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THE IMPACT OF DEPRESSION ON SEMEN QUALITY

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ABSTRACT

Objective: Depression is characterized by low or depressed mood, anhedonia, feelings of guilt or worthlessness, lack of energy, fatigue, appetite changes, psychomotor retardation, sleep disturbances, or suicidal thoughts. Despite numerous studies analyzing the epidemiology, symptomatology, and treatment of depression, the impact on men's reproductive health, semen quality, and procreation requires further research. This review aims to summarize the current state of knowledge about the impact of depression on semen parameters and quality.

Methods: PubMed, ScienceDirect, and Google Scholar were systematically searched for studies. The search included original articles published from January 2017 to December 2026. Only studies in English and with full-text access were considered. Inclusion criteria focused on original research assessing depressive disorder, semen quality, and semen analysis. Data were extracted and synthesized narratively.

Key Findings: Depression significantly affects semen parameters and quality, causing a reduction in sperm motility, sperm density, and sperm concentration.

Conclusion: Depression has an impact on semen quality and reproductive health. This review highlights the importance of recognizing and addressing sexual dysfunction alongside psychological symptoms, as well as the need for a multidisciplinary approach to the management of depression. In the end, Further research and deeper investigation are necessary to fully examine the complex impacts of depression on semen quality, even though these collective studies demonstrate a strong correlation between mental health and fertility.

KEYWORDS

Depression, Depressive Disorder, Semen Quality, Semen Analysis, Sperm Count

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Introduction

Depression is a common mental health disorder. It is characterized by low or depressed mood, anhedonia or decreased interest in pleasurable activities, feelings of guilt or worthlessness, lack of energy, fatigue, sleep disturbances (such as insomnia or hypersomnia), or suicidal thoughts. To diagnose depression, the aforementioned symptoms should persist for a period of at least two weeks. (Substance Abuse and Mental Health Services Administration, 2016) Depression affects approximately 290 million people worldwide (including about 110 million men), according to 2019 data from the Global Burden of Disease study; this represents a significant increase compared to 1990, when the global number of cases was estimated at around 182 million. These figures illustrate the severity of depression as a global public health issue. (Liu et al., 2024; Yang et al., 2024) As many as one-third (34%) of adults are at potential risk of developing clinical depression. Among older adults, this risk affects one in eight individuals (13.3%). (Abdoli et al., 2022; Shorey et al., 2022). Canadian Network for Mood and Anxiety Treatment (CANMAT) guidelines recommend psychotherapy as a first-line treatment for depression because of the favorable risk-benefit ratio. (Lam et al., 2024) Antidepressants belonging to the second-generation group like SSRIs, SNRIs, and atypical antidepressants are recommended as first-line pharmacotherapy. (Urata et al., 2025)

Due to the high level of stigma surrounding mental illness in society and widespread models of masculinity, men often fail to seek help for mood disorders, particularly depression, which means the link between it and sperm abnormalities may be underestimated in current studies. (Gosling et al., 2022; Krumm et al., 2023; McKenzie et al., 2022) Semen quality parameters, including sperm concentration and sperm counts, are declining, and this reduction has accelerated globally over the past 20 years. (Levine et al., 2023) The lower reference values presented as 5th percentile presented by Sixth edition of the WHO Laboratory Manual for the Examination and Processing of Human Semen include a semen volume of 1.4 ml, sperm concentration of 16 million/mL, total motility of 42%, sperm vitality of 54%, normal sperm morphology of 4%, progressive motility of 30% and total sperm number of 39 million per ejaculate (*World Health*

Organization: WHO Laboratory Manual... - Google Scholar, n.d.) 15% of couples worldwide are affected by male infertility, but in general, women are more likely than men to be infertile. It is estimated that 20% to 30% of infertility cases are caused by a male factor. (Kaltsas et al., 2025; Vander Borgh & Wyns, 2018; Yang et al., 2024) For example, considering the entire UK population, it is estimated that 10.1% of men and 12.5% of women are infertile. (Datta et al., 2016) Many factors, including hormonal, behavioral, and environmental ones, influence semen quality in men. (N. Wdowiak et al., 2024)

Along with known risk factors like unhealthy lifestyles and environmental endocrine disruptors such as smoking, alcohol, recreational drugs (including marijuana, cocaine, opiates, and methamphetamines), and obesity. (Durairajanayagam, 2018) The goal of this systematic review is to combine existing research on how depression affects men's semen quality and overall fertility. Although the connection between mental and reproductive health is becoming more well acknowledged, little is known about how depression affects semen quality on its own. Variations in study populations, techniques for measuring semen characteristics and depression symptoms, the possible impact of antidepressant therapy, and other confounding factors make it difficult to evaluate the results that are currently available. Thus, the purpose of this study is to assess currently available information about how depression affects semen quality and to determine the possible biological and behavioral mechanisms underlying this relationship. By emphasizing the wider implications of this condition, this review promotes more integrated clinical care and guides future research.

Methodology

Literature Search Strategy

A systematic literature search was conducted using the electronic databases PubMed and ScienceDirect to assess the impact of depression on semen quality. Search terms were adjusted for each database. The Boolean operators (AND, OR, NOT) and Medical Subject Headings (MeSH) were used. The search included original articles published from January 2017 to December 2026. Only studies in English and with full-text access were considered.

Inclusion and Exclusion Criteria

Inclusion Criteria:

Population: Men diagnosed with depression.

Exposure: Depression diagnosed using validated clinical criteria, medical records, or standardized psychological assessment tools.

Outcome: Articles evaluating one or more semen quality parameters, including sperm concentration, total sperm count, motility, morphology, semen volume, or DNA fragmentation.

Study Type: Original research articles, including cohort studies, case-control studies, cross-sectional studies, and prospective observational studies.

Language: English

Publication Date: January 2017 – December 2026.

Access: Only full-text articles.

Exclusion Criteria:

Population: Studies not referring to men diagnosed with depression.

Scope: Studies unrelated to subjects mentioned in the inclusion criteria.

Study type: systematic reviews, meta-analyses, case reports, experts' opinions, letters, editorials, and conference abstracts.

Data: Articles that do not contain original data or consist solely of anecdotal evidence.

Access: Articles that do not have full-text access.

Study Selection

The first selection was based on abstracts and titles. Articles that met the inclusion criteria were thoroughly reviewed during the second screening phase. When there was uncertainty or disagreement about inclusion, discussions continued until consensus was reached.

Search Terms

Search strategies were implemented for each database:

1. **PubMed** (((Depression) OR (Depressive disorder)) AND ((semen quality) OR (semen analysis) OR (sperm count) OR (semen))) NOT (review)) NOT (systematic review) Filters: in the last 9 years, Free full text
2. **ScienceDirect** ((Depression) OR (Depressive disorder)) AND ((semen quality) OR (semen analysis) OR (sperm count) OR (semen))
3. **Google Scholar** ((Depression) OR (Depressive disorder)) AND ((semen quality) OR (semen analysis) OR (sperm count) OR (semen))

Results

The cross-sectional study conducted by Zhang et al. involving 1,053 Chinese men attending an IVF clinic provided evidence that depression, rather than anxiety, was associated with impaired semen quality. During this study, psychometric instruments were used — the Patient Health Questionnaire-9 (PHQ-9) for depression and Generalized Anxiety Disorder-7 (GAD-7) for anxiety. The authors demonstrated that depressive symptoms were significantly associated with reduced sperm quality parameters, particularly progressive motility, total motility, sperm concentration, and total sperm count. The severity of depressive symptoms was associated with progressively poorer semen quality parameters.

Comparing men with depression severity from moderate to severe to a group of participants without depression revealed a significant reduction in progressive motility by 9.13% (95% CI, 3.273 to 14.9550). Total motility in the same comparison was reduced by $11.14 \times 10^6/\text{ml}$ (95% CI: 4.046-18.240; $P=0.002$). Sperm concentration was lower in both depression groups. In men with mild depression, the decrease was $10.81 \times 10^6/\text{ml}$ (95% CI: 0.175–21.438; $P=0.046$), whereas in those with moderate-to-severe depression, it was $47.71 \times 10^6/\text{ml}$ (95% CI: 26.536–68.875; $P<0.001$). Total sperm count (TSC) in the moderate to severe depression group was reduced by 98.49×10^6 per ejaculate (95% CI: 32.112–164.865; $P=0.004$). The composite semen quality index (F1), derived from principal component analysis of multiple semen parameters, was also significantly reduced in men with depressive symptoms, by 0.25 in mild depression (95% CI: 0.002–0.492; $P=0.048$) and by 0.92 in moderate to severe depression (95% CI: 0.416–1.424; $P=0.048$). The logistic regression model's results were consistent. Men with depression severity from moderate to severe had a 3.33 (95% CI, 1.66 to 6.66, $P=0.001$) odds ratio for reduced progressive motility ($<32\%$) and a 3.2 (95% CI, 1.56 to 6.58, $P=0.002$) odds ratio for total motility ($<40\%$) than men without depression. In the group of men with mild depression, the odds ratio for low sperm concentration was 1.99 (95% CI 1.06 to 3.73, $P=0.032$). (Zhang et al., 2024) Jenifer et al. investigated the impact of depression and its treatment on semen quality in a North American cohort of 329 men in a prospective cohort study. The results led to the conclusion that depression was associated with a 4.3-fold increased risk of low semen volume ($<1.5 \text{ mL}$) (95% CI: 1.16, 16). This association remained consistent when using a composite marker for depression (ever diagnosed or MDI score ≥ 21), which showed a 4.4-fold increased risk of low semen volume. Furthermore, a 5-unit increase in the Major Depression Inventory (MDI) score, reflecting more severe depressive symptoms, was associated with a 1.38-fold increased risk of low semen volume. Regarding other semen parameters, the findings were inconsistent; no meaningful associations were observed between a history of depression or current depressive symptoms and sperm concentration, motility, or total sperm count. (Yland et al., 2021) In another study conducted by Yi-Xiang Ye et al., involving 1,000 potential sperm donors and 5,880 repeated semen samples to investigate the association between depression severity and semen quality. The study participants were divided into four groups based on the Beck Depression Inventory: no depression ($n=523$, 52.3%), mild depression ($n=391$, 39.1%), moderate depression ($n=67$, 6.7%), and severe depression ($n=19$, 1.9%). Their research results show a strong inverse dose-response effect of depression on semen quality. Compared with men without depression, participants with moderate depression had a 12.28% reduction in semen volume (95% CI: -21.16% to -2.40%) and a 23.56% reduction in total sperm count (95% CI: -36.50% to -7.97%). In men

with severe depression, semen volume was 25.26% lower (95% CI: -38.65% to -8.93%) and total sperm count was 37.04% lower (95% CI: -55.37% to -11.20%) than in the non-depressed group. Severe depression was also associated with a 13.57% reduction in total motility (95% CI: -23.17% to -2.78%) and a 15.08% reduction in progressive motility (95% CI: -25.09% to -3.72%). Besides the data showed that every 5-score increase in BDI score was related with 4.40% (-7.11%, -1.61%) lower semen volume, 5.77% (-9.53%, -1.85%) lower sperm concentration, 9.58% (-13.98%, -4.96%) lower sperm count, 1.67% (-3.26%, -0.05%) lower total motility, and 1.92% (-3.64%, -0.18%) lower progressive mortality, showing a gradual decline in semen quality as depressed symptoms get worse. Moreover, the study analyzed the correlation of depression and oxidative stress biomarkers. Between urinary concentrations of 8-iso-prostaglandin F_{2α} (8-isoPGF_{2α}) and depression, a positive dose-response relationship was observed; however, no correlation was observed between depression severity and urinary concentrations of 8-OHdG or HNE-MA. These results showed that oxidative stress markers did not mediate the impact of depression on semen quality. (Ye et al., 2022)

In a cross-sectional study, 896 eligible questionnaires were obtained after screening 1236 questionnaires from seven sperm banks across China during the COVID-19 pandemic, in accordance with the inclusion and exclusion criteria. The Patient Health Questionnaire (PHQ-9) was used in this study to assess the participants' psychological depression level. According to previous studies, participants were divided into a non-depressive group (defined by 0-4 score of 0-4 in the PHQ scale) and a depressive group, additionally divided by PHQ-9 score defined as mild depression with a score from 5 to 10 or more, which was specified as severe depressive symptoms. Across 896 participants, 173 were depressed (19.30%). Among depressed participants, semen parameters were significantly lower and associated with poorer quality. Compared that data to group of non-depressive participants, participants with depressive symptoms had lower semen volume (3.03 ± 1.68 vs. 3.66 ± 1.67 [mL]), lower sperm concentration 45.76 ± 29.96 vs. $57.40 \pm 32.78 \times 10^6/\text{mL}$), lower total sperm count (141.97 ± 125.10 vs. $212.85 \pm 164.03 \times 10^6$) and lower progressive sperm motility ($38.31 \pm 16.60\%$ vs. $51.21 \pm 12.23\%$; all $P < 0.001$) There was no difference in the abstinence duration between the two groups. The association between depressed symptoms and compromised semen parameters was confirmed by multivariable regression analysis after accounting for factors such as BMI, smoking, alcohol consumption, age, and education level, which could have confounded the study results. According to the adjusted linear regression model, individuals with depressive symptoms had lower sperm concentration (95% CI, 3.39–15.15; $P = 0.021$), semen volume (95% CI, 0.27–0.87; $P = 0.002$), total sperm count (95% CI, 32.93–91.48; $P < 0.001$), and progressive sperm motility (95% CI, 10.55–15.37; $P < 0.001$). Following confounding factor adjustment, the depressed symptoms were classified into three groups based on the depression score scale classification criteria: normal mentality (≤ 4 points), mild depression (5–9 points), and severe depression (≥ 10). Furthermore, dose-response analyses of the relationship between depression scores and semen quality measures showed a linear decline with PHQ-9 scores in semen concentration and total sperm count. Nonetheless, a nonlinear correlation was found between depression score, sperm progressive motility, and sperm volume, with the steepest decline occurring below a PHQ-9 score of 8 and a plateau effect above the threshold. (Wang et al., 2021)

In an interventional study of 16 Egyptian men divided into 3 groups based on DSM-5 criteria and Hamilton Depression Rating Scale (HAM-D), 11 participants had moderate depression, 1 participant had severe depression, and 4 had very severe depression. There are no included participants with mild depression based on the HAM-D scale. All 16 patients received serotonin-norepinephrine reuptake inhibitors. Semen parameters were evaluated at baseline and following clinical improvement of depressive symptoms. All sixteen patients showed a significant reduction in their HAM-D scale score and depression severity following SNRIs. After improvement, the HAM-D score decreased from 16.5 (15–22) at baseline to 9 (6–11) (medians and interquartile ranges [median (IQR)]) (P value = 0.000). Among all patients, semen volume increased significantly following improvement in depression, from a median of 2.25 mL (IQR 1–3.5) [median (IQR)] at baseline to 2 mL (IQR 2–4.5, range up to 9.5 mL) post-improvement ($p = .033$). No significant changes were observed for sperm aggregation, agglutination, concentration, count per ejaculate, progressive motility, total motility, spermatogenic cell count, or normal morphology (all $p > .05$) Improvements reached significance in several domains when the analysis was limited to the subset of patients with abnormal baseline parameters: semen volume of 7 patients with baseline hypospermia increased from 1.05 at baseline to 2. ($p = .026$); 5 patients with baseline oligozoospermia had higher sperm count per ejaculate increasing from 14.1 at baseline to 70.5 ($p = .043$); and 7 patients with baseline asthenozoospermia had increase in higher total motility from 35 (5–40) to 55 (50–55) [median (IQR)] ($P = 0.018$) and across 5 patients with baseline asthenozoospermia was observed raise in progressive sperm motility from 15 (4–15) to 40 (35–40) [median (IQR)] ($p = 0.043$) There were insignificant associations between the HAM-D score and each of the semen characteristics (semen

volume, sperm concentration/ml, count/ejaculate, progressive and total motility, spermatogenic cells, normal morphology percentage, sperm aggregation, and agglutination) at baseline and after depression improvement in all patients, even those with aberrant baseline semen parameters. (El-Khateeb et al., 2023) Among 222 males who were undergoing an IVF procedure and who met inclusion criteria, the group was categorized according to the Hospital Anxiety and Depression Scale (HADS), of whom 49 men (22.5% of responders) met the criteria for anxiety (HADS-A ≥ 8). Only 14 men (6.5% of responders) met the criteria for depression (HADS-D ≥ 8). Due to the excessively low percentage of patients with elevated HADS-D scores, it was not possible to include them in the regression analyses. of semen parameters). But Men with and without high depression symptoms had comparable final total motile sperm counts (16.02 ± 15.2 vs. 18.65 ± 25.3 million, respectively). Men with anxiety (HADS-A ≥ 8) showed substantially lower final sperm concentrations (adjusted $\beta = -0.41$) and lower final total motile sperm counts (fTMSC) (11.8 ± 13.6 vs. 20.08 ± 26.5 ; adjusted $\beta = -0.66$) at the time of oocyte retrieval when compared to Men with normal anxiety scores. Initial semen volume, concentration, and motility did not differ significantly across the anxiety groups. Despite the observed differences in fTMSC, live birth rate (LBR) was comparable between men in the anxiety group (HADS-A ≥ 8) and the control group (4.32% VS. 45.1%; adjusted relative risk $p = 0.83$) (Walker et al., 2023) Wdowiak et al compared 112 participants treated in a privately-owned fertility clinic in Poland for infertility with a 12-month history of unprotected sexual intercourse to a group of 60 participants who were verified fertile sperm donors as the control group. The study's objective was to assess how certain hormone concentrations and semen quality relate to anxiety and depression in men with infertility issues. The 21-point Beck Depression Inventory (BDI); the cut-off values for depression severity levels were as follows: 0–11 for no depression, 12–26 for mild depression, 27–49 for moderate depression, and 50–63 for severe depression. Another scale used in this study was the State-Trait Anxiety Inventory (STAI). The questionnaire consists of two scales: STAI-1, which measures state anxiety, and STAI-2, which measures trait anxiety. Each scale has twenty statements. On a scale of 1 to 4, respondents rate each statement. Participants were divided into groups based on their scores: 1–4 points (low anxiety). 5–6 points (moderate anxiety) and 7–10 points (high anxiety). The group of infertile participants obtained higher BDI scores (18.69 vs 5.25, $p < 0.001$), STAI -1 (6.05 VS 2.15, $p < 0.001$), and STA-2 scores (5.79 vs 1.50, $p < 0.001$) compared to the fertile participants. What's more, the infertile group had a different hormonal profile compared to the control group, with considerably higher levels of cortisol (165.35 $\mu\text{g/dL}$ vs 130.78 $\mu\text{g/dL}$ ($Z = 5.965$; $p < 0.001$)), prolactin (25.76 ng/mL vs 16.93 ng/mL; $Z = 5.10$; ($r = 0.562$; $p < 0.001$), and significantly lower levels of testosterone (13.15 nmol/L; vs 21.03 nmol/L $Z = -6.813$; $p < 0.001$). ($r = -0.322$; $p < 0.001$), sex hormone-binding globulin (SHBG) (142.60 nmol/L vs 77.29 nmol/L) ($Z = -6.608$; $p < 0.001$), and dehydroepiandrosterone sulfate (DHEA-S) (94.24 mg/mL vs 161.28 mg/mL) ($Z = -6.14$; $p < 0.001$). All differences were statistically significant ($p < 0.001$). The mean sperm count in the confirmed-fertile group was 57.84 M/mL, which was substantially greater than the mean value of 35.46 M/mL ($Z = -5.529$; $p < 0.001$) in the infertile treatment group. Also, sperm donors had a higher mean ejaculate volume (5.56 mL) than infertile patients (3.38 mL) ($Z = -6.077$; $p < 0.001$). Other semen parameters, such as progressive motility [%], Viability [%], Normal morphology [%], MAR test IgA [%], and MAR test IgA [%], did not show statistically significant differences between the two groups ($p > 0.05$). The increase in BDI scores contributed to a decrease in testosterone levels ($r = -.322$), SHBG ($r = -.712$), DHEA-S ($r = -.588$), prolactin ($r = -.562$), and cortisol ($r = -.657$) in the infertile group; however, without affecting FSH or LH levels. Lower sperm count ($r = -.496$, $-.665$, and $-.645$, respectively) and lower semen volume ($r = -.484$, $-.568$, and $-.656$, respectively) were also significantly correlated with higher BDI, STAI-1, and STAI-2 scores (all $p < .001$). In contrast, the anxiety measures showed weaker but significant negative correlations with normal morphology and progressive motility. In the experimental group, there were no statistically significant associations ($p > 0.05$) between BDI scores and sperm motility, vitality, IgG-MAR, or IgA-MAR. Similarly, there was no significant correlation ($p > 0.05$) between STAI-1 and STAI-2 and sperm viability, IgG-MAR, or IgA-MAR. (A. Wdowiak et al., 2017) In the study conducted by Moghadam et al 102 participants who were eligible for intracytoplasmic sperm injection because of male factors and visited the infertility clinic were asked to donate semen, screened on semen parameters using WHO sixth guidelines for semen analysis, and the 42-item Depression Anxiety Stress Scale (DASS-42), a self-report tool, was used to measure depressive symptoms, anxiety, and stress. Each subscale (Depression, Anxiety, and Stress) is assessed using 14 questions in this 42-question survey. The subject's score is determined by summing the statement scores within each subscale, with severity classified as normal, mild, moderate, severe, or very severe. The expressions "never," "somewhat," "often," and "always" are rated from 0 to 3 on a four-choice Likert scale. The more serious the psychological issues, the higher the scores on this test. The 15-item International Index of Erectile Function (IIEF-15) was also used to measure

erectile function concurrently. According to the findings, 20 participants (19.65%) had normal sperm counts ($\geq 15 \times 10^6/\text{mL}$), according to the 5th edition WHO guidelines for semen analysis. 36 participants (35.3%) had normal sperm motility, and 89 participants (87.3%) had normal sperm morphology. The participants, based on DASS questionnaires, were divided into groups: group with depression (21 participants, 20.6%), anxiety (40 participants, 39.2%), moderate stress to very severe stress (23 participants, 22.5%). 60 individuals out of 102 subjects had Erectile dysfunction based on the IIEF scale, while the remaining 42 individuals, or 41% of the total, were categorized as normal. Certain subscales of semen analysis and DASS were found to have a weakly significant negative connection in the Pearson test. A weak negative correlation was found between sperm morphology and level of stress ($r = -0.213$, $p = 0.034$). The same correlation was found between sperm motility and anxiety ($r = -0.208$, $p = 0.037$) or depression ($r = -0.214$, $p = 0.035$). However, a similar correlation wasn't found between progressive motility or sperm count and stress, anxiety, and depression. (Nakhaee Moghadam et al., 2024)

Discussion

Depression is becoming an increasingly serious global problem in terms of population health and its impact on future generations. Also, depression was linked to a twofold increase in all-cause mortality with a reduced life expectancy of 13 years when compared to individuals without depression, according to studies involving over 10.8 million individuals with depression. In patients struggling with depression, the risk of death from heart and lung disease is higher. (Chan et al., 2023, 2025) Furthermore, a scoping review of 36 observational studies indicated that depression contributes to increased cancer-related mortality, making it a significant factor that worsens prognosis in oncology. (Tang et al., n.d.) Furthermore, according to the latest meta-analyses, 63% of men suffering from depression experience sexual dysfunction, 40% have reduced libido, 32% have erectile dysfunction, and 34.17% experience orgasmic disorder. (Gonçalves et al., 2023) Further studies analyzing the impact of depression on reproduction show that gonadotropin-inhibitory hormone (GnIH) overexpression suppresses the hypothalamic-pituitary-gonadal (HPG) axis through inhibition of kisspeptin and gonadotropin-releasing hormone (GnRH) production, and probably this is the main way that psychological stress and mental illnesses like depression contribute to idiopathic male infertility. Reduced testosterone production and decreased spermatogenesis are the results of this hormonal repression, which deteriorates sperm quality and causes aberrant morphology, motility, and count. While there is growing evidence linking depression, low testosterone levels, and sexual dysfunction, little is known about how depression may affect the quality of semen. (Baroudi et al., 2021; Indirli et al., 2023; Odetayo et al., 2024) Semen quality has reportedly declined over the previous few decades in many nations including Saudi Arabia (Ahmad et al., 2024), China (Liu et al., 2020), Brazil (Borges et al., 2015), Italy (Cannarella et al., 2021), Finland (Rodprasert et al., 2019) and Scotland (Irvine et al., 1996) For example, in Switzerland, over 97% of young men recruited through military conscription were asked to take part in the study, which involved 92,274 people over 12 years. Only 38% of young men in Switzerland had sperm concentration, motility, and morphology values above the WHO standard. Sixty-two percent of the males had one or more semen parameters that fell below the WHO limits. (Rahban et al., 2019) Given its high prevalence, its potential impact on male reproductive health and semen quality warrants further investigation. The available evidence suggests that depression may have a negative impact on semen quality; however, the degree and clinical importance of this link vary between studies. Further evidence for a depression-specific rather than a general psychiatric effect on semen quality comes from a large-scale cross-sectional study of 1,053 Chinese men attending an IVF facility conducted by Zhang et al. The study found that moderate-to-severe depression—but not anxiety—was independently associated with significant reductions in progressive motility, total motility, sperm concentration, and total sperm count using validated PHQ-9 and GAD-7 instruments to separate depressive from anxious symptoms. Anxiety only showed an isolated effect on concentration. (Zhang et al., 2024)

A history of clinical depression was linked in another study conducted by Yland JJ et al. to a 4.3-fold higher chance of poor semen volume ($< 1.5 \text{ mL}$), according to the study. Using a composite marker for depression (ever diagnosed or MDI score > 21), which showed a 4.4-fold greater risk of reduced semen volume, this connection remained. Moreover, a 1.38-fold higher risk of reduced semen volume was linked to a 5-unit rise in the Major Depression Inventory (MDI) score, which represents more severe depressed symptoms. Other semen measures showed mixed results; no significant correlations were found between sperm concentration, motility, or total sperm count with a history of depression or current depressed symptoms. (Yland et al., 2021) In another prospective study of 1,000 healthy sperm donors who provided 5,880 repeated semen samples over roughly six months, depression severity categorized using the Beck Depression Inventory was found to have

a consistent inverse dose-response relationship with all major semen parameters using mixed-effects models. The results showed that men suffering from depression had a 25.3% reduction in semen volume and a 37% reduction in total sperm count compared to men without depression. (Ye et al., 2022) Across the analyzed cross-sectional studies, which included 896 qualified participants, the reported psychological depression level was measured using the Patient Health Questionnaire (PHQ-9). Compared to the group of non-depressive participants, participants with depressive symptoms had lower semen volume, lower sperm concentration, lower total sperm count, and lower progressive sperm motility. There was no difference in the abstinence duration between the two groups. Furthermore, dose-response analysis of the association between depression levels and semen quality metrics revealed a linear decrease in semen concentration and total sperm count with PHQ-9 values. However, with sperm progressive motility and sperm volume, the correlation was non-linear. (Wang et al., 2021) In a small study conducted by El-Khateeb, E.A. et al., evidence was shown that, rather than improving semen quality generally, treating depression may preferentially increase ejaculate volume. Semen volume increased significantly across the entire cohort after SNRI treatment and was associated with improved HAM-D scores, but concentration, count, motility, and morphology did not change significantly. However, when analysis was limited to patients with baseline semen abnormalities, improvements also became significant for count, concentration, and both total and progressive motility.

The study results, showing an improvement in specific semen parameters following the resolution of symptoms, suggest that depression negatively affects semen quality; however, the study is limited by a small sample size (16 men), the absence of a control group, and the lack of a significant correlation between HAM-D scores and semen parameters, factors that may skew the actual findings. (El-Khateeb et al., 2023) Walker et al. evaluated semen parameters and depression symptoms in 222 IVF patients, but among them only 14 met the criteria of depression in the Hospital Anxiety and Depression Scale, which shows that, despite a relatively large study group, the proportion of participants from that group can be very small. No significant difference in total motile sperm counts was demonstrated between the group of men suffering from depression and the group that did not. (16.02 ± 15.2 vs 18.65 ± 25.3 million). Furthermore, live birth rates per embryo did not differ significantly between the two study groups. (46.7% vs. 45.4%). Because it included a few men with high depression ratings, adjusted regression analysis was not feasible. (Walker et al., 2023) Wdowiak et al. contrasted a control group of 60 individuals who were confirmed viable sperm donors with 112 patients treated for infertility. Compared to the infertile treatment group, the confirmed-fertile group had a significantly higher mean sperm count. Furthermore, the mean ejaculate volume of sperm donors was larger than that of infertile patients. There were no statistically significant changes between the two groups in other semen measures, such as progressive motility, viability, normal morphology, MAR test IgG, and MAR test IgA. (A. Wdowiak et al., 2017)

Using the DASS-42 and Pearson correlation analysis, there was no significant correlation found between depression and either sperm count or progressive motility; however, depression was significantly but weakly associated with decreased sperm motility, along with similar weak correlations for anxiety with motility and stress with normal morphology. Because the study was single-center designed, with a small study group of only 16 men, all of whom were an ICSI-candidate (Intracytoplasmic Sperm Injection) population who had a diagnosis of male infertility) resulted in the absence of a control group in the study. (Nakhaee Moghadam et al., 2024) Based on the aforementioned studies, there is a need further to investigate the impact of depression on semen quality. However, it is worth noting that the deterioration of semen parameters leading to infertility can also increase the risk of developing depression. A study conducted by Kooli et al. demonstrated that a diagnosis of depression in men with initial infertility led to a further deterioration of semen parameters. (Kooli et al., 2023) Furthermore, the pharmacological treatment of depression plays a significant role regarding its impact on semen quality. A scientific study demonstrated that SSRIs, including Citalopram, Escitalopram, Fluoxetine, Paroxetine and Sertraline, can reduce sperm concentration, impair sperm morphology, decrease sperm motility and lead to severe fragmentation of sperm DNA (Xu et al., 2022) However, studies on other drugs used in the pharmacotherapy of depression—such as duloxetine, an SNRI—have not shown a negative impact on semen quality. (Punjani et al., 2021) The article highlights the need for a more in-depth analysis of the impact of depression on semen parameters, taking into account the direct mechanisms involved, while also considering the destructive effect of depression on patients' daily lives and its indirect influence through changes in daily habits—such as sleep disturbances, eating and weight disorders, and substance use (including cigarettes, alcohol, and psychoactive substances). (Maxwell & Cole, 2009; Mohebbi et al., 2025; Murphy & Peterson, 2015)

Conclusion

Mood disorders, especially depression and anxiety, are strongly linked to a decrease in sperm motility and density, according to clinical studies by Nakhaee Moghadam et al., Wang et al., and Wdowiak et al. Moreover, empirical research by Ye et al., Walker et al., and Zhang et al. consistently shows a correlation between a decrease in important parameters such as sperm concentration and total motile count and the intensity of psychiatric symptoms. Yland et al. and El-Khateeb et al.'s longitudinal and clinical observations highlight that the diagnosis and effective treatment of mental health issues can directly impact ejaculate volume and general fertility markers. Further research is needed to clarify the relationship between depression and semen quality.

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