



Erectile Dysfunction in a Sample of Sexually Active Young Adult Men from a U.S. Cohort: Demographic, Metabolic and Mental Health Correlates

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Purpose: Little is understood about physiological and psychological correlates of erectile dysfunction among younger men. We examined prevalence and correlates of erectile dysfunction in a large U.S. sample of 18 to 31-year-old men.

Materials and Methods: Erectile dysfunction prevalence and severity (defined using the International Index of Erectile Function-5 scale) were examined in cross-sectional survey data from 2,660 sexually active men, age 18 to 31 years, from the 2013 Growing Up Today Study. Erectile dysfunction medication and supplement use were self-reported. Multivariable models estimated associations of moderate-to-severe erectile dysfunction with demographic (age, marital status), metabolic (body mass index, waist circumference, history of diabetes, hypertension, hypercholesterolemia) and mental health (depression, anxiety, antidepressant use, tranquilizer use) variables.

Results: Among sexually active men 11.3% reported mild erectile dysfunction and 2.9% reported moderate-to-severe erectile dysfunction. Married/partnered men had 65% lower odds of erectile dysfunction compared to single men. Adjusting for history of depression, antidepressant use was associated with more than 3 times the odds of moderate-to-severe erectile dysfunction. Anxiety was associated with greater odds of moderate-to-severe erectile dysfunction, as was tranquilizer use. Few men (2%) reported using erectile dysfunction medication or supplements. However, among them, 29.7% misused prescription erectile dysfunction medication. Limitations include reliance upon cross-sectional data and the sample's limited racial/ethnic and socioeconomic diversity.

Conclusions: Erectile dysfunction was common in a large sample of sexually active young adult men from a U.S. cohort and was associated with relationship status and mental health. Health providers should screen for erectile dysfunction in young men, and monitor use of prescription erectile dysfunction medications and supplements for sexual functioning.

Key Words: anxiety, depression, erectile dysfunction, marital status, prescription drug misuse

Abbreviations and Acronyms

BMI = body mass index
ED = erectile dysfunction
GUTS = Growing Up Today Study
IIEF-5 = 5-item International Index of Erectile Functioning
SSRI = selective serotonin reuptake inhibitor

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ERECTILE dysfunction, the inability to maintain an erection sufficient to engage in sexual intercourse, often induces distress and decreases quality of life of men and their sexual and romantic partners.^{1,2} ED is typically identified as a condition affecting men older than 40 years.^{3,4} Less is known about ED among younger men. According to the 2001-2002 U.S. National Health and Nutrition Examination Survey, the prevalence of ED in men age 20 to 39 years old is 5.1% (in contrast to 14.8% at age 40 to 59 and 44% at age 60 to 69).⁵ These estimates are similar to those identified in the UK based on the 2010-2012 British National Surveys of Sexual Attitudes and Lifestyles, in which 7.7% of males ages 16 to 34 years reported ED.⁶ Data from clinical and community based samples indicate that the number of men younger than 40 years reporting ED may be substantial.⁷⁻⁹ For example, a study of undergraduate students in the southern U.S. found that up to 13% of students may meet the criteria for ED,¹⁰ and data from an Italian clinic indicated that 25% of men seeking treatment for ED are less than 40 years old.⁷ Understanding the prevalence and correlates of ED among young adult men is paramount given its profound effects on fundamental aspects of men's identities (eg feelings about masculinity, self-confidence),¹ mental health (eg depression)¹¹ and sexual satisfaction.¹²

Epidemiological studies typically assess ED with single items,^{5,6} limiting understanding of the context and frequency of ED, the characterization of severity of ED (ie as mild, moderate and severe)¹³ and potentially contributing to discrepancies in estimated prevalence among young adult males. Clearer delineation regarding severity of ED may be of substantive relevance in distinguishing the correlates of ED, given that ED may be caused by multiple factors (ie neurogenic, psychogenic, metabolic, vascular).^{3,4} Among young adults ED was previously thought to be psychogenic in origin,¹⁴ with erectile difficulties stemming from factors such as anxiety, depression, stress, trauma or potentially psychopharmacological treatment.¹⁵ Recently, clinicians have advocated for examination of whether cardiovascular pathways, which account for high ED prevalence in older adult males, may also explain ED in young adult males, as measured by metabolic factors and markers of elevated metabolic risk, such as diabetes, BMI, hypertension and hypercholesterolemia.^{5,8,15} However, most research identifying correlates for ED are focused on men age 40+ years.^{16,17}

In addition, there is limited understanding regarding the use of ED medication (eg phosphodiesterase type 5 inhibitors) among the general young adult male population. Prior research has examined the recreational use of ED medication in the context of other drugs (eg methamphetamines) to facilitate

prolonged sexual activity among men who have sex with men.^{18,19} One study of college students found that 4% of males reported using ED medication for recreational purposes.¹⁰ Few studies have examined the prevalence of supplements purported to address ED (eg Epimedium/horny goat weed) among young adult men. Medically supervised use of prescription medication for ED can be safe, but prescription drug misuse and use of underregulated or adulterated dietary supplements can have dangerous and potentially lethal health consequences.²⁰ The goals of the current study were to examine the prevalence and correlates of ED in a large study of sexually active young adult males in the U.S. and use of prescription drugs and supplements to treat ED.

METHODS

Participants

Study participants were drawn from the Growing Up Today Study, a large U.S. prospective cohort. Participants, all children of women in the Nurses' Health Study II (NHSII), were enrolled at age 9 to 16 years in 1996 and 2004 and subsequently followed. After obtaining parental consent participants were invited to enroll in GUTS, with return of the baseline questionnaire considered as assent. The study protocol was approved by the institutional review boards of the Brigham and Women's Hospital and Harvard TH Chan School of Public Health (IRB Protocol No. 1999P002104/BWH). Demographic information on NHSII and GUTS are described elsewhere.²¹ Cross-sectional data for the current study were based on males who completed the 2013 questionnaire (4,482), when ED was assessed and when participants were age 18 to 31. Analyses were restricted to participants who were sexually active in the past year and with available data on self-reported ED (2,660).

Measures

Sexual activity. Past year engagement in any sexual activity to further validate assessment of ED was measured with a single item, "Were you sexually active in the past 12 months?" (yes/no).

Severity of erectile dysfunction. Past year ED was measured using the 5-item International Index of Erectile Functioning Questionnaire,²² a validated self-report instrument that assesses context and frequency of erectile function and sexual activity satisfaction (rating responses to each item on unique 5-point scales). Items on the index are summed, with scores ranging from 5 to 25, and categorized into levels of severity of ED as 22-25—no ED, 17-21—mild ED, 12-16—mild-to-moderate ED, 8-11—moderate ED and 5-7—severe ED). In the current study moderate-to-severe ED was defined as scores ranging from 5-16 (ie mild-moderate, moderate or severe ED; no ED and mild ED [IIEF-5 scores greater than 16] was the referent).

Use of ED prescription medications or supplements. Participants indicated the frequency of ED medications and supplements use by responding to the question, "During the past 12 months, how often did you use

medications or supplements to correct or enhance the quality and/or duration of your erections? (eg Viagra®, Cialis®, L-Arginine, Epimedium/horny goat weed etc)” (with response options of 0—never, 1—less than once a month, 2—once a month, 3—2 to 3 times a month, 4—once a week, 5—2+ times a week). Responses of 1 to 5 were coded as 1—ever use and 0—never (referent). For ever use, a followup question asked, “How did you get the product?” (with response options of product was prescribed to me by a health provider; from someone else [family member, friend] to whom the product was prescribed; purchased abroad or online without proof of prescription; over the counter [no prescription required]; specialty health or natural food store [eg GNC®]).

Demographic correlates. Participant age in years was calculated based on birth year and date of survey return. Marital status was based on self-report to the question, “What is your current status?” (response options categorized as never married, separated, divorced or widowed=referent, vs married or living with a partner).

Metabolic syndrome risk indicators. Five metabolic syndrome indicators were measured to approximate metabolic risk factors for ED (scored as no=referent, yes): overweight or obese weight status (BMI greater than 25 kg/m², calculated from current self-reported height and weight); waist circumference greater than 40 inches (measured via self-report using a tape measure provided to survey participants); and diabetes, hypertension, hypercholesterolemia (scored via a self-report health conditions checklist if they indicated that a health provider diagnosed them with the condition since 2006, and/or if they indicated taking medication for the condition in the past year).

Mental health indicators. Participants indicated whether they received a diagnosis of depression or whether they received a diagnosis of anxiety from a health provider since 2006 via a self-report health conditions checklist (scored no=referent vs yes). Psychopharmacological therapy was assessed via self-report on past year use (scored none=referent vs any use) of SSRIs antidepressants (eg Prozac®), other antidepressants (eg Elavil®) and minor tranquilizers (eg Valium®).

Analysis

Descriptive frequencies and means were calculated for all key variables, including the prevalence of mild (IIEF-5 scores ranging from 17 to 21) and moderate-to-severe ED (IIEF-5 scores 16 or less). Prevalence of ED medication and supplement use by level of ED was calculated. Finally, cross-sectional univariate and grouped bivariate regression models examined the associations of demographic, metabolic and mental health correlates of moderate-to-severe ED (with mild and no ED [IIEF-5 scores greater than 16] as the referent). Missing data on demographic, metabolic and mental health correlates were handled using multivariate imputation by chained equations. Analyses were performed in SAS® version 9.4.

RESULTS

A total of 11.3% (300) of participants reported mild ED and 2.9% (77) reported moderate-to-severe ED (table 1). Few participants (2%, 64) reported using ED medication or supplements, and among men who reported use 17.2% to 29.7% reported potential misuse of prescription drugs (ie using drugs prescribed to someone else, or drugs purchased abroad or without a prescription). Descriptive analysis of participants reporting any use of ED medication or supplements suggests that males reporting mild-moderate, moderate or severe ED may use ED medication prescribed by a medical provider (11/29 cases), whereas males who report no or mild ED report using ED medication that was prescribed to someone else or purchased abroad or without a prescription (18/29 cases) (table 2).

Logistic regression models examining demographic, metabolic and mental health correlates of ED indicate that married/partnered men had 65% (OR 0.35, 95% CI 0.19–0.65) lower odds of moderate-to-severe ED compared to single men (table 3). Grouped bivariate models indicate that, adjusting for depression, men reporting a history of any antidepressant use had elevated odds (OR 3.45, 95% CI 1.87–6.36) of reporting moderate-to-severe ED. Men reporting a history of anxiety (OR 2.07, 95% CI 1.19–3.60) or any tranquilizer use (OR 2.72, 95% CI 1.31–5.64) had elevated odds of moderate-to-severe ED. Age and metabolic factors were not associated with ED. Results were similar when these associations were analyzed using the full IIEF scale as a continuous variable (supplementary table, <https://www.jurology.com>).

DISCUSSION

Among sexually active men 18 to 31 years old in the current study approximately 11% reported mild ED and 3% reported moderate-to-severe ED. The combined prevalence was comparable to other community based and clinic based survey estimates of ED, which found that up to 13% of young adult men may meet the criteria for ED.^{7,10} The prevalence of participants reporting moderate-to-severe ED was slightly lower than U.S. and UK studies examining the prevalence of ED among similarly aged samples, but that used single-item assessments.^{5,6} The divergent estimates of moderate-to-severe ED in the current study relative to other studies could potentially be attributed to the use of the validated IIEF-5, which enables detection of varying degrees of ED severity.

Moderate-to-severe ED was more prevalent among men who were not married or living with a partner, who reported using antidepressants, or who reported anxiety or using tranquilizers. Metabolic factors such as high BMI, diabetes, hypertension or hypercholesterolemia were not associated

Table 1. Descriptive statistics for self-reported ED and potential demographic, metabolic risk and mental health correlates

| | IIEF-5 scores | |
|--|---------------|---------|
| % Level of ED (score range) (No.): | | |
| No ED (22–25) | 85.8 | (2,283) |
| Mild ED (17–21) | 11.3 | (300) |
| Mild-moderate ED (12–16) | 2.0 | (52) |
| Moderate (8–11) or severe (5–7) ED | 0.9 | (25) |
| Median overall IIEF-5 scale score (IQR) | 24.00 | (2.00) |
| % Any past yr use of ED prescription medication or supplement (No.): | 2.0 | (64) |
| % Medication or supplement source (No.): | | |
| Prescribed by health care provider | 35.9 | (23) |
| Prescribed to someone else | 17.2 | (11) |
| Purchased abroad or online without proof of prescription | 12.5 | (8) |
| Over the counter (no prescription required) | 31.3 | (20) |
| Specialty health or natural food store | 21.9 | (14) |
| | Demographics | |
| Mean age (SD) | 25.82 | (3.33) |
| % Currently married/living with partner (No.): | 39.9 | (1,062) |
| % Metabolic syndrome risk indicators (No.): | | |
| Overweight or obese wt status | 20.3 | (539) |
| Waist circumference greater than 40 in | 9.4 | (250) |
| Diabetes | 1.1 | (28) |
| Hypertension | 6.3 | (168) |
| Hypercholesterolemia | 7.7 | (205) |
| % No. metabolic syndrome risk indicators (No.): | | |
| 1 or More | 33.8 | (899) |
| 2 or More | 7.5 | (200) |
| 3 or More | 1.7 | (44) |
| % Mental health (history of clinical diagnosis) (No.): | | |
| Depression | 11.1 | (296) |
| Anxiety | 8.4 | (224) |
| % Antidepressant medication use (past yr) (No.): | 5.6 | (149) |
| SSRIs (eg Prozac) | 4.5 | (119) |
| Other antidepressants (eg Elavil, Tofranil) | 2.0 | (52) |
| % Tranquilizer use (past yr, eg Valium, Xanax) (No.): | 2.3 | (62) |

IIEF-5 scores range from 5 to 25, with lower scores indicating greater degrees of ED. Weight status was based on BMI calculated from self-reported height and weight. Waist circumference was measured via self-report using a tape measure provided to survey participants. Participants were scored as having diabetes, hypertension or hypercholesterolemia if they indicated that a health provider diagnosed them with the condition, and/or if they indicated taking medication for the condition. Participants were scored as having depression or anxiety by self-report if a health provider diagnosed them with the condition in the past.

with ED, and depression was not associated with ED after adjusting for antidepressant use. Given the overall young age range of the sample, it is possible that metabolic factors were not associated with ED because such conditions were not established long enough within individuals to cause vascular damage.

Although the current study did not examine all potential correlates of ED (eg neurogenic factors), the results suggest that among young adult men in the current study ED may be associated more with demographic and psychogenic factors rather than physiological determinants. The current study cannot determine directionality of associations. However, the findings are consistent with other research on the social and psychological impacts of ED on men's quality of life.^{1,8} The findings indicate that ED could interfere with the pursuit or maintenance of relationships among young men, and that ED may be associated with considerable psychological distress. Given the high prevalence of mild to severe self-reported ED in the current study, results may help health providers counsel young adult male patients on the prevalence of ED within their age bracket. Health providers may consider asking young adult male patients about erectile difficulties and their impact on quality of life. Additionally, health providers may consider asking patients who are receiving pharmacological treatment for depression or anxiety about potential ED. Although the majority of ED cases in the current study were in the mild range, a recent clinic based study of 765 patients being treated for ED indicated that the psychological impact of mild ED may be greater among younger men (ie younger than 50 years old) relative to older men, and that treating ED and associated psychological health among younger men may produce greater benefits for sexual satisfaction.²³

Descriptive analysis indicates that only 2% (64) of men in the current study reported past year use of ED medication or supplements, yet approximately 30% (20) of those reporting such use potentially engaged in some form of prescription drug misuse (ie using medication prescribed to someone else, purchasing medication without prescription). These prevalence estimates are low, yet consistent with estimates of recreational ED medication use among young adult male college students.¹⁰ Prevalence estimates of ED medication use and misuse in the current study may be underestimated, as the analysis was restricted to sexually active young adult

Table 2. Use of ED prescription medication or supplements by degree of self-reported ED

| | No ED | Mild ED | Mild-Moderate ED | Moderate or Severe ED |
|--|-------|---------|------------------|-----------------------|
| No. | 2,283 | 300 | 52 | 25 |
| No. any past yr use of ED medication | 28 | 21 | 12 | 3 |
| No. source of prescription medication or supplement: | | | | |
| Prescribed by health care provider | 4 | 8 | 10 | 1 |
| Prescribed to someone else | 7 | 4 | 0 | 0 |
| Purchased abroad or online without proof of prescription | 5 | 2 | 1 | 0 |
| Over the counter (no prescription required) | 13 | 3 | 2 | 2 |
| Specialty health or natural food store | 6 | 4 | 3 | 1 |

Counts of users of prescription medication or supplements for addressing ED and counts of sources of medication and supplements may be discrepant if users are utilizing multiple forms of treatments from multiple sources.

Table 3. Results from multivariable regression models examining associations between demographic, metabolic risk indicators and mental health correlates of self-reported ED

| | Model 1 OR (95% CI)* | p Value | Model 2 OR (95% CI)† | p Value |
|--|----------------------|---------|----------------------|---------|
| Demographics: | | | | |
| Age | 0.96 (0.90, 1.03) | | 1.02 (0.94, 1.10) | |
| Married/living with a partner | 0.36 (0.21, 0.63) | 0.0004 | 0.35 (0.19, 0.65) | 0.0009 |
| Metabolic syndrome risk indicators: | | | | |
| Overweight or obese | 0.52 (0.26, 1.04) | | | |
| Waist circumference greater than 40 in | 0.39 (0.12, 1.23) | | | |
| Diabetes | 1.02 (0.14, 7.10) | | | |
| Hypertension | 0.52 (0.16, 1.63) | | | |
| Hypercholesterolemia | 1.07 (0.50, 2.31) | | | |
| Approximate metabolic syndrome score | | | 0.71 (0.48, 1.07) | |
| Mental health indicators: | | | | |
| Depression | 2.61 (1.58, 4.32) | 0.0002 | 1.46 (0.82, 2.60) | |
| SSRIs | 3.56 (1.93, 6.56) | <0.0001 | | |
| Other antidepressants (eg Elavil) | 5.02 (2.42, 10.38) | <0.0001 | | |
| Any antidepressants | 4.42 (2.61, 7.48) | <0.0001 | 3.45 (1.87, 6.36) | <0.0001 |
| Anxiety | 2.63 (1.52, 4.54) | 0.0005 | 2.07 (1.19, 3.60) | 0.0105 |
| Tranquilizers (eg Valium, Xanax) | 4.19 (2.03, 8.65) | <0.0001 | 2.72 (1.31, 5.64) | 0.0073 |

* Individual bivariate associations with moderate-to-severe ED (IIEF-5 scores 16 or less, mild and no ED [IIEF-5 scores greater than 16] as the referent).

† Grouped bivariate (demographic; approximate metabolic syndrome score [count of metabolic risk indicators]; depression and any antidepressants; anxiety and tranquilizers) associations with moderate-to-severe ED (IIEF-5 scores 16 or less, mild and no ED [IIEF-5 scores greater than 16] as the referent).

men, and did not also analyze other medications that men may use for ED (eg testosterone, anabolic-androgenic steroids). More detailed data collection on ED medication and supplement use among young adult males in general is warranted as prescription drug misuse can result in physical harms associated with incorrect dosage and contraindications.²⁴ Furthermore, recent studies have highlighted the dangers of medically unsupervised use of dietary supplements for sexual functioning, as such supplements are underregulated and may be adulterated with dangerous substances or drug analogs.^{20,25,26} Examining adverse events among adolescents and young adults, data from the U.S. Food and Drug Administration Adverse Events database reveals that, compared to vitamins, supplements sold for sexual functioning are 2.5 times more likely to be associated with severe adverse events or medical complications.²⁷

The study analyzed varying degrees of ED in a large sample of young adult, sexually active men from a U.S. national cohort study, yet there are several limitations that warrant attention. First, the study relied on self-report of ED symptoms, medication and supplement use, and clinical health correlates, without clinician assessment. In addition, although the survey design permitted analysis of several demographic, metabolic and psychological factors that are known correlates of ED, the scope of analysis meant that we did not examine additional demographic and behavioral factors that have been explored in previous research (eg sexual orientation, consumption of alcohol, tobacco). In addition, the survey did not include assessment of neurogenic or additional physical health conditions that could contribute to ED among young adult men (eg hypogonadism,

concurrent testosterone supplementation), or other psychosocial and behavioral factors that may be implicated in ED risk (eg sexual trauma, pornography consumption). In our analyses we report only grouped bivariate analyses to retain power for the binary outcome. However, ancillary analyses used a fully adjusted multivariable model and examined the degree of ED as a continuous score, and yielded a similar pattern of effects. The cross-sectional design prevents analysis of directionality of associations. Men with more severe ED may not have been sexually active in the past year and, thus, could have been excluded from the analytic sample. Finally, the sample's limited racial/ethnic and socioeconomic diversity may limit the generalizability of the results.

CONCLUSIONS

Cross-sectional data from a large U.S. national prospective cohort reveal that approximately 14% of young sexually active men ages 18 to 31 years reported mild to severe ED. Moderate-to-severe ED was more prevalent among men who were not married or living with a partner, who use antidepressants, report anxiety or use tranquilizers. Approximately 30% of men who use ED medication and supplements reported misuse of ED medication. Given the high prevalence of mild to severe ED, research examining additional demographic, psychological, behavioral and physical correlates of ED in diverse samples of young men is needed.

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