ORIGINAL RESEARCH PAPER
Volume-8 | Issue-9 | September - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

RELATIONSHIPS BETWEEN MAJOR DEPRESSIVE DISORDER , ANXIETY AND ERECTILE DYSFUNCTION

Psychiatry

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ABSTRACT

Aims - This study aimed to elucidate the relationships between erectile dysfunction (ED) and depression or anxiety.
Methods - Subjects were 242 Indian men aged 40–64 years. ED was assessed by the International Index of Erectile Function 5 (IIEF-5) score, and depression and anxiety symptoms were assessed by the Hospital Anxiety and Depression Scale (HADS). In this study ED cases were defined as those whose IIEF-5 value was less than 12, and a score of 8 or higher was used to classify a subject as suffering from depression or anxiety, respectively. The prevalence odds ratio (OR) of ED was calculated with confidence interval (CI) estimated by the Woolf's method by five age groups (40–44, 45–49, 50–54, 55–59, 60–64 years). To control for age, body mass index, smoking, and alcohol drinking factors, we conducted the multivariate logistic regression analysis for calculating adjusted ORs and 99% CIs.
Results - ED was significantly associated with depression in age groups 45–49 (OR 3.42, 99% CI 1.51–7.76) and 50–54 years (OR 2.43, 99% CI 1.11–5.35). After using multivariate analysis, adjusted OR also showed statistical significance. (OR 2.02, 99% CI 1.32–3.08). ED was significantly associated with anxiety in the 50–55-year-old age group (OR 2.48, 99% CI 1.12–5.47). After using multivariate analysis, adjusted OR also showed statistical significance (OR 1.77, 99% CI 1.15–2.72). The concomitant depression and anxiety group (A+D+) had significantly higher prevalence of ED than the control group (A–D-) in both the 45–49 and 50–54 age groups. ($P < 0.01$)
Conclusion - ED associated significantly with depression and anxiety status only in late 40s to early 50s (45–55 years) in males. Furthermore, comorbidities of depression and anxiety strengthen this association. Our results might be useful in furthering understanding of ED etiology and determining a target population for prevention in ED subjects.

KEYWORDS

Male Erectile Disorder; Male Psychological Assessment of Sexual Dysfunction; Male Risk Factors/Comorbidities; Male Epidemiology

INTRODUCTION

Erectile dysfunction is a male sexual disorder characterized by inability to obtain and or maintain penile erection sufficient for satisfactory sexual performance [1]. Although ED is not life-threatening, it strongly influences both well-being and quality of life. Moreover, screening patients for ED will yield a high correlation to presence of other numerous medical conditions, such as hypertension, hyperlipidemia, diabetes mellitus, coronary heart disease, and peripheral vascular disease [2–4]. The Massachusetts Male Aging Study (MMAS) demonstrated a strong positive association between ED and depressive symptoms evaluated by the Center for Epidemiologic Studies CES-D within middle-aged to senior groups (40–50, 51– 60, and 61–70 years) [5]. And, from multivariate analyses, depressive symptoms remained a strong predictor of ED, controlled for all other potential ED con-founders. Hence, investigation of relationships between ED and depressive symptoms is important in terms of elucidating ED etiology.

However, although ED is the subject of vast amounts of clinical literature, few reports other than hospital-based studies have been conducted to evaluate the association between ED and depressive symptoms. In addition, because it is well known that ED prevalence varies across geo-graphical groups [6,7], it is essential to research ED etiology according to different racial, cultural, religious, and socioeconomic backgrounds.

Therefore, this cross-sectional study aimed to evaluate both depression and anxiety in the context of ED designed for healthy Indian subjects, using standardized self-administered assessments. Although this study design could show only "associations" and not "causality" of ED, this study, with its relatively moderate sample, might be useful in furthering understanding of ED etiology and determining a target population for prevention of ED.

METHODS

Final eligible subjects comprised 242 non-institutionalized men aged 40–64 years. Subjects from Psychiatry OPD operating at MMC were selected . All of our subjects were Psychiatry OPD patients between January 2018 and January 2019 in the OPD. They responded to the International Index of Erectile Function 5 (IIEF-5) score, as previously described [11,12], the Hospital Anxiety and Depression Scales (HADS) [13] questionnaire, and a survey on health status (age, present illnesses, and previous history of medication, hospitalization, and surgery). Subjects completed a self-administered questionnaire during OPD consultations. Both the IIEF-5 and HADS questionnaires were self-administered in the Psychiatry Dept . The initial sample consisted of 356 patients aged 40–64 years, and 299 examinees completed the survey. Unmarried men and widowers (n = 13), and subjects who had a history of strokes, heart disease, hypertension, and diabetes mellitus (n = 44), which might affect erectile function, were excluded.

Instruments

IIEF-5

The severity of ED was determined with the IIEF-5 scale, a five-question, validated measure of erectile function [14,15]. In IIEF-5, the ED severity was classified into five categories: "no ED" (IIEF-5 score 22–25); "mild ED" (IIEF-5 score 17–21); "mild-to-moderate ED" (IIEF-5 score 12–16); "moderate ED" (IIEF-5 score 8–11); and "severe ED" (IIEF-5 score 1–7). In this study ED cases were defined as those whose IIEF-5-value was less than 12, i.e., classified as having "moderate to severe" ED. This dichotomization is consistent with National Institutes of Health guidelines for definition of ED [16].

HADS

The HADS is a 14-item, self-reporting screening scale that contains two seven-item Likert scales, one for anxiety and one for depression; the scores of both scales range from 0 to 21 [13]. The HADS is scored by summing the ratings for the 14 items to yield a total score, and by summing the ratings for the seven items of each subscale to yield separate scores for anxiety and depression. In this study we used HADS to yield separate assessments, and subjects were dichotomized into those who did and did not suffer from anxiety or depression or not suffering, respectively. A score of 8 or more was used to classify a subject as suffering from anxiety or depression, respectively.

Statistical Analysis

Demographic data on frequency, percentage, and mean and standard deviations were demonstrated for the background characteristics of subjects by erectile function (e.g., ED cases group: N = 356, normal group: N = 5,196). For evaluation of association between ED and anxiety or depression, the prevalence odds ratio (OR) of ED was calculated with confidence interval (CI) estimated by the Woolf's method [17,18] by five age groups (40–44, 45–49, 50–54, 55–59, 60–64 years). Furthermore, to control for age, body mass index (BMI), smoking, and alcohol drinking factors, we conducted the multivariate logistic regression analysis for calculating adjusted ORs and 99% CIs in total analysis.

Furthermore, from anxiety/depression status we divided the subjects into four groups:

1. Anxiety score < 8 AND Depression score < 8: A–D– group, N = 943
2. Anxiety score ≥ 8 AND Depression score < 8: A+D– group, N = 122
3. Anxiety score < 8 AND Depression score ≥ 8: A–D+ group, N = 139
4. Anxiety score ≥ 8 AND Depression score ≥ 8: A+D+ group, N = 215

For age stratum where there was a significant difference between the four groups (A–D–, A+D–, A–D+, A+D+), pairwise comparisons by chi-square test were undertaken, using the A–D– group as comparison, to determine the source of the difference.

Because attention must be given in multiple comparisons to the total number of comparisons, we used the significance level of 99% CIs and precise P values as a guide [19], unless mentioned otherwise. Statistical analysis was performed by using SAS programs (Version 8.02, SAS Institute Inc., Cary, NC, USA) [20] and CIA software (Version 2.1.0, Trevor Bryant, University of Southampton, 2000) [18]. Our study was conducted in accordance with the recommendations outlined in the Declaration of Helsinki (revised in 1983, 2000) and the Ethical Guideline for Epidemiological Research (The Ministry of Health, Labor and Welfare, The Ministry of Education, Science, Sports and Culture, India, 2002). Informed consent was obtained from all participants. Close attention was especially given to storage of the private information.

RESULTS

Table 1 shows demographic characteristics of subjects by erectile function groups (ED cases/normal controls). Mean ages were 51.9 ± 6.3 years, 50.1 ± 6.1 years, and mean BMIs were 23.4 ± 3.0 kg/m2, 23.3 ± 2.8 kg/m2, respectively. Current smoking rates were 48.5%, 47.3%, and alcohol drinkers whose drink intake was five or more times a week was 49.3%, 54.3%, respectively. Above items, no statistical difference (P < 0.05) was found between ED cases and normal controls other than age. Moreover, there were no subjects who had language, physical, or psycho-cognitive impairment. All subjects were from similar socioeconomic and occupational backgrounds.

Table 2 shows prevalence of ED by depression status, stratified by five age groups. ED was significantly associated with depression in age groups 45–49 (OR 3.42, 99% CI 1.51–7.76) and 50– 54 years (OR 2.43, 99% CI 1.11–5.35).

Table 1 Demographic characteristics of subjects by erectile function

		ED cases (N = 356)		Normal (N = 5,196)		95% CI*	
		Mean	SD	Mean	SD	Lower	Upper
Age	years	51.9	6.3	50.1	6.1	0.92	2.68
Body mass index	kg/m2	23.4	3.0	23.3	2.8	-0.31	0.51
		N	%	N	%		
Smoking	Smoker	111	48.5%	866	47.3%	0.83	1.47
	Former smoker, nonsmoker	32	48.9%	430	52.7%		
Alcohol drinking	5/week	93	49.3%	650	54.3%	0.65	1.15
	Nondrinker ~ 3–4/week	130	48.0%	1546	45.7%		

* 95% CIs for the difference between means in age and body mass index using unpaired t distribution, 95% CIs for odd ratios in smoking and alcohol drinking using chi-square distribution.
ED = erectile dysfunction; SD = standard deviation.

Table 2 Proportion of erectile dysfunction and depression status by age group

	Proportion of ED cases				Ors and CIs in depression cases compared by normal		
	Depression cases (N = 354)		Normal (N = 1,065)		99% CI		
Age group	N	%	N	%	OR	Lower	Upper
40–<45	12/88	13.6%	22/218	10.1%	1.41	0.52	3.78
45–<50	25/92	27.2%	24/244	9.8%	3.42	1.51	7.76
50–<55	23/109	21.1%	29/293	9.9%	2.43	1.11	5.35
55–<60	17/53	32.1%	46/209	22.0%	1.67	0.70	4.00
60–<65	2/12	16.7%	23/101	22.8%	0.68	0.08	5.47
Total*	79/354	22.3%	144/1,065	13.5%	2.02	1.32	3.08

* The logistic regression analysis was used for calculating adjusted odd ratios (ORs) and 99% confidence interval (CI) in total analysis controlling for age, body mass index, smoking, and alcohol drinking.
ED = erectile dysfunction.

Table 3Proportion of erectile dysfunction (ED) and anxiety status by age group

	Proportion of ED cases				Ors and CIs in depression cases compared by normal		
	Depression cases (N = 354)		Normal (N = 1,065)		99% CI		
Age group	N	%	N	%	OR	Lower	Upper
40–<45	11/82	13.4%	23/224	10.3%	1.35	0.49	3.71
45–<50	19/85	22.4%	30/251	12.0%	2.12	0.92	4.90
50–<55	22/102	21.6%	30/300	10.0%	2.48	1.12	5.47
55–<60	16/55	29.1%	47/207	22.7%	1.40	0.58	3.35
60–<65	1/13	7.7%	24/100	24.0%	0.26	0.02	4.12
Total*	69/337	20.5%	154/1,082	14.2%	1.77	1.15	2.72

* The logistic regression analysis was used for calculating adjusted odd ratios (ORs) and 99% confidence interval (CI) in total analysis controlling for age, body mass index, smoking, and alcohol drinking.

After using multivariate analysis, adjusted OR also showed statistical significance (OR 2.02, 99% CI 1.32– 3.08).

Table 3 shows prevalence of ED by anxiety status, stratified by five age groups. ED was signif-icantly associated with anxiety in the 50–54-year-old age group (OR 2.48, 99% CI 1.12–5.47). After using multivariate analysis, adjusted OR also showed statistical significance (OR 1.77, 99% CI 1.15–2.72).

Table 4 shows prevalence of ED by anxiety and depression, stratified by five age groups. Among four groups (A–D–, A+D–, A–D+, A+D+), significant association was found in age groups 45–49 (P = 0.0002) and 50–54 years (P = 0.0077) by the chi-square test. In these two age strata, by pairwise comparisons using the A–D– group as comparison, only the concomitant anxiety and depression group (A+D+) reached statistical significance (P < 0.01), and this concomitant depression and anxiety group (A+D+) showed higher ED prevalence compared with the anxiety group (A+D–) and the depression group (A–D+) solely in the same age stratum.

Table 4 Proportion of erectile dysfunction, anxiety, and depression by age group

Age group	A–D– (N = 943)		A+D– (N = 122)		A–D+ (N = 139)		A+D+ (N = 215)		Chi-square test P valueamong four groups
	N	%	N	%	N	%	N	%	
40–<45	19/188	10.1%	3/30	10.0%	4/36	11.1%	8/52	15.4%	0.7551
45–<50	23/216	10.6%	1/28	3.6%	7/35	20.0%	18/57	31.6%	0.0002*
50–<55	23/258	8.9%	6/35	17.1%	7/42	16.7%	16/67	23.9%	0.0077*
55–<60	39/186	21.0%	7/23	30.4%	8/21	38.1%	9/32	28.1%	0.2572
60–<65	23/95	24.2%		–/6	—	1/5	20.0%	1/7	14.3%

* For age stratum where there was a significant difference between the four groups, pairwise comparisons were undertaken, by using A–D– group as comparison, to deteremine the source of the difference ($P < 0.01$; underlined figures).

A–D– = Anxiety score < 8 AND Depression score < 8; A–D+ = Anxiety score < 8 AND Depression score ≥ 8; A+D– = Anxiety score ≥ 8 AND Depression score < 8; A+D+ = Anxiety score ≥ 8 AND Depression score ≥ 8.

DISCUSSION

The prevalence of ED increases with increasing age [2,21]. Therefore, we analyzed associations between ED and depression or anxiety by both age stratification and multivariate logistic regression analysis, adjusting for age confounding. And we could demonstrate significant associations between ED and depression or anxiety in general patients. However, what we found was that these significant associations existed only in a narrow range of age strata (45–54 years) (Tables 2 and 3). Although several previous studies [2,22,23] reported close relationships between ED and psychological factors (such as depression symptoms), few demonstrated and discussed age distribution (range) in detail.

From our results, there might be three sub-types of ED assessed by IIEF-5 in Indian general male population, comprised of EDs in "early" (less than 45 years), "middle" (45–54 years), and "late" (55 years or more) adulthood. As mentioned above, psychological factors (depression and anxiety) strongly related to ED in "middle" adulthood (45–54 years). On the other hand, we did not find these significant associations in "early" (less than 45 years) and "late" (55 years or more) adulthood. Therefore, factors other than psychological links should correlate with ED in "early" (less than 45 years) and "late" adulthood (55 years or more). In our same subjects, we had reported marked rise in prevalence of ED from "late" adulthood (55 years or more) [24]. We might be able to speculate that other age-related factors such as physical factors (merely aging or atherosclerosis) associated with general Indian men in "late" adulthood. These postulates need further etiological investigations.

Although depression is a major public health concern especially in the elderly [25,26], Moore et al. showed a difference in symptom patterns among ED patients according to age groups in a recent study[27]. They reported that younger men had comparatively greater depressive symptoms, accompanied by lower relationship satisfaction, more negative reactions from partners, and lower job satisfaction. Thus, our inconsistent results in "late" adulthood with previous studies might be partly explained by older men experiencing less difficulty than younger men adjusting to life with ED. For middle-adulthood ED cases, i.e., late 40s and early 50s (45–54 years old), we might need different strategies from those that target "late" adulthood, which consider intensive psychosocial preventive care.

Recently, a new two-way model was postulated, and it proposed that both ED and depressed symptoms mutually reinforce each other [28]. Moreover, it also suggested that close relation-ships between ED, depressed symptom, and cardiovascular disease (CVD) were also indicated. They shared many of the same risk factors, and most importantly, subjects with ED should be routinely screened for symptoms of depression and CVD. Patients with either or both conditions should be offered treatments and careful follow-up. In addition, patients with ED might need to receive proactive measures for the prevention of CVD complications, including depression management, exercise, weight control, dietary counseling, strict control of blood pressure, and patient and family education [29].

In terms of anxiety, we also demonstrated significant associations with ED in subjects in early 50s (50–54 year old) (Table 2).

Furthermore, we found that only the concomitant anxiety and depression group (A+D+) reached statistical significance ($P < 0.01$) in pairwise comparison analysis and showed higher prevalence of ED compared with the anxiety group (A+D-) and depression group (A-D+) solely in the same age stratum (Table 4). Although, anxiety is a well-known etiological factor in the development of ED [9], few epidemiological researches have been conducted in the context of close connection between anxiety and ED. Further studies are also needed to elucidate this association.

Because the present study used a cross-sectional design, it has shown only "associations" and not "causality" between anxiety and ED. It is difficult to determine which variable (e.g., ED or anxiety/ depressive symptomatology) takes precedence, or is etiologically antecedent. Both ED and depressive symptoms seem to exhibit multifactorial etiologies, including organic and nonorganic components [30]. However, this study of a relatively large sample could be very helpful in teasing out a clue in terms of ED etiology and may help to form prevention strategies.

CONCLUSION

This cross-sectional study evaluated associations between depression, anxiety, and ED in Indian general subjects by using standardized self-administered assessments. ED associated significantly with depression and anxiety status only in the 45–55-year-old age group. Furthermore, the concomitant depression and anxiety strengthen this association with ED. Our results might be useful to find a clue for understanding ED etiology, and to determine a target population for prevention and health care in ED.

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