and also develop synchronous telemedicine services for diagnostic and counseling purposes[21-25]. This would reduce the fear of infection and the fear of worsening health conditions associated with coronavirus[19] and also help people to ignore false information that increases stress.

A frequently observed phenomenon is the accompanying sexual dysfunction of depression. Many researchers have tried to find out what mechanisms are responsible for this. Sexual expression and the ability to experience sexual pleasure tend to be consistent with mood, motivation, and overall activity. Therefore, the typical state of depression (low mood, motivation and activity) is associated with an overall reduction in sexual responsiveness. There may be fear of physical intimacy, decreased reactions to excitement, a lack of pleasure during sexual intercourse, and a difficulty in reaching orgasm.[26]

Among the many studies, an increased correlation between more severe sexual dysfunction and the use of antidepressants in patients with depression can be found.[26,27] Antidepressants and mood stabilizers, especially selective serotonin reuptake inhibitors - particularly affecting 5HT2 and 5HT3 receptors - may cause increased serotonin levels; decreased dopamine; lockage of cholinergic and alpha-1 adrenergic receptors; inhibition of nitric oxide synthase; and an elevation of prolactin levels. The side effects of these drugs can be decreased desire and excitement, and the inhibition of orgasm. In the present study, we did not investigate this correlation due to small percentage of people using sedatives. It is worth noting, however, that the percentage of patients under psychiatric and/or psychologic supervision is smaller (6.5%) than this of people taking sedatives (7.5%). We assume that some people use self-medication and may not be aware of side effects of various drugs.

These side effects are based on various biochemical mechanisms, in particular the influence of drugs on the concentrations of individual neurotransmitters and their receptors in the central nervous system.[28,29] Cohen et al. reported that people with mental disorders had a high prevalence of sexual dysfunction, which was highest in people with depressive disorders. According to other studies, even in untreated patients, depression is associated with adverse effects on sexual function.[30]

In our study, 24.3% of participants agree or strongly agree that the more frequent use of alcohol and/or cigarettes was caused by the pandemic, with 66.3% disagreeing or strongly disagreeing with this statement. In comparison, the EMCDDA study shows a decrease in stimulant drug use and an increase in the use of cannabis, alcohol and prescription medicines to combat anxiety and depression. The study suggests a few reasons for increased alcohol use: using alcohol as a replacement for drugs, loneliness, and feeling depressed. The study also suggests that the rise in use of alcohol is associated with a greater use of prescription drugs.[31]

## CONCLUSIONS

The COVID-19 lockdown setting was associated with a high occurrence of depressive symptoms, as well as increased risk of sexual dysfunction in women translating in a decreased libido level and a lower frequency of sexual activity. Our findings may be used for improving psychological, psychiatric and sexological care during stressful events.

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## STATEMENT OF AUTHORSHIP

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# Depressive and Sexual Disorders during the First and Second Wave of the COVID-19 Pandemic among Young Polish Women

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**Abstract:** We investigated whether long-term social restrictions and COVID-19 exposure have different impacts on the mental and sexual health of Polish women compared to the effects experienced at the beginning of the pandemic. An online survey was conducted among Polish women via Facebook groups. The Beck Depression Inventory (BDI) and Female Sexual Function Index (FSFI) scores were compared for the first wave (April–May 2020) and the second wave (November 2020 to February 2021) of the pandemic. We enrolled 1644 participants (mean age 25.11 ± 7.09 years) during the first wave and 720 participants (mean age 23.23 ± 5.34 years) during the second wave of COVID-19 pandemic. Significant differences were observed in libido levels and frequency of sexual activity before and during the first and second wave of the COVID-19 pandemic (both $p < 0.001$). The percentage of participants under psychiatric or psychological care increased from 6.5% to 14.44% and those who were anxious about the health conditions of loved ones increased from 57.5% to 65.14%. BDI scores increased significantly from 11 (IQR 5–18) to 12 (IQR 7–20). The change in the FSFI score was not significant (27.01 ± 7.61 vs. 26.38 ± 7.76). The COVID-19 pandemic affected various aspects of human life, including sexual life. The data obtained during the first and the second wave of the COVID-19 pandemic in Poland showed that female sexual dysfunction did not differ, but depressive symptoms and fear intensified.

**Keywords:** COVID-19 pandemic; women; health; sexual functioning; mental health; Polish population; online survey

## 1. Introduction

Coronavirus belongs to the group of RNA viruses that directly affect the functioning of the respiratory system, but can also affect the work of other organs, e.g., the heart or central nervous system. The first case of coronavirus was diagnosed in Poland on 4 March 2020. On the 11th of March, the restrictions in Poland began. Schools, kindergartens and universities were closed. Then, restaurants and pubs followed. From the 25th of that month, everybody had to stay at home; only going out for shopping was possible. From the 3rd of April, forests and parks were closed. The 20th of April was the first day when restrictions were

lifted. The next limitation started with the second wave—on the 16th of November, gyms and swimming pools were closed, then e-learning in schools was provided. From the 28th of December to the 17th of January, a national quarantine was implemented. In January, the lifting of restrictions began [1].

The COVID-19 virus was spreading rapidly and a few days later (on 11 March 2020), the WHO called this situation the COVID-19 pandemic, which was identified as the greatest health threat of the past century [2,3]. Since then, governments, scientists and public health organizations have been focusing on the coronavirus's spread [4], prevention and vaccination. Across the world, the SARS-CoV-2 virus caused almost 5 million deaths [5]. Due to the rapid spread of COVID-19, public health authorities in many countries decided to provide numerous restrictions including travel bans, restrictions of social gatherings and closures of public schools [6]. This resulted in a global economic crisis and a deterioration in the mental health of the general population, particularly affecting medical personnel [7,8].

Attempts were also made to control the global pandemic by using masks in public areas, paying attention to personal hygiene practices, following social distancing rules and ensuring the isolation of sick individuals [9]. Social isolation unavoidably impacted the economy and functioning of society [6]. Furthermore, it was also connected with anxiety and widespread fear, which can lead to situations that negatively affect quality of life, including the development of depression and sexual dysfunction [10]. In Nowak et al.'s research, Poles demonstrated varying fear levels regarding different aspects of the COVID-19 pandemic and its potential consequences. The highest ranked was the fear over the health of relatives, followed by fear of pandemic-induced economic crises, fear regarding the use of the pandemic to control citizens, fears around individuals' own health, as well as fears of pandemic-induced political crises, and of job losses. Women displayed greater fear regarding every considered aspect [11]. Idzik et al. also revealed anxiety and depression disorders in Polish women. Two in three women experienced loneliness. Women aged 18–29 years showed the highest levels of anxiety, depression, irritability, and loneliness [12].

Sexual health is one of the factors influencing human well-being. Although sexual rights must be protected in times of crisis, this is often overlooked in the face of more pressing problems. The New York City Department of Health issued recommendations regarding sexual activity during the COVID-19 pandemic to minimize the risk of virus transmission. It was considered the safest practice was to masturbate and the second safest practice was having sex with a cohabitating partner [13]. The frequency of masturbation behavior, and the use of sex toys and pornography increased [14].

Many scientists investigating mental health found a higher prevalence of depression, anxiety, insomnia and violence in the population during the outbreak of COVID-19, concluding that the pandemic harmed the mental health of the population [15,16]. Reports from the literature suggest a link between women's quality of life, sexual health and stressful events in their life [17,18]. The evidence on the impact of the COVID-19 pandemic on sexual behavior is growing [19]. Our previous study, which we performed at the beginning of the pandemic (April–May 2020) revealed that the COVID-19 lockdown setting was associated with a high occurrence of depressive symptoms and increased risk of sexual dysfunction in women, translating into a decreased libido and a lower frequency of sexual activity [20]. The aim of this study was to investigate the frequency of depressive symptoms and changes in sexual functioning in Polish women during long-term social restrictions and COVID-19 exposure using subjective, patient-centric measures. To this end, we evaluated correlations between BDI and FSFI scores as well as psychological characteristics.

## 2. Materials and Methods

This was a cross-sectional study that was repeated twice during the COVID-19 pandemic. The data on the first wave of the COVID-19 pandemic were collected between 22 April 2020 and 7 May 2020. The study on the second wave of the pandemic was conducted from 4 November 2020 to 14 February 2021. Invitations with links to the online questionnaire, which used Google Forms, were shared in Facebook groups containing

female users of all ages. Two different groups of women were administered the same surveys during the first and second pandemic waves. Participation was voluntary and the respondents were informed about the aim of the study and were asked to read and complete consent forms. Each woman was asked to complete the Beck Depression Inventory (BDI) and Female Sexual Function Index (FSFI) questionnaires. The forms also included demographic questions and questions about women's behavior and feelings during the pandemic. For the analysis, we included women of 18 years or older, those who were sexually active as well those who returned fully completed questionnaires. The respondents were asked to read information about the aim of the study and to accept the rules of the research before completing the questionnaire. They were informed that they could ask questions and that participation was voluntary. The study was approved by the Commission of Bioethics at Wroclaw Medical University, Wrocław, Poland (KB-424/2021).

The FSFI is a validated questionnaire that consists of 19 questions, which are classified into 6 sections—desire, arousal, lubrication, orgasm, satisfaction and pain or discomfort [21]. Each section is scored from 1 to 6 points and the maximum score is 36 points. Our version was validated for the Polish population by Nowosielski et al. with the optimal cut-off score of 27.50 [22]. Scores below 27.50 indicate sexual dysfunction.

The BDI is one of the most popular questionnaires used to measure depressive syndromes, and it consists of a 21-question multiple-choice self-report inventory. Each question is scored from 0 to 3. Higher total scores are correlated with more severe depressive symptoms, which indicate minimal (0–11 points), mild (12−19), moderate (20–25) or severe (26–63) depression [23].

The collected data were statistically analyzed with Statistica software v. 13.3 (StatSoft, Tulsa, OK, USA). Descriptive data were presented as numbers and percentages for categorical variables, and as the mean, standard deviation, median, range and interquartile range for numerical variables. The distribution of continuous variables was tested using visual (histogram) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk tests). The Chi-square test or Fisher exact test were used for the comparison of qualitative variables (BDI scores and psychological characteristics). The Mann–Whitney U test was used for the subgroup analysis of non-normally distributed variables and a Student's *t*-test was used for the comparison of means for normally distributed data. The Pearson correlation coefficient with the Fisher Z-transformation was used to measure the association between FSFI, BDI and questions about the pandemic. We compared levels of FSFI and BDI during two waves of the pandemic using general linear models (GLM) to take into account the possible influence of socioeconomic covariates. We separately modelled the dependency of FSFI and BDI scores on a set of predictors including age as a continuous variable and four nominal predictors: wave of the pandemic (I or II), education (higher, secondary, lower), place of living (as in Appendix A, Table A1) and employment status (student, employed, working remotely, unemployed, sick leave). The best models were selected in a step procedure based on the Akaike Information Criterion (AIC). The sample size was calculated using the G* power package (Heinrich Heine University Dusseldorf; North Rhine-Westphalia; Germany). The differences were considered statistically significant at $p < 0.05$.

## 3. Results

Two study samples were analyzed. A total of 1644 participants during the first wave of the COVID-19 pandemic and 720 participants during the second wave of the COVID-19 pandemic were included in the study. The mean age of the first wave study population was 25.11 ± 7.09 years with a median age of 23 years, and the second wave study population had a mean age of 23.23 ± 5.34 years with a median of 23 years. In both waves, people with a higher education dominated. In addition, in both groups, students constituted the highest percentage of respondents. Most of them lived with a partner and in a big city. A summary of the characteristics of the study groups is presented in Appendix A, Table A1. Regarding the COVID-19 related characteristics, more people were in quarantine, had a history of infection with COVID-19, were currently infected, and had more friends and

relatives affected by the disease. The COVID-19 related characteristics are presented in Appendix A, Table A2.

Regarding psychological condition, significantly more people confirmed being under psychiatric/psychological care during the second wave of the COVID-19 pandemic (6.5% vs. 14.44%; $p < 0.001$), but they felt significantly less isolated ($p < 0.001$). During the second wave of the COVID-19 pandemic, as compared to the first wave, more respondents strongly agreed or agreed that fear of the health condition of loved ones was a source of stress and depressed mood (n = 469; 65.14%). The results of the psychological characteristics of the study participants are presented in Appendix A, Table A3.

There was a statistically significant difference between the libido level before and during the first and second wave of the COVID-19 pandemic ($p < 0.001$), as well as a difference in the frequency of sexual activity before and during the first and second wave ($p < 0.001$). The results are presented in Table 1.

**Table 1.** Sexual status characteristics of the study group during the first and second wave of the COVID-19 pandemic.

| Variable | First Wave ($N$ = 1644) | | Second Wave ($N$ = 720) | |
|---|---|---|---|---|
| Frequency of sexual activity before/during pandemic | I wave $p < 0.001$ | | II wave $p = 0.028$ | |
| Several times a day | 27 (1.6%) | 36 (2.2%) | 17 (2.36%) | 19 (2.64%) |
| Every day | 93 (5.7%) | 84 (5.1%) | 32 (4.44%) | 37 (5.14%) |
| Several times a week | 749 (45.6%) | 579 (35.2%) | 326 (45.28%) | 260 (36.11%) |
| Once a week | 221 (13.4%) | 228 (13.9%) | 99 (13.75%) | 107 (14.86%) |
| Several times a month | 325 (19.8%) | 320 (19.5%) | 132 (18.34%) | 151 (20.97%) |
| Once a moth | 55 (3.3%) | 84 (5.1%) | 23 (3.19%) | 36 (5.00%) |
| Fewer than once a month | 174 (10.6%) | 313 (19.0%) | 91 (12.64%) | 110 (15.28%) |
| Libido level before/during pandemic | $p < 0.001$ | | $p < 0.001$ | |
| High | 521 (31.7%) | 504 (30.7%) | 234 (32.50%) | 228 (31.67%) |
| Moderate | 909 (55.3%) | 747 (45.4%) | 407 (56.53%) | 320 (44.44%) |
| Decreased libido | 214 (13.0%) | 393 (23.9%) | 79 (10.97%) | 172 (23.89%) |

The best model explaining the BDI score indicated a strong influence of socioeconomic covariates (age: Wald stat. = 53.379, df = 1, $p < 0.01$; education: Wald stat. = 26.989, df = 2, $p < 0.01$; employment: Wald stat. = 9.204, df = 4, $p = 0.05$) but also included the wave of the pandemic (Wald stat. = 2.990, df = 1, $p = 0.08$). During the second wave, the BDI total score for all participants was 12 (IQR 7-20), which corresponds to the classification of mild depression. The results obtained from the first wave showed that total BDI score was 11, which corresponds to minimal depression. A direct comparison of BDI scores between the study group from the first and another group from second wave of the COVID-19 pandemic showed a higher percentage of participants with depressive disorders (mild, moderate and severe depression) in the second wave. Additionally, during the first wave of the pandemic, there were no significant differences in the number of BDI total scores between the groups of participants not subject to quarantine and those in quarantine ($p = 0.41$). However, during the second wave, the mean BDI score was significantly higher in quarantined participants ($p = 0.044$). The detailed results of the BDI questionnaire are presented in Table 2. The mean FSFI total score for second wave participants was 26.38 ± 7.76 (range 1.2–36), which was similar to that of the first wave, where the total FSFI score was 27.01 ± 7.61 (range 2–36). The final model that explained the FSFI score included education, place of living and employment status but not the wave of the pandemic. The detailed results of the FSFI scores are presented in Table 3. Correlations between BDI and FSFI scores as well as the psychological characteristics of the study groups were similar during both waves of the pandemic (Appendix A, Table A4).

**Table 2.** Beck Depression Inventory score during the first and second wave of the COVID-19 pandemic.

| | First Wave, $N = 1644$ | Second Wave, $N = 720$ | |
|---|---|---|---|
| Total score | | | |
| median | 11 | 12 | |
| range | 0–51 | 0–55 | |
| IQR | 5–18 | 7–20 | |
| minimal depression—0–11 scores | 858 (52.2%) | 328 (45.55%) | |
| mild depression—12–19 scores | 437 (26.6%) | 211 (29.31%) | $p = 0.024$ |
| moderate depression—20–25 scores | 183 (11.1%) | 91 (12.64%) | |
| severe depression—26–63 scores | 166 (10.1%) | 90 (12.50%) | |

**Table 3.** Female Sexual Function Index score during the first and second wave of the COVID-19 pandemic.

| Domain | Score, Mean ± SD | | Range | |
|---|---|---|---|---|
| | I Wave | II Wave | I Wave | II Wave |
| Desire | 4.16 ± 1.17 | 4.05 ± 1.19 | 1.2–6 | 1.2–6 |
| Arousal | 4.60 ± 1.52 | 4.54 ± 1.49 | 0–6 | 0–6 |
| Lubrication | 4.90± 1.60 | 4.88± 1.58 | 0–6 | 0–6 |
| Orgasm | 4.32 ± 1.69 | 4.17 ± 1.73 | 0–6 | 0–6 |
| Satisfaction | 4.53 ± 1.55 | 4.53 ± 1.55 | 0–6 | 0–6 |
| Pain | 4.49 ± 1.75 | 4.48 ± 1.74 | 0–6 | 0–6 |
| Overall score | 27.01 ± 7.61 | 26.38 ± 7.76 | 2–36 | 1.2–36 |

## 4. Discussion

In March 2020, a statement calling upon governments and global health institutions to collect the sex and gender effects of the COVID-19 outbreak was published. The authors paid attention to the fact that during past outbreaks, the problem of gender-related consequences of epidemics was usually marginalized. It was also noticed that the degree to which disease outbreaks have a differential impact on women and men is the basis for understanding the primary and secondary health risks for various individuals and communities, and for developing effective and fair policies and interventions [24]. Lockdown and self-isolation at the beginning of the pandemic were connected with fear and anxiety, although the impact of long-term social isolation is still unknown. Many outbreaks that were provided in Poland revealed a higher prevalence of anxiety and depressive disorders, especially in Polish women [11,12,25].

The aim of this study was to investigate the difference in the occurrence of depressive symptoms and sexual function in women during the first and second waves of the pandemic. The results demonstrate that the difficult experience of the COVID-19 pandemic was associated with the higher occurrence of depressive symptoms and changes in sexual function during both waves of the pandemic.

Comparing the BDI results during the first and second wave among people who were quarantined, there is a clear difference, namely that with the duration of the pandemic, depressive symptoms intensified [26]. Moreover, Schuch and co-authors also noted an increased tendency of episodes of depression and anxiety in people who self-isolated and did not engage in any physical activity [27]. Many authors (e.g., Bhambhvani et al. [28], Ilgen et al. [19], Güzel and Döndü [9] and Fuchs et al. [29]) reported that the FSFI score decreased during the pandemic in comparison to the FSFI scores obtained before the pandemic. Our study showed no statistically significant difference in the FSFI score (27.01 vs. 26.38; $p = 0.127$) between waves of the pandemic. There is no study comparing the FSFI scores between waves of COVID-19. In comparison to other authors who investigated female sexual functioning in different countries, at different times of the pandemic, our results were similar (Bhambhvani et al. [28]—27.22 and Fuchs et al. [29]—25.8). The impor-

tant fact is that our respondents were young women. Young people are less vulnerable to developing sexual dysfunctions. During the lockdown, due to remote education and working, people spent more time with a partner, which created more opportunities for sexual intercourse.

The COVID-19 pandemic is a significantly stressful factor that affects the health system, the economy and relationships. Its impact on these major aspects of everyday life could cause mental disorders, namely depression. Our findings confirm those of Ilgen et al. [19], who concluded that depression and anxiety increased during the pandemic. In their study as well as in our results, the mean score of BDI was classified as mild depression.

Stress is one of the major factors affecting sexual function, especially sexual desire. However, there are studies with varying results on this issue. The study conducted by Hall et al. concluded that women have better sexual activity during stressful times, which may be associated with spending more time with their partners [30]. Our findings depicting that chronic stress associated with the COVID-19 pandemic negatively affects women's sexual life were confirmed by Yuksel et al. [31], who showed that the pandemic caused a significant deterioration in female sexual function during its duration. However, they found that despite the decreased quality of sexual life during the pandemic, the frequency of sexual intercourse increased.

The relationship between female sexual dysfunction and the presence of depression symptoms has been widely studied. Cohen et al. [32] showed a higher prevalence of sexual dysfunction in people with depressive disorders. Ilgen et al. [19] showed that the anxiety levels and BDI score significantly increased during the pandemic. However, the FSFI scores did not decrease. In addition, no correlation was found between FSFI and BDI scores. In our study, an inversely proportional relationship between BDI and FSFI was found, but the strength of the correlation was weak.

There are many guidelines and recommendations on preventing COVID-19 infection, such as self-isolation, using masks and disinfecting hands. The most efficient one is vaccination [33]. No vaccine works for every patient. Although the reducing of the infection or mortality rate depends on factors related to the specimen, there are also many patient-related aspects. Madison et al. described that distress may be a negative predictor of responses to vaccination [34]. Furthermore, psychological factors could worsen the vaccine's efficiency as well as its side effects [35]. Our study was conducted before the introduction of the vaccine for everyone in Poland. The depressive disorders in our respondents could affect their immune responses to further vaccinations. Rapid diagnosis and treatment of mental disorders could prevent depressive disorders and improve immune responses to vaccination.

With the development of the pandemic, strict restrictions have been introduced in the world in order to inhibit person-to-person contact. Understandably, doctors' attention was focused mainly on the symptoms caused by COVID-19, but it should not be forgotten that this new situation affects various aspects of human life, including sexual life. People are more likely to suffer from depression and loneliness while staying at home. Social campaigns informing people on how to look after their mental health, and encouraging the use of psychological consultations, should be considered. Furthermore, during the lockdown, participation in online meetings with friends and family, as well as webinars and other online activities, should be recommended. Local authorities should pay attention to popularizing outdoor sports activities that are safe during the pandemic and lockdown. These additional disorders are worth paying attention to, because fighting them is just as important as fighting the disease, and the long-term consequences can be serious.

It should be taken into consideration that the present study has some limitations. The main one is that Facebook groups are mostly used by young people, which was confirmed by the mean age (25.11 $\pm$ 7.09 years old—first wave; 23.23 $\pm$ 5.34 years old—second wave) of our study group. Moreover, computer and internet use is still not common among older age groups, so it is important to consider that our findings are not representative of the whole population of women. Our respondents were mostly high school or university

students, which also could have affected sexual functioning. We also have to highlight the fact that despite the survey being distributed in the same way during the first and the second wave of the pandemic, there were differences between the enrolled groups. Our regression models showed an influence of socioeconomic covariates on the BDI and FSFI scores. The strong impact of socioeconomic status on sexual functioning was also reported by other researchers [36], while age differences do not seem to be clinically significant (Appendix A Figure A1). In addition, naturally, there were differences in terms of COVID-19 contact characteristics because more people were infected or had more infected friends and relatives. Many other factors may have an impact on women's sexual functioning such as living with a partner, changes in the amount of time partners spend together, the presence of children and changes in the amount of time spent with them, relationship status, and the amount of stress resulting from these changes. Personal strategies of coping with stressful situations could also influence depressive disorders. Furthermore, male sexual behavior may affect female sexual functioning.

Prolonged lockdown followed by subsequent quarantines caused by further outbreaks of infections caused by the SARS-CoV-2 virus, as shown in this study, had a global negative impact on the depression symptoms and sexual function of the population of young women. Deterioration of mental health and sexual functioning may have potentially long-term negative multidimensional effects on the functioning of an individual. On top of this, many women had additional burdens during the pandemic, such as supervising their children during homeschooling and simultaneous remote working, that were not studied here. This should prompt the government, family physicians, sexologists and mental health counsellors to pay more attention to individuals who present with depressive symptoms and disorders of sexual functioning and to develop preventive and intervention measures to alleviate negative overall health effects.

## 5. Conclusions

Data obtained during the first and the second wave of the COVID-19 pandemic in Poland showed that female sexual dysfunction did not differ; however, depressive symptoms and fear intensified. The prolonged lockdown greatly increased perceived feelings of depression and loneliness in women in comparison to the first wave.

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**Informed Consent Statement:** Written informed consent was obtained from all subjects involved in the study. The subjects participating in the study were informed about the course of the research.

**Data Availability Statement:** Data are contained within the article.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Study group characteristics during the first and second wave of the COVID-19 pandemic.

| Variable | First Wave (*N* = 1644) | Second Wave (*N* = 720) | *p*-Value |
|---|---|---|---|
| Age, years (distribution other than normal) | Mean 25.11 ± 7.09<br>Median 23<br>IQR (21–27)<br>Range (18–67) | Mean 23.23 ± 5.34<br>Median 22.00<br>IQR (18–25)<br>Range (18–55) | <0.001 |
| Education | | | |
| Primary | 88 (5.4%) | 42 (5.83%) | <0.001 |
| Vocational | 74 (4.5%) | 15 (2.08%) | |
| Secondary | 780 (47.4%) | 414 (57.5%) | |
| Higher | 702 (42.7%) | 249 (34.58%) | |
| Employment status | | | |
| Employed—working at work place | 407 (24.8%) | 165 (22.92%) | <0.001 |
| Remote work | 331 (20.1%) | 66 (9.17%) | |
| Employment issues due to pandemic | 55 (3.3%) | 4 (0.56%) | |
| Sick leave | 60 (3.6%) | 19 (2.64%) | |
| Unemployed due to other reasons | 58 (3.5%) | 20 (2.78%) | |
| Full-time student | 637 (38.8%) | 435 (60.42%), including: students 391(54.31%) and pupils 44 (6.11%). | |
| Student—income lost | 24 (1.5%) | 2 (0.28%) | |
| Maternity leave/stay-at-home-mum | 58 (3.5%) | 5 (0.69%) | |
| Childcare due to COVID-19 pandemic | 9 (0.5%) | 1 (0.14%) | |
| Pensioner | 5 (0.3%) | 3 (0.42%) | |
| Marital status | | | |
| Single | 278 (16.9%) | 150 (20.84%) | <0.001 |
| Married | 302 (18.4%) | 79 (10.97%) | |
| In partnership | 1064 (64.7%) | 491 (68.19%) | |
| Place of living | | | |
| Rural area | 311 (18.9%) | 139 (19.30%) | <0.001 |
| City >50,000 inhabitants | 267 (16.2%) | 99 (13.75%) | |
| City from 50,000 to 100,000 | 142 (8.6%) | 73 (1 0.14%) | |
| City from 100,000 to 250,000 | 186 (11.3%) | 82 (11.39%) | |
| City above 250,000 inhabitants | 738 (44.9%) | 327 (45.42%) | |

**Table A2.** COVID-19 related study group characteristics during the first and second wave of the COVID-19 pandemic.

| Variable | First Wave (*N* = 1644) | Second Wave (*N* = 720) | *p*-Value |
|---|---|---|---|
| Comorbid chronic disease | | | |
| No | 1306 (79.4%) | 560 (77.78%) | 0.362 |
| Yes | 338 (20.6%) | 160 (22.22%) | |

**Table A2.** *Cont.*

| Variable | First Wave (*N* = 1644) | Second Wave (*N* = 720) | *p*-Value |
|---|---|---|---|
| On treatment due to any disease | | | |
| No | 1072 (65.2%) | 440 (61.11%) | 0.056 |
| Yes | 572 (34.8%) | 280 (38.89%) | |
| In quarantine | | | |
| No | 1590 (96.7%) | 598 (83.06%) | <0.001 |
| Yes | 54 (3.3%) | 122 (16.94%) | |
| Friends/family in quarantine | | | |
| No | 1351 (82.2%) | 336 (46.67%) | <0.001 |
| Yes | 293 (17.8%) | 384 (53.33%) | |
| History of contact with infected with COVID-19 | | | |
| No | 1615 (98.2%) | 473 (65.69%) | <0.001 |
| Yes | 29 (1.8%) | 247 (34.31%) | |
| Diagnosed with COVID-19 | | | |
| No | 1638 (99.6%) | 674 (93.61%) | <0.001 |
| Yes | 6 (0.4%) | 46 (6.39%) | |
| Friends/family infected with COVID-19 | | | |
| No | 1544 (93.9%) | 260 (36.11%) | <0.001 |
| Yes | 100 (6.1%) | 460 (63.89%) | |
| Friends/family died of COVID-19 | | | |
| No | 1620 (98.5%) | 649 (90.14%) | <0.001 |
| Yes | 24 (1.5%) | 71 (9.86%) | |

**Table A3.** Psychological characteristics of the study group during the first and second wave of the COVID-19 pandemic.

| Variable | First Wave (*N* = 1644) | Second Wave (*N* = 720) | *p*-Value |
|---|---|---|---|
| Under psychiatric/psychological care during COVID-19 pandemic | | | |
| No | 1537 (93.5%) | 616 (85.56%) | <0.001 |
| Yes | 107 (6.5%) | 104 (14.44%) | |
| On sedatives during COVID-19 pandemic | | | |
| No | 1520 (92.5%) | 668 (92.78%) | 0.785 |
| Yes | 124 (7.5%) | 52 (7.22%) | |
| Fear of infection with coronavirus has negative impact on my mental health | | | |
| Strongly agree | 125 (7.6%) | 61 (8.47%) | |
| Agree | 410 (24.9%) | 180 (25.00%) | |
| Undecided | 382 (23.2%) | 134 (18.61%) | 0.139 |
| Disagree | 393 (23.9%) | 189 (26.25%) | |
| Strongly disagree | 334 (20.3%) | 156 (21.67%) | |
| Fear of heath condition of the loved ones is a source of stress and depressed mood | | | |
| Strongly agree | 302 (18.4%) | 179 (24.86%) | |
| Agree | 642 (39.1%) | 290 (40.28%) | 0.003 |
| Undecided | 234 (14.2%) | 96 (13.33%) | |
| Disagree | 305 (18.6%) | 93 (12.92%) | |
| Strongly disagree | 161 (9.8%) | 62 (8.61%) | |

**Table A3.** *Cont.*

| Variable | First Wave (*N* = 1644) | Second Wave (*N* = 720) | *p*-Value |
|---|---|---|---|
| Following the media reports is a source of a significant deterioration of my mental state | | | |
| Strongly agree | 344 (20.9%) | 189 (26.25%) | |
| Agree | 461 (28.0%) | 209 (29.03%) | 0.017 |
| Undecided | 307 (18.7%) | 106 (14.72%) | |
| Disagree | 295 (17.9%) | 116 (16.11%) | |
| Strongly disagree | 237 (14.4%) | 100 (13.89%) | |
| Perceived loneliness caused by isolation from the world/loved ones | | | |
| Strongly agree | 528 (32.1%) | 223(30.97%) | |
| Agree | 191 (11.6%) | 223 (30.97%) | |
| Undecided | 176 (10.7%) | 91 (12.64%) | <0.001 |
| Disagree | 191 (11.6%) | 107 (14.86%) | |
| Strongly disagree | 187 (11.4%) | 76 (10.56%) | |
| More frequent use of alcohol/cigarettes cause by pandemic | | | |
| Strongly agree | 165 (10.0%) | 49 (6.81%) | |
| Agree | 235 (14.3%) | 105 (14.58%) | 0.118 |
| Undecided | 154 (9.4%) | 61 (8.47%) | |
| Disagree | 257 (15.6%) | 121 (16.81%) | |
| Strongly disagree | 833 (50.7%) | 384 (53.33%) | |

**Table A4.** Correlations between BDI, FSFI and COVID-19-related characteristics.

| Variable | Variable | I Wave | | II Wave | | Fisher's z |
|---|---|---|---|---|---|---|
| | | Correlation Coef. | *p* Value | Correlation Coef. | *p* Value | |
| BDI | FSFI | −0.3261 | <0.001 | −0.2769 | <0.001 | 0.2267 |
| FSFI | Age | 0.04983 | 0.0434 | 0.0662 | 0.076 | 0.5573 |
| | In quarantine | 0.02175 | 0.3782 | | | |
| | Diagnosed with COVID-19 | −0.01121 | 0.6496 | | | |
| | Comorbid chronic disease | −0.08747 | <0.001 | | | |
| | Fear of infection | −0.08848 | <0.001 | −0.1290 | 0.01 | 0.3597 |
| | Fear of heath condition | −0.1016 | <0.001 | −0.0824 | 0.027 | 0.6654 |
| | Following the media | −0.1046 | <0.001 | −0.0426 | <0.084 | 0.1679 |
| | Perceived loneliness | −0.1527 | <0.001 | −0.1141 | <0.01 | 0.38 |
| | More frequent use of alcohol/cigarettes | −0.03532 | 0.1523 | 0.0064 | 0.864 | 0.3515 |
| BDI | Age | −0.3261 | <0.001 | −0.1970 | <0.001 | <0.001 |
| | In quarantine | −0.02053 | 0.4055 | | | |
| | Diagnosed with COVID-19 | 0.01882 | 0.4456 | | | |
| | Comorbid chronic disease | 0.05604 | 0.0231 | | | |
| | Fear of infection | 0.2936 | <0.001 | 0.2556 | <0.001 | 0.3586 |
| | Fear of heath condition | 0.3047 | <0.001 | 0.2502 | <0.001 | 0.2952 |
| | Following the media | 0.2738 | <0.001 | 0.2260 | <0.001 | 0.262 |
| | Perceived loneliness | 0.3923 | <0.001 | 0.3083 | <0.001 | 0.324 |
| | More frequent use of alcohol/cigarettes | 0.2308 | <0.001 | 0.2744 | <0.001 | 0.2982 |

BDI, Beck Depression Inventory; FSFI, Female Sexual Function Index.

There was a significant age difference (median = 22 vs. median = 23; $p < 0.001$). However, the numerical difference was one year, which was not clinically significant. The

histograms show that groups were similarly distributed and all women were at reproductive age.

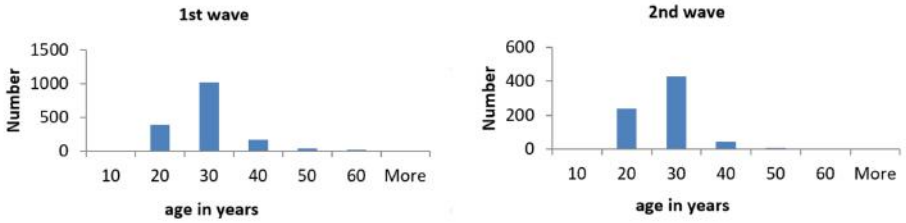


**Figure A1.** Age difference/distribution and sample size calculation.

We estimated the sample size using the G* power package. A priori, we set the Mann–Whitney U test (two groups) with an average effect size of d = 0.50, a power (1-β) of 0.95, a probability level of α = 0.05 and an allocation ratio of 1/3. With these assumptions, the total study group should have included 244 (61/181) participants. The total study group was 2364 participants (about 10 times more than required), which means it was overpowered. The reason for this is related to the fact that with larger samples, it is easier to show statistical differences between study groups. In this case, those differences were not clinically significant.

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# Mental and Sexual Health of Men in Times of COVID-19 Lockdown

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**Abstract:** Due to the worldwide spread of COVID-19, some restrictions were introduced which could lead to the development of distress and somatic symptoms. This survey aimed to study the mental and sexual health of men during the COVID-19 outbreak. An online questionnaire was conducted to collect data on contact with people suspected of infection/infected with the SARS-CoV-2 virus, use of stimulants, and perceived mental and sexual health during isolation among Polish men. They were also asked to answer the Beck Depression Inventory (BDI) and the International Index of Erectile Function (IIEF-15) questionnaire. In total, 606 men with a mean age of 28.46 ± 9.17 years took part in the survey. Fear of contracting the COVID-19 infection had a negative impact on the mental health of 132 men (21.8%). Fear of the health condition of loved ones caused stress and a depressed mood in 253 men (41.7%), and media reports worsened the mental health of 185 men (30.2%). In the BDI, 71.95% of the respondents did not suffer from depressive symptoms, 17.33% were diagnosed with mild depression, 6.11% with moderate depression, and 4.62% had severe depression. The mean score in the IIEF-15 questionnaire in the erectile function domain was 22.27, orgasm—7.63, desire—8.25, satisfaction—10.17, and general satisfaction—6.84. Depressive symptoms indicated more severe sexual functioning disorders ($p < 0.001$). Fear, following the media, and loneliness were associated with more severe depressive and sexual disorders ($p < 0.001$). The libido level ($p = 0.002$) and frequency of sexual activity ($p < 0.001$) were also lower during the pandemic than before the lockdown. These data showed that the COVID-19 pandemic had a significant impact on male mental and sexual health.

**Keywords:** COVID-19 pandemic; mental health; sexual functioning; erectile dysfunction; men's health; Polish population



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## 1. Introduction

The COVID-19 pandemic has caused changes in the daily functioning of people from all over the world. On 25 March 2020, the Polish government instated a lockdown. Travelling, meeting other people, and outdoor activities were forbidden. To protect citizens, shops were closed and remote work and home-schooling were suggested. These restrictions were introduced in a short period, without any premises and time to prepare or get used to the new situation. Moreover, the scale of the COVID-19 infection spread was terrifying. From 4 March 2020, 6,213,262 infections and 117,252 fatal SARS-Cov2 infection cases were reported in Poland [1]. Recent studies have shown that the COVID-19 pandemic has had an impact not only on physical conditions but also on mental health. Many researchers revealed a higher presence of depressive symptoms and higher levels of anxiety and

stress [2–4]. Many young people faced stressful situations, such as fear of infection as well as job loss, suspension of education, and isolation. The COVID-19 pandemic had a significant impact on mental health, the economy, education, and relationships.

According to the World Health Organization, sexual health is a state of physical, emotional, mental, and social well-being regarding sexuality. It is influenced by a complex web of factors ranging from sexual behavior, attitudes, and societal factors, to biological risk and genetic predisposition [5]. Reduced physical activity, increased physiological stress, and reduced entertainment impacted sexual activity and functioning [6]. Due to the pandemic, many people were forced to be with their partners or to be isolated. This can emotionally influence relationships and sexual activity. [7] Furthermore, reports from the literature suggest that among young people, depression and anxiety are widespread. About 350 million people suffer from depression worldwide, while in Poland, this number reaches about 1.5 million [8]. Depression is also strongly related to erectile dysfunction [9]. Moreover, satisfaction with one's sex life significantly reduces the level of stress and anxiety in many populations [10]. The study of Ibarra et al. showed that quarantine affects people's emotions and decreases libido levels [11]. Lehmiller et al. conducted a study on changes in people's sexual lives after the onset of the pandemic. The researchers reported that the frequency of sexual behaviors decreased compared to past year frequencies [12].

Having analyzed the phenomenon in which emotional distress could cause physical symptoms, we conducted a study to investigate the link between the COVID-19 outbreak and the mental and physical health of the male population.

## 2. Materials and Methods

We conducted an online survey on social media. The questionnaire collected data on COVID-19 infection or being in quarantine, contact with people suspected of COVID-19 infection/infected people, fear of COVID-19 infection, use of stimulants, and perceived mental and sexual health. Sexually active adults aged 18 years or older, currently residing in Poland and self-isolating/social-distancing due to COVID-19, were eligible to participate. All men were asked to complete the Beck Depression Inventory (BDI) and the International Index of Erectile Function (IIEF-15) questionnaire. The questionnaire included additional demographic questions. The study was conducted from 22 April 2020 through 7 May 2020. Data collection started one month after the lockdown in Poland was established (25 March 2020).

Mental health was investigated using the Beck Depression Inventory (BDI) questionnaire, a 21-question multiple-choice self-report inventory, which measures attitudes and characteristic symptoms of depression [13]. Each question is scored on a scale of 0–3. Total scores can range from 0 to 63. Standard cut-off scores are 0–11 minimal depression, 12–19 mild depression, 20–25 moderate depression, and 26–63 severe depression.

The International Index of Erectile Function (IIEF-15) questionnaire is a patient-reported outcome measure widely used to measure erectile dysfunction (ED). Each answer is scored on a discrete scale value of 0–5 (questions 1–10) and 1–5 (questions 11–15). The 15 questions examine the 5 main domains of male sexual function over the last four weeks: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction [14]. Erectile function scores of the IIEF-15 total up to 30 points. ED was defined as a score of 25 or less. All collected questionnaires were analyzed. Our participants were informed that participation was voluntary and that they would remain anonymous. Every man provided informed consent to participate in the study. The questionnaire was verified with the CHERRIES checklist [15]. The study was approved by the Commission of Bioethics at Wroclaw Medical University, Wroclaw, Poland (KB-424/2021).

Data were statistically analyzed using Statistica software v. 13.3 (StatSoft, Tulsa, OK, USA). The data were presented as numbers, percentages, and means with standard deviations. The Shapiro–Wilk test was used to analyze the distribution of the data. The Chi-square test was used to compare sexual activity frequency and libido before and during the pandemic. To compare all the variables between groups, the Mann-Whitney U test was

used. The Kruskal–Wallis test with the post hoc median test was used when comparing more than two continuous variables. Spearman's rank correlation coefficient was used to measure the strength of the association between the FSFI and BDI scores. The differences were interpreted as statistically significant at $p < 0.05$. Cronbach's alpha was used to assess the internal consistency of the questionnaire. A value higher than 0.7 indicates good internal consistency. This indicator was calculated for the entire questionnaire, covering all questions from the BDI (21 questions) to the IIEF (15 questions) sections. The results indicate that the questionnaire had good overall internal consistency, with a Cronbach's alpha of 0.83. Moreover, internal consistency was assessed separately for both parts of the questionnaire. The Cronbach's alpha for the BDI and IIEF parts was 0.92 and 0.93, respectively.

## 3. Results

In our analysis, we included 606 men with a mean age of 28.46 ± 9.17 years old. Our respondents were mostly employed (working in the workplace), in a partnership, and living in big cities. The characteristics of the study group are presented in Table 1.

**Table 1.** Sociodemographic characteristics of the group.

| Variable | N = 606 |
|---|---|
| Age, years (distribution other than normal) | Mean 28.46 ± 9.17<br>Median 25.00<br>IQR (22–31)<br>Range (18–76) |
| Education | |
| Primary | 13 (2.15%) |
| Vocational | 36 (5.94%) |
| Secondary | 248 (40.92%) |
| Higher | 309 (50.99%) |
| Employment status | |
| Employed—working at the workplace | 245 (40.43%) |
| working students | 17 (2.81%) |
| Remote work | 180 (29.70%) |
| working students | 29 (4.79%) |
| Employment issues due to the COVID-19 pandemic | 13 (2.15%) |
| Sick leave | 14 (2.31%) |
| Unemployed due to other reasons | 9 (1.49%) |
| Full-time student | 139 (22.94%) |
| Student-income lost | 2 (0.33%) |
| Pensioner | 4 (0.66%) |
| Marital status | |
| Single | 146 (24.09%) |
| Married | 127 (20.96%) |
| In partnership | 333 (54.95%) |
| Place of living | |
| Rural area | 103 (17.00%) |
| City > 50,000 inhabitants | 83 (13.70%) |
| City from 50,000 to 100,000 inhabitants | 40 (6.60%) |
| City from 100,000 to 250,000 inhabitants | 81 (13.37%) |
| City above 250,000 inhabitants | 299 (49.34%) |

Of our respondents, 11.39% had comorbid chronic diseases, and 17.82% were on treatment due to a disease. In total, 2.31% were in quarantine, while 14.36% had friends or family in quarantine. Only one participant was diagnosed with COVID-19. Nevertheless, 5.61% had friends/family infected with the SARS-Cov2 virus, and 7 participants (1.16%) stated they had experienced the death of a friend/family member due to COVID-19.

In our study, 20 men (3.30%) were under psychiatric/psychological care during the COVID-19 pandemic, while only half (1.65%) used sedatives. In the BDI, 71.95% of respondents did not reveal depressive symptoms; 17.33% were diagnosed with mild depression; 6.11% were diagnosed with moderate depression, and 4.62% had severe depression. The detailed questions concerning the psychological condition of our respondents are presented in Table 2.

**Table 2.** Attitudes and habits related to the pandemic.

| Variable | N = 606 |
|---|---|
| Fear of infection with coronavirus has a negative impact on my mental health | |
| Strongly agree | 26 (4.29%) |
| Agree | 106 (17.49%) |
| Undecided | 101 (16.67%) |
| Disagree | 162 (26.73%) |
| Strongly disagree | 211 (34.82%) |
| Fear of the heath condition of the loved ones is a source of stress and depressed mood | |
| Strongly agree | 50 (8.25%) |
| Agree | 203 (33.50%) |
| Undecided | 104 (17.16%) |
| Disagree | 130 (21.45%) |
| Strongly disagree | 119 (19.64%) |
| Following the media reports is a source of a significant deterioration of my mental state | |
| Strongly agree | 67 (11.06%) |
| Agree | 118 (19.47%) |
| Undecided | 105 (17.33%) |
| Disagree | 137 (22.61%) |
| Strongly disagree | 179 (29.54%) |
| Perceived loneliness caused by isolation from the world / loved ones | |
| Strongly agree | 108 (17.82%) |
| Agree | 185 (30.53%) |
| Undecided | 84 (13.86%) |
| Disagree | 121 (19.97%) |
| Strongly disagree | 108 (17.82%) |
| More frequent use of alcohol/cigarettes cause by pandemic | |
| Strongly agree | 56 (9.24%) |
| Agree | 97 (16.01%) |
| Undecided | 52 (8.58%) |
| Disagree | 110 (18.15%) |
| Strongly disagree | 291 (48.02%) |

The libido level was lower during the COVID-19 pandemic than before the pandemic ($p = 0.002$). Consequently, the frequency of sexual activity was also significantly lower during the pandemic than before the lockdown ($p < 0.001$).

The mean score in the IIEF-15 questionnaire in the erectile function domain was 22.27, which should be interpreted as mild erectile dysfunction. The mean scores in orgasm, desire, and satisfaction were also related to mild dysfunction. General satisfaction corresponded to moderate-mild dysfunction. The detailed IIEF-15 results are presented in Table 3.

Our findings also revealed that depressive symptoms indicated more severe sexual functioning disorders ($p < 0.001$). What is more, fear, following the media, and loneliness also had a negative impact on depressive and sexual disorders ($p < 0.001$). Nevertheless, older men achieved better IIEF-15 scores but had more severe depressive symptoms ($p < 0.001$). The use of stimulants (alcohol/cigarettes) was higher among men with more severe sexual functioning disturbances. The detailed data are presented in Tables 4 and 5.

**Table 3.** Sexual activity and libido levels before and during the pandemic.

| Frequency of Sexual Activity before/during the Pandemic | Before | During |
|---|---|---|
| | $p < 0.001$ | |
| Several times a day | 27 (4.46%) | 38 (6.27%) |
| Every day | 72 (11.88%) | 67 (11.06%) |
| Several times a week | 281 (46.37%) | 224 (36.96%) |
| Once a week | 71 (11.72%) | 62 (10.23%) |
| Several times a month | 90 (14.85%) | 77 (12.71%) |
| Once a month | 17 (2.81%) | 27 (4.46%) |
| Fewer than once a month | 48 (7.92%) | 111 (18.32%) |
| Libido level before/during the pandemic | before | during |
| | $p = 0.002$ | |
| High | 308 (50.83%) | 266 (43.89%) |
| Moderate | 264 (43.56%) | 276 (45.54%) |
| Decreased libido | 34 (5.61%) | 64 (10.56%) |

**Table 4.** International Index of Erectile Function 15 results.

| Domain | Score, Mean ± SD | Range |
|---|---|---|
| Erection | 22.27 ± 10.21 | 0–30 |
| Orgasm | 7.63 ± 3.91 | 0–10 |
| Desire | 8.25 ± 1.79 | 0–10 |
| Satisfaction | 10.17 ± 4.28 | 0–15 |
| General satisfaction | 6.84 ± 3.08 | 0–10 |

**Table 5.** Correlations between Beck Depression Inventory scores, International Index of Erectile Function-15 scores, and other variables (Spearman's rank correlation coefficient).

| Variable | Variable | Correlation Coef. | *p* Value |
|---|---|---|---|
| BDI | IIEF-15 score | −0.469 | <0.001 |
| IIEF | Age | 0.225 | <0.001 |
| | Fear of infection | −0.161 | <0.001 |
| | Fear of health condition | −0.137 | <0.001 |
| | Following the media | −0.181 | <0.001 |
| | Perceived loneliness | −0.291 | <0.001 |
| | More frequent use of alcohol/cigarettes | −0.215 | <0.001 |
| BDI | Age | 0.251 | <0.001 |
| | Fear of infection | 0.303 | <0.001 |
| | Fear of health condition | 0.225 | <0.001 |
| | Following the media | 0.258 | <0.001 |
| | Perceived loneliness | 0.321 | <0.001 |
| | More frequent use of alcohol/cigarettes | −0.079 | 0.05 |

BDI, Beck Depression Inventory; IIEF-15, International Index of Erectile Function-15. Strongly agree = 5; strongly disagree = 1.

We found no correlation between the education level ($p = 0.31$) or the city size ($p = 0.52$) with sexual functioning. In the ANOVA Kruskal-Wallis test, we found that respondents in relationships (married or in informal relationships) had significantly better sexual function than single men ($p < 0.001$). Furthermore, we have also found no correlation between education ($p = 0.25$) or city size ($p = 0.91$) and depression. Using the ANOVA Kruskal-Wallis test, we found that respondents in relationships had a significantly lower risk of depressive disorders than single men ($p < 0.001$). In addition, married men had a significantly lower risk of depression than men in informal relationships ($p < 0.001$).

We have also found that men on pharmacotherapy scored lower in IIEF-15 erection ($p = 0.01$) and desire ($p = 0.02$) domains. Furthermore, the respondents under psychi-

atric/psychological supervision, due to the pandemic, achieved lower scores in the general satisfaction domain ($p = 0.04$).

## 4. Discussion

Our study aimed to investigate the link between the COVID-19 outbreak and the mental and physical health of the male population. We found that of 606 surveyed men, 21.8% confirmed that fear of contracting the COVID-19 infection had a negative impact on their mental health, 41.7% confirmed that fear of the health condition of loved ones caused stress and a depressed mood, and 30.2% confirmed that media reports worsened their mental health. Overall, 28.05% of surveyed men experienced depressive symptoms. The erectile function domain score from the IIEF-15 questionnaire was 22.27 showing mild erectile dysfunction in the study group. The occurrence of symptoms of depression was significantly correlated with the occurrence of severe sexual functioning disorders. The intensity of other fears was also correlated with depressive and sexual disorders.

Stress related to the COVID-19 pandemic and fear of infection promote a weakening of the immune system [16]. There is evidence supporting the thesis that sexuality supports the immune system; therefore, maintaining an acceptable frequency of sexual intercourse is highly recommended. Healthy sexual activity improves the immune system and also helps soothe the negative psychological effects associated with COVID-19 infection [17]. The results of this study revealed the impact of the COVID-19 pandemic on human health. Many scientists note a correlation between lockdowns, fear of coronavirus infection, and higher prevalence of depressive symptoms. In the literature review conducted by Burmistova et al., the findings showed that almost 18% of the population experienced at least mildly severe anxiety symptoms, 18.85% exhibited at least mild symptoms of depression, and 36.59% complained about sleep disturbances [18].

Similar results were seen in our study, as 17.33% of respondents suffered from mild depression. The COVID-19 pandemic significantly reduced interpersonal contact by maintaining social distance. Accordingly, sexual contact also appeared to be involved in the transmission of the virus, as the infection is spread by aerosolized particles [19]. According to available knowledge, the virus can persist on surfaces and clothes for several days, and infected individuals can spread respiratory secretions to their partner's skin and personal belongings. However, data on other routes of transmission are lacking [19]. It can be concluded that the COVID-19 pandemic had a significant impact on sexual health. Fang et al. reported that the COVID-19 pandemic caused a deterioration in sexual function associated with increased depression, anxiety, and a decreased sex life frequency [20].

Louis et al. reported that in Great Britain, during the first lockdown, 39.9% of women and men engaged in sexual activity at least once a week [21]. According to the results of our study, more than half of the respondents (55.2%) engaged in sexual activity at least once a week. Cocci et al. showed that more than 40% of the study group admitted an increased sexual desire during the quarantine, compared to the pre-pandemic situation. However, enhanced desire did not contribute to the increase in the frequency of sexual intercourse [22], whereas our study showed that the desire among the respondents corresponded to mild dysfunctions.

Many researchers investigated sexual desire before the pandemic and during the lockdown. Ballester-Arnal et al.'s study conducted in Spain shows that 39,5% of participants declared greater sexual desire during the lockdown. On the other hand, 34,9% declared lower sexual desire [23]. Pancerei et al.'s study in Italy revealed that 18,20% of men felt decreased sexual desire [24]. Another study conducted in the USA shows that 25% of respondents reported less sexual desire, and 18% of men increased sexual desire [25]. Masoudi et al. perform a systematic literature review. Most of the mentioned studies show a decreased number of sexual relationships during and prior to the COVID-19 pandemic, and the reduction in sexual intercourse was significant. Moreover, other studies revealed other factors influencing participants' sexual activity and functioning, such as alcohol use, high number of self-isolation days, having children at home, and lack of privacy. Also,

three studies investigated male sexual functioning using the IIEF-5 questionnaire and revealed a statistically significant difference before and during the pandemic [26]. In addition, the finding of a study conducted by Karagöz et al. using the IIEF-15 questionnaire showed statistically significantly lower results of male sexual function during the COVID-19 pandemic compared to the pre-pandemic period. However, it was also concluded that there was no significant decrease in male sexual desire [27]. Based on the findings of an Italian study during the COVID-19 pandemic among healthcare workers, De Rose et al. showed that low sexual satisfaction was a predictor of a low level of sexual desire [28].

In addition, the reasons for ED are varied. ED can be caused by hypertension, diabetes mellitus, obesity, hyperlipidemia, and testosterone deficiency. It is also important to emphasize the physiological causes such as depression, anxiety, and problems in the relationship. Furthermore, many drugs and substances can contribute to the development of ED [29]. During the COVID-19 pandemic, many symptoms were exacerbated. The feeling of loneliness, fear of coronavirus infection and death, and more severe symptoms of depression had an impact on men's sexual health. Karkin and Alma also revealed changes in endothelium, in corpus cavernosum biopsy, in patients who had developed COVID-19 [30]. Also, the testosterone level was significantly lower after COVID-19 infection [31].

The risk factors of COVID-19 infection and ED are strongly associated. Katz et al. showed a correlation between the incidence of COVID-19 and the occurrence of ED. Moreover, smokers were reported to be disproportionately affected by both conditions [32].

Disturbances in mental and sexual health could have negative effects on daily functioning. Physicians, sexologists, psychologists, and governments should pay attention to individuals who present depressive symptoms or sexual dysfunction. General practitioners are also very important. They should be able to recognize symptoms early and implement cures. What is more, social campaigns should educate people about methods of dealing with social isolation, feelings of loneliness, and feelings of fear. Furthermore, healthcare professionals should inform patients that mental and sexual dysfunction is common in order to decrease the feeling that one is isolated with their problems. Additionally, people should be enhanced to check the information from reliable, official sources. Physical activity also affects mental health, and sports and outdoor activities should be suggested and popularized [33].

Several limitations of this study should be kept in mind while interpreting the results. Due to the lockdown, the questionnaire had to be published online. As a result, the study is based on cross-sectional data. Consequently, our findings are not representative of the entire male population. More research is required on a much larger scale to understand the impact of the COVID-19 pandemic on physical and reproductive health in different populations and regions.

## 5. Conclusions

The COVID-19 pandemic has had a significant impact on the mental and sexual health of many people. The results of many studies show a link between mild depressive disorder and ED caused by the lockdown. Therefore, it is extremely important to undertake interventions aimed at improving health and overall well-being. In addition, healthcare and society have focused on combating the COVID-19 pandemic, and therefore basic reproductive health services have been disrupted.

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mój udział polegał na opracowaniu metodologii, analizie danych i opracowaniu manuskryptu.

Ponadto wyrażam zgodę na wykorzystanie w/w publikacji w cyklu prac stanowiących podstawę rozprawy doktorskiej lek. Ewy Szuster.

Paulina Kostrzewska

Warszawa, 12.05.2023

lek. Paulina Kostrzewska
Indywidualna Praktyka Lekarska
Paulina Kostrzewska

OŚWIADCZENIE

Oświadczam, że w pracy:
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Paulina Kostrzewska

Bielsko-Biała, 18.05.2023

lek. Amanda Mandera-Grygierzec
Szpital Pediatryczny w Bielsku-Białej

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Amanda Mandera-Grygierzec
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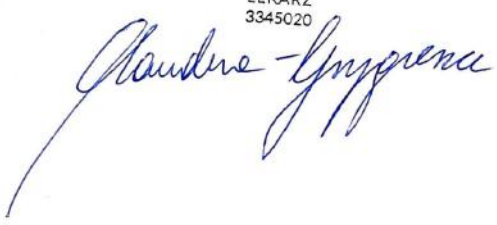

Bielsko-Biała, 18.05.2023

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Ginekologiczno-Położniczy Szpital Kliniczny
Uniwersytetu Medycznego im. Karola Marcinkowskiego
w Poznaniu

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Wrocław, 12.05.2023

Kinga Brawańska
Studentka Uniwersytetu Medycznego
im. Piastów Śląskich we Wrocławiu

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