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REVIEW

Erectile Dysfunction and Depression: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: Some studies have reported that exposure to depression increases the risk of erectile dysfunction (ED), whereas others have observed no association. Moreover, additional studies have reported that exposure to ED increases the risk of depression.

Aim: To identify and quantitatively synthesize all studies evaluating the association between ED and depression and to explore factors that may explain differences in the observed association.

Methods: We conducted a systematic review and meta-analysis. We searched Medline, Ovid Embase, and the Cochrane Library through October 2017 for studies that had evaluated the association between ED and depression. Studies were included in accordance with Patient Population or Problem, Intervention, Comparison, Outcomes, and Setting (PICOS) inclusion criteria.

Outcomes: The odds ratio (OR) was regarded as the effect size, and the heterogeneity across studies was assessed using the I^2 statistic.

Results: We identified 49 eligible publications. The pooled OR for studies evaluating depression exposure and risk of ED was 1.39 (95% CI: 1.35−1.42; n = 46 publications with 48 studies). Although we observed large heterogeneity ($I^2 = 93.6\%$), subgroup analysis indicated that it may have been as a result of variations in study design, comorbidities, ED assessment, depression assessment, the source of the original effect size, etc. No significant publication bias was observed ($P = .315$), and the overall effect size did not change by excluding any single study. The pooled OR for studies evaluating ED exposure and risk of depression was 2.92 (95% CI: 2.37−3.60; n = 5 publications with 6 studies). No significant heterogeneity ($P < .257$, $I^2 = 23.5\%$) or publication bias ($P = .260$) was observed.

Clinical Implications: Patients reporting ED should be routinely screened for depression, whereas patients presenting with symptoms of depression should be routinely assessed for ED.

Strengths and Limitations: There are several strengths to this study. First, evaluations of the association between ED and depression are timely and relevant for clinicians, policymakers, and patients. Second, we intentionally conducted 2 meta-analyses on the association, allowing us to include all potentially relevant studies. However, our study also possesses some limitations. First, the OR is a measure of association that only reveals whether an association is present. Thus, this study was unable to determine the direction of causality between ED and depression. Second, the high heterogeneity among studies makes it difficult to generalize the conclusions.

Conclusion: This study demonstrates an association between depression and ED. Policymakers, clinicians and patients should attend to the association between depression and ED. **Liu Q, Zhang Y, Wang J, et al. Erectile dysfunction and depression: A systematic review and meta-analysis. J Sex Med 2018;xx:xxxx−xxxx.**

Key Words: Depression; Erectile Dysfunction; Review; Meta-Analysis

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INTRODUCTION

Erectile dysfunction (ED), which is defined as the persistent inability to attain and maintain an erection sufficient to permit satisfactory sexual performance,[1] can have a negative effect on quality of life for both patients and their partners because of its effects on both physical and psychosocial health. Epidemiologic studies have revealed that the prevalence and incidence of ED are high among men,[2] with evidence suggesting that ED will affect an estimated 322 million individuals worldwide by the year 2025.[3] However, research has indicated that ED may also be an early predictor of future cardiovascular events and coronary artery disease[4]; 4 meta-analyses have confirmed the relationship between ED and cardiovascular risk.[5–8] Corona et al[9] demonstrated that the impairment of penile Doppler ultrasound is an independent risk factor for cardiovascular disease.[10] A meta-analysis by Gupta et al[11] reported that only-lifestyle modification and pharmacotherapy for cardiovascular risk factors can improve ED. Depression, which may significantly impact quality of life, is common among patients with ED,[12,13] with a reported frequency ranging from 8.7%[14] to 43.1%.[15]

A systematic review and meta-analysis also indicated that there is an association between depression and sexual dysfunction for both men and women; however, the term *sexual dysfunction* encompasses not only ED, but also includes sexual desire, sexual aversion, lack of sexual enjoyment, failure of genital response, and more.[16] Numerous primary studies have focused on the association between ED and depression.[17–22] Although some studies have reported that exposure to depression increases the risk of ED, others observed no association between depressive symptoms and the incidence of ED. Moreover, some studies have reported that ED exposure increases the risk of depression.[23–25] Quantitative syntheses of these studies may provide evidence of the association between ED and depression and help to elucidate factors influencing odds ratios (ORs).

Therefore, this study aims to quantitatively synthesize the findings of all studies that had evaluated the association between ED and depression. We performed 2 meta-analyses: 1 summarizing studies evaluating the risk of ED on the basis of exposure to depression, and the other exploring the risk of depression based on exposure to ED. We also explored factors that may explain the differences in ORs, such as differences in study design or the assessment scales used for ED and depression.

METHODS

Reporting Standards

The present meta-analysis complies with the standards of reporting meta-analyses of observational studies in epidemiology.[26]

Eligibility Criteria

In accordance with the Patient Population or Problem, Intervention, Comparison, Outcomes, and Setting inclusion criteria,[27] studies were included if they (1) were performed among male humans; (2) documented exposure to depression or ED; (3) involved the diagnosis or evaluation of depression and ED; (4) included cross-tabulation analysis or calculation of ORs and 95% CIs between depression and ED; and (5) were cohort, case-control, or cross-sectional studies. Studies in English and of any publication type were included.

Studies were excluded if they were not conducted among male humans; did not document exposure to depression or ED; did not involve the diagnosis of depression and ED; or did not involve cross-tabulation analysis or calculation of ORs and 95% CIs between depression and ED. Commentaries, editorials, meeting abstracts, and review articles lacking original data were excluded. Case series without control groups were also excluded.

Data Sources

We conducted a systematic search in Medline, Ovid Embase, and the Cochrane Library. MeSH terms for the search strategy included *erectile dysfunction* and *depression*. The complete search strategy for each database is presented in eTable 1. The last search was performed on October 15, 2017. Moreover, all references of the included articles were reviewed.

Study Selection

Duplicate references were removed. Independently, 2 reviewers screened all titles and abstracts, and records identified by either reviewer as eligible for inclusion were reviewed in full text. Conflicts were resolved by discussion with a third research member.

Data Extraction

A form was developed in accordance with the data extraction template provided by the Cochrane Consumers and Communication Review Group. This form was then pilot-tested on 10 randomly selected eligible articles and refined accordingly. The form included year of publication, first author's name, country of study, study design, sample size, comorbidities, mean age of patients, ED scale, depression scale, and use of cross-tabulation analysis or ORs and 95% confidence interval (95% CI). Data were independently extracted by the 2 reviewers using the same form, and disagreements were resolved by discussion with another research member. If some required information was not reported in original publications, attempts were made to obtain the data by e-mailing the corresponding authors.

Quality Assessment

The quality of individual studies was assessed using the Risk of Bias in Non-randomized Studies—of Interventions (ROBINS-I) tool.[28] Based on signaling questions, 7 domains were assessed: bias resulting from confounding, bias in selection of participants into study, bias in classification of interventions, bias as a result of departure from intended interventions, bias because of missing