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EDUCATION AND RISK FOR LATE LIFE DEPRESSION: A META-ANALYSIS OF PUBLISHED LITERATURE

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ABSTRACT

Objective: Less education is commonly viewed as an important risk factor for late life depression. However, this has still not been confirmed. The goal of this study was to determine the relationship between education and risk for depression among the old. *Method:* MEDLINE, EMBASE, and The Cochrane Library database were used to identify potential studies. The studies were divided into cross-sectional and longitudinal subsets. The qualitative meta-analysis of cross-sectional studies and that of longitudinal studies were preformed, respectively. For prevalence and incidence rates of depression, odds risk (OR) and relative risk (RR) were calculated, respectively. *Results:* Twenty-four cross-sectional and 12 prospective longitudinal studies were included in this review. In this meta-analysis, in the more and less education groups, there were 22,964 and 28,024 subjects and

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3032 and 6462 cases of depression, respectively. The qualitative meta-analysis showed that, compared with old people with more education, those with less education had higher risk for depression (odds risk (OR): 1.58, 95% confidence intervals (95% CI): 1.38-1.82; Relative risk (RR): 1.49, 95% CI: 1.16-1.91). *Conclusions:* Despite the methodological limitations of this meta-analysis, less education is associated with increase risk of late life depression.

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Key Words: education, depression, risk, meta-analysis

INTRODUCTION

Depression is a major contributor to healthcare costs associated with older populations, and is projected to be the leading cause of disease burden in older populations by the year 2020 [1-2]. The prevalence of depression in patients aged 65 and older may be as high as 40% in hospitalized and nursing home patients, and 30% in community settings [3]. The prognosis of these depressive states is poor. A meta-analysis of outcomes at 24 months estimated that only 33% of subjects were well, 33% were depressed, and 21% had died [4]. Moreover, studies of depressed adults indicated that those with depressive symptoms, with or without depressive disorder, had poorer functioning, comparable to or worse than that of people with chronic medical conditions such as heart and lung disease, arthritis, hypertension, and diabetes [5-7]. In addition to poor functioning, depression increased the perception of poor health, the utilization of medical services, and health care costs [7-9].

Less education was commonly viewed as a risk factor for depression in the elderly, which was shown in many longitudinal and cross-sectional studies [10-12]. However, converse conclusion was also conducted by some studies [13, 14]. Moreover, a recent systematic review and meta-analysis showed that odds risk (OR) of less education as a function of increased depression was un-significant (OR = 1.5, 95% confidence intervals (95% CI) = 0.8-2.8). This meta-analysis only included five prospective studies and was published in 2003 [15]. Since then, there have been many relevant studies published, so we can make a meta-analysis to confirm the relationship between education and the late life depression. Both the OR and the relative risk (RR) compare the likelihood of an event between two groups. In medical research, the OR is favored for prevalence rate in cross-sectional studies. RR is favored for incidence rate in longitudinal studies. Therefore, in the meta-analysis, for prevalence and incidence rates of depression, OR and RR were calculated, respectively.

METHODS

Search Method

This was one part of a best-evidence research on depression in the elderly. In the research, we collected literature through searching MEDLINE (from the beginning of 1966), EMBASE (from the beginning of 1980), and The Cochrane Library (1990 to August 2007). The search terms (provided by Cochrane Center) included depression, elderly patients (≥ 55years) and clinical trials. Four researchers selected literature which involved clinical trials, depression (diagnostic criteria in formal depression scale), and elderly patients (≥ 55years). The literatures, which were not clinical trials, unrelated with depression, or not including elderly patients, were rejected. The literature selection included three stages: (i) review the title and then reject the articles and retain those which would be potentially included; (ii) review the title and abstract of the articles that were retained in the first stage, then reject the articles and retain those which would be potentially included; and (iii) read the full text of the articles that were retained in the second stage, then reject the literature and retain those which would be included. Finally, 6,420 articles were retained in the third stage and were classified into four subgroups according to the objective of the research program: aetiology or epidemiology related, diagnostics related, therapeutics related and prognosis related. The search terms, search results and classification of literature were reported previously [16-18]. The selection and classification of literature were performed by the four researchers, and each article was independently selected and classified by two researchers; discrepancies were addressed through discussion. This meta-analysis only focused on the etiopathogenisis or epidemiology related literature, and the inclusion criteria and exclusion criteria were listed as follows.

Inclusion Criteria

1. Cross-sectional and longitudinal studies where all participants were 55 years and over (the age at the end of the follow-up for longitudinal study);
2. original research reported in English;
3. with the complete information on the prevalence or incidence of depression in different education group; and
4. use of an acceptable definition of depression.

We accepted the diagnostic category of depression as applied by the authors of each study, which included the following:

1. the presence of depressive disorder, depressive symptoms, or "psychological distress," as defined by scores above a cut point for abnormality on a standard mood scale;

2. severity of depressive disorder, depressive symptoms, or psychological distress, as defined by scores on a standard mood scale; and
3. the presence of major depression or minor depression (or dysthymia) according to Diagnostic and Statistical Manual of Mental Disorders (DSM)-IIIR, DSM-IV, or other standard psychiatric diagnostic criteria.

Exclusion Criteria

Studies were excluded if they had any of the following: limited to specific patient characteristics, such as convenience sampling; retrospective recruitment; or if there was only unstructured assessment of mood.

Data Extraction and Checking

For longitudinal study, information about the country of study, group size at baseline and follow-up, age, proportion of men, depression criteria, exclusion criteria at baseline, length of follow-up, number of incident cases of depression in each group were abstracted from each report. For cross-sectional study, information about the country of study, group size, age, proportion of men, depression criteria, exclusion criteria, number of cases of depression in each group were abstracted from each report. Every paper included in the meta-analysis was read and the data were extracted and cross-checked independently by two authors; discrepancies were resolved by discussion.

Statistical Analysis

Data were entered into the RevMan 4.2 meta-analysis program (Cochrane Collaboration, Oxford, UK; see http://www.cc-ims.net/RevMan/current.htm). Considering the meta-analysis of cross-sectional studies was with the advantages of a huge sample size and being easily able to find the association between education level and prevalence of depression, whereas it was with the limitation of being unable to conduct a causality conclusion, but the meta-analysis of longitude studies was able to do it. Therefore, we conducted the meta-analysis of cross-sectional and that of longitudinal studies respectively. In the meta-analysis of cross-sectional studies, for prevalence rates of depression, OR and 95% confidence intervals (95% CIs) were calculated. Results had been summarized using conventional Forest plots and ORs, stratified by features of the studies included. In the meta-analysis of longitudinal studies, for incidence rates of depression, RRs and 95% CIs were calculated. Results had been summarized using conventional Forest plots and RRs, stratified by features of the studies included. Summary ORs and RRs were estimated using a random effects model.

RESULTS

The Search

Our search found 1,027 potential aetiology- or epidemiology-related reports: 878 of the 1,027 articles were rejected as obviously unsuitable (e.g., unrelated with education) and 149 were retained; 113 of these 149 articles were rejected for a variety of reasons, including (a) no usable data and (b) no recognized instrument used for diagnosis. The remaining 36 studies were included in the review [11, 12, 14, 19-51].

Included Studies

Characteristics of the 36 studies (including 24 cross-sectional [12, 14, 19-40] and 12 longitudinal studies [11, 41-51] available for meta-analysis) were summarized in Tables 1 and 2.

Data Synthesis

Although it was unlikely that publication bias influenced publication of risk factor studies, we assessed this bias using funnel plot (shown in Figure 1). The funnel plot of ORs (under a fixed-effects model) was from the 36 studies in Tables 1 and 2. In the absence of publication bias, the points should be symmetrical about the vertical line at the pooled ORs. The reasonably symmetrical did suggest the absence of publication bias.

Figure 2 was a forest plot of ORs from the 24 studies which compared the prevalence of depression between subjects with less and more education [12, 14, 19-40]. There were 16,590 and 24,067 subjects with more and less education, respectively. After pooling these studies, there were 2,465 and 5,857 cases of depression in the more and less education groups, respectively. Subjects with less education had higher prevalence of depression than those with more education, OR: 1.58, 95% CI: 1.38-1.82.

Figure 3 is a forest plot of RRs from the 12 studies that compared the risk for depression between old people with more and less education [11, 41-51]. There were 6,374 and 3,957 subjects with more and less education, respectively. After pooling these studies, there were 567 and 605 cases of depression in the more and less education groups, respectively. Subjects with less education had higher risk for depression than those with more education (RR: 1.49, 95% CI: 1.16-1.91).

DISCUSSION

We conducted meta-analyses of cross-sectional studies and of prospective longitudinal studies respectively. The results were clear: less education was associated with increase risk of late life depression. This was a robust finding about the relationship between less education and risk for depression among old people.

Table 1. Characteristics of 24 Cross-Section Studies Included in the Meta-Analysis

Study	Country	Participants (*N*)	From population	Age (years)	Gender (Male %)	Criteria for depression	Exclusion criteria	Cases of depression
Al-Shammari (1999)	Saudi Arabia	7970	Community	> 60	62	30-GDS > or = 20	—	670
Blay (2007)	Brazil	6961	Community	> 60	34	the Short Psychiatric Evaluation Schedule (six-item version) > or = 20	—	2722
Blazer (1980)	USA	997	Community	> or = 65	37.4	DSM-III-DIS-R	—	147
Bruce (2002)	USA	539	Community	65-102	34.9	DSM-IV	—	73
Carnethon (2007)	USA	4681	Community	> or = 65	40.8	10-CES-D, > or = 8	Diabetes	—
Carvalhais (2008)	Brazil	1499	Community	> or = 60	38.8	GHQ-12, or = 4	—	576
Cassidy (2004)	Australia	278	Community	> or = 65	0	BDI > or = 10	—	85
Chi (2005)	China	917	Community	> or = 60	47.5	15-GDS > or = 8	Cognitive impairment	113
Chong (2001)	China	1500	Community	> or = 65	53.4	AGECAT	—	287
Chow (2004)	China	245	Nursing home	> or = 65	37.1	15-GDS > or = 8	Cognitive impairment	71
Friedman	USA	926	Primary care	> or = 65	25.7	Mini-International Neuropsychiatric Interview, major depressive	Cognitive impairment	119

Goldberg (1985)	USA	1144	Community	65-75	0	CES-D > or = 16	—	105
Heok (1996)	China	1062	Community	> or = 65	43	AGECAT	—	55
Kivela (1988)	Finland	1235	Community	> or = 65	40.9	DSM-III	—	330
Kulaksizoglu (2005)	Turkey	1018	Community	> or = 70	39	30-GDS > 14	—	163
McDougall (2007)	UK	2640	Institutional settings and not	> or = 65	35.6	AGECAT	—	346
O'Hara (1985)	USA	3159	Noninstitutional-ized older adults	65-105	37.1	CES-D > or = 16	—	285
Sewitch (2004)	Canada	193	Emergency department (ED)	> or = 65	43	15-GDS > 5	—	76
Sonnenberg (2000)	Netherlands	3056	Community	55-85	48.4	CES-D > or = 16	—	455
Tsai (2005)	China (tai wan)	1200	Nursing homes	> or = 65	55.8	15-GDS > 5	Cognitive impairment	328
Tsai (2007)	China (tai wan)	200	Care homes	> or = 65	65.5	15-GDS > 8	Cognitive impairment	98
Tsai (2006)	China	220	Nursing homes	> or = 65	42.3	GDS-S, cutoff 5	Cognitive impairment	121

Note: CES-D Scale: Center for Epidemiologic Studies Depression Scale. DSM: Diagnostic and Statistical Manual of Mental Disorders. GMS-AGECAT: Geriatric Mental State Schedule Automated Geriatric Examination for Computer Assisted Taxonomy. Short CARE: shortened Comprehensive Assessment and Referral Evaluation. GDS-15: Geriatric Depression Scale. SADS: Schedule for Affective Disorders and Schizophrenia. CIDI: Composite International Diagnostic Interview. MINI: Mini International Neuropsychiatric Interview. MMSE: Mini-Mental State Examination.

Table 2. Characteristics of 12 Longitudinal Studies Included in the Meta-Analysis

Study	Number of subjects		Age (years)	Gender (male %)	Criteria for depression	Exclusion criteria at baseline	Length of follow-up (months)	Cases of incident depression		Country
	Baseline	Follow-up						*N*	(%)	
Forsell (2000)	1777	903	≥ 75	23	DSM-IV criteria	Depression, anxiety, psychosis	36	29	(3.2%)	Sweden
Geerlings (2000, 2002)	325	234	55-85	48	CES-D Scale score > 16 plus 5 points above 5	Depression	36	40	(14.1%)	Netherlands
Gitlay (2006)	229	229	64-84	1	Zung SDS ≥ 50	Depression	60	75	(32.7%)	Netherlands
Livingston (2000)	141	79	65-95	23	Short CARE (clinical depression criteria)	Limitations in activities of daily living, depression, dementia	36	19	(24.1%)	UK
Maraldi (2007)	597	597	70-79	52	10-item CES-D Scale score > 10	Depression	12	53	(9.6%)	USA
Meller (1997)	358	263	≥ 85		AGECAT (HAMD)	—	12			Germany

Phifer (1986)	2937	1233	≥ 55	41	CES-D Scale score > 20	CES-D Scale score 16; psychiatric treatment in past 6 months	6	66 (5.4%)	USA
Robert (2000)	2164	2147	50-95	23	DSM-IV	Depression	60	215 (4.2%)	USA
Schoevers (2000)	3747	1940	65-84	38	GMS-AGECAT criteria (level 3.5)	Depression	36	309 (14.1%)	Netherlands
Stek (2006)	334	141	≥ 85	37	15 GDS > 4	Cognitive impairment	46	56 (39.7%)	Netherlands
Steunenberg (2006)	1511	1511	55-85	50	CES-D Scale score > 16	Depression, MMSE score < 16	72	255	Netherlands
Whyte (2004)	1165	930	≥ 70	36.6	mCES-D score > 5	—	36	—	USA

Note: CES-D Scale: Center for Epidemiologic Studies Depression Scale. DSM: Diagnostic and Statistical Manual of Mental Disorders. GMS-AGECAT: Geriatric Mental State Schedule Automated Geriatric Examination for Computer Assisted Taxonomy. Short CARE: shortened Comprehensive Assessment and Referral Evaluation. GDS-15: Geriatric Depression Scale. MMSE: Mini-Mental State Examination.

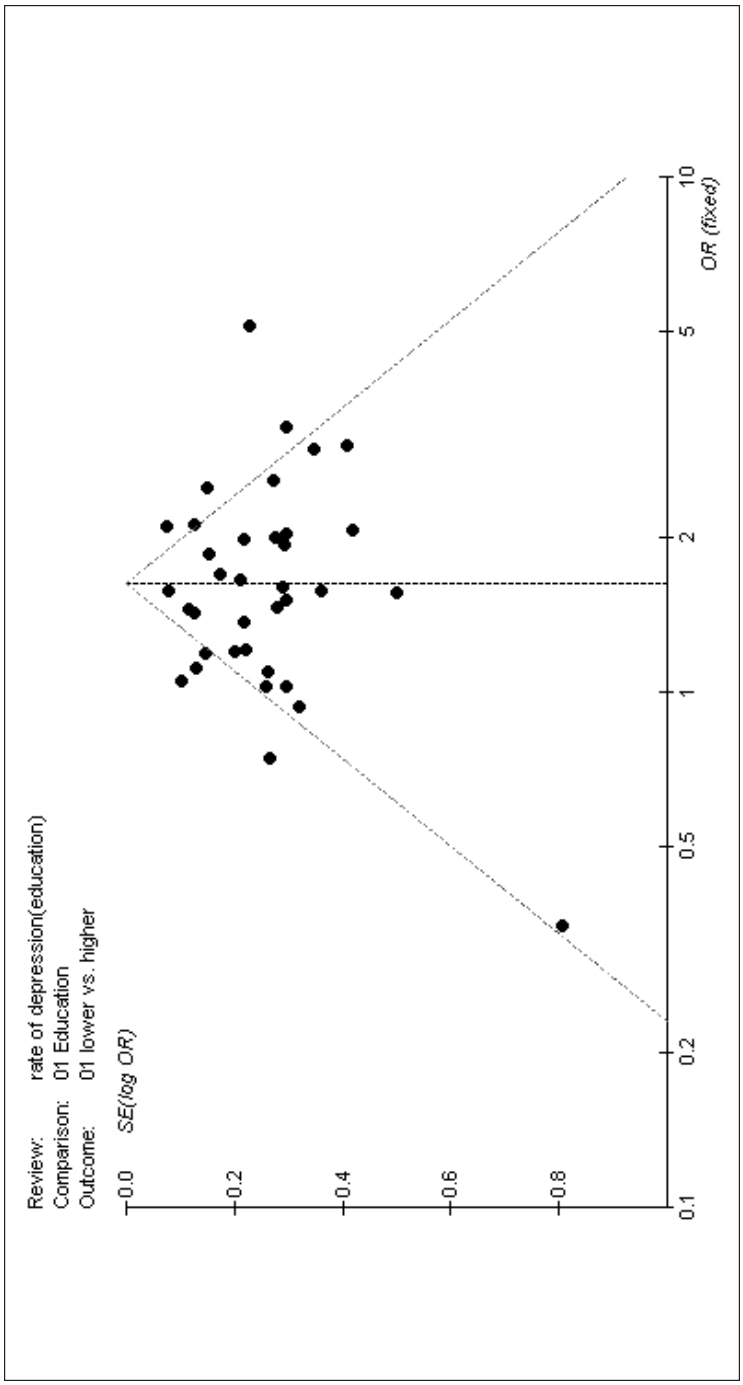

Figure 1. Funnel plot of the 36 studies included in the meta-analysis. In the absence of publication bias the points should be symmetrical about the vertical line at the pooled ORs. The reasonably symmetrical did suggest the absence of publication bias.

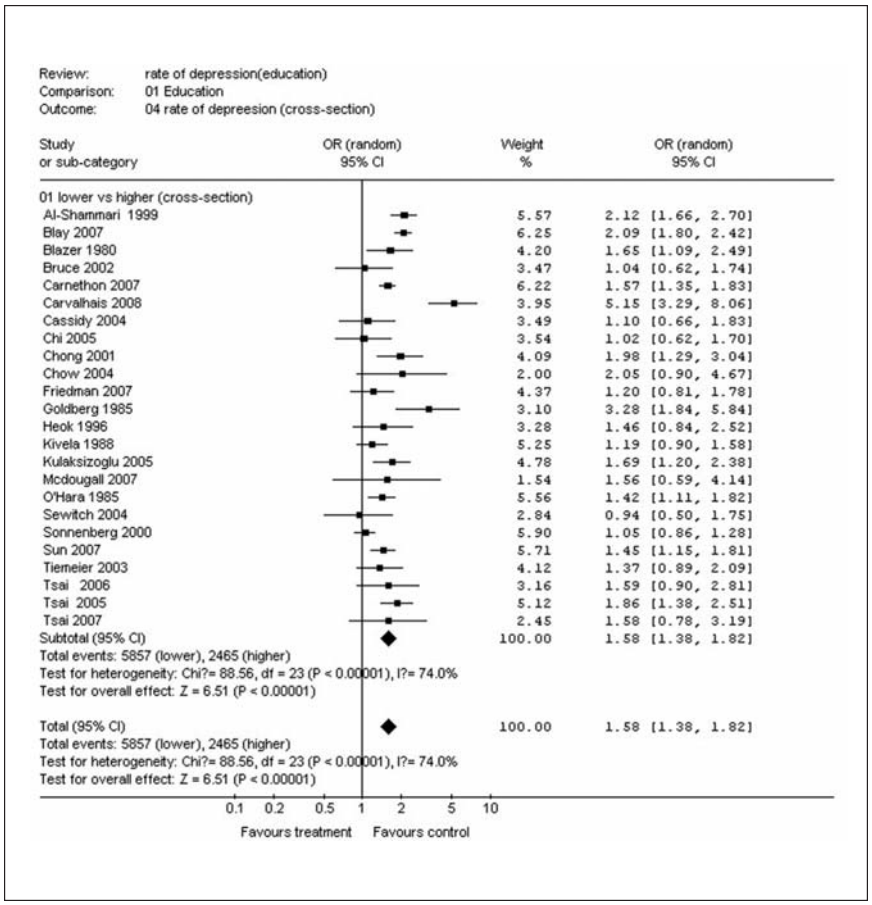

Figure 2. A forest plot of Odd Risk (ORs) from the 24 cross-sectional studies. The figure showed that less education favored increase risk of late life depression, OR: 1.58, 95% CI: 1.38-1.82.

In the present study, in the meta-analysis of cross-sectional studies, the subjects with more and less education were both more than ten thousand. We concluded that significant association between the late life depression and less education was robust. In the meta-analysis of prospective longitudinal studies, the results also showed that less education was associated with increase risk of late life depression. These findings have important clinical implications. Because elderly populations with less education are at higher risk of depression, less educated older individuals with depression may benefit from screening and being targeted for interventions.

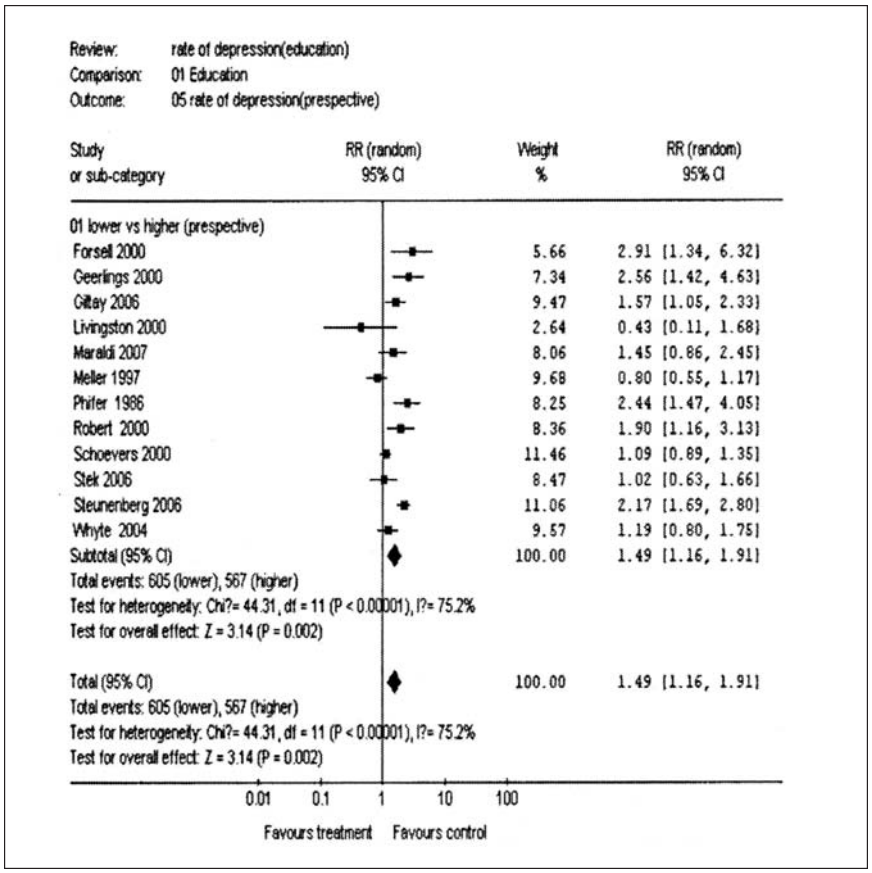

Figure 3. A forest plot of Relative Risk (RRs) from the 12 prospective longitudinal studies. The figure showed that less education favored increase risk of late life depression, RR: 1.49, 95% CI: 1.16-1.91.

The reason why less education is a risk factor for late life depression is unclear. It has been shown that older people with less education have less self-efficacy and cognitive function. Lower self-efficacy and cognitive function may contribute to the higher risk for depression. Other unknown factors may also play a role.

Although the study adhered to the guidelines for reporting meta-analyses of observational studies [52], the review does have some limitations. First, we did not hand-search journals or make an attempt to identify unpublished studies, raising the possibility that some studies have been missed. Second, despite our extensive literature search, we only included MEDLINE, EMBASE, and The Cochrane

Library in our search; other databases such as CINAHL, PsycINFO were not included. Moreover, we screened the literature by reading abstracts, rather than full texts, which was also a limitation. Third, the search was limited to articles published in English. Finally, there was heterogeneity in the included studies, which perhaps related to different definitions of depression in different studies and small study groups in some studies. Therefore the random-effects model, which has less precision than the fixed-effects model, was used in the review. Consequently, the results of the meta-analysis must be interpreted cautiously.

REFERENCES

1. Goodwin RD. Association between physical activity and mental disorder among adults in the united states. *Preventive Medicine* 2003;36:698-670.
2. Katon WJ, Lin E, Russo J, Unutzer J. Increased medical costs of a population-based sample of depressed elderly patients. *Archives of General Psychiatry* 2003;60(9): 897-903.
3. Leon FG, Ashton A K, DMello D A, Dantz B. Depression and comorbid medical illness: Therapeutic and diagnostic challenges. *The Journal of Family Practice* 2003; Suppl:19-23.
4. Cole MG, Bellavance F, Mansour A. Prognosis of depression in elderly community and primary care populations: A systematic review and meta-analysis. *American Journal of Psychiatry* 1999;156:1182-1189.
5. Gurland BJ, Wilkder DE, Berkman C. Depression and disability in the elderly: Reciprocal relations and changes with age. *International Journal of Geriatric Psychiatry* 1988;3:163-179.
6. von Korff M, Ormel J, Katon W, Lin EH. Disability and depression among high utilizers of health care: A longitudinal analysis. *Archives of General Psychiatry* 1992;49:91-100.
7. Wells KB, Burman MA: Caring for depression in America: Lessons learned from early findings of the Medical Outcomes Study. *Psychiatry and Medicine* 1991;9: 503-519.
8. Katon W, von Korff M, Lin E, Bush T, Ormel J. Adequacy and duration of anti-depressant treatment in primary care. *Medical Care* 1992;30:67-76.
9. Unutzer J, Patrick DL, Simon G, Grembowski D, Walker E, Rutter C, Katon W. Depressive symptoms and the cost of health services in HMO patients aged 65 and over: A 4-year prospective study. *Journal of the American Medical Association* 1997;277:1618-1623.
10. Beekman AT, Deeg DJ, Geerlings SW, Schoevers RA, Smit JH, van Tilburg W. Emergence and persistence of late life depression: A 3-year follow-up of the Longi-tudinal Aging Study Amsterdam. *Journal of Affective Disorders* 2001;65(2):131-138.
11. Steunenberg B, Beekman AT, Deeg DJ, Kerkhof AJ. Personality and the onset of depression in late life. *Journal of Affective Disorders* 2006;92(2-3):243-251. Epub 2006 Mar 20.
12. Al-Shammari SA, Al-Subaie. Prevalence and correlates of depression among Saudi elderly. *International Journal of Geriatric Psychiatry* 1999;14(9):739-747.

13. Cho HJ, Helen L, Richard O, Levin MJ. Oxman MN, Michael IR. Sleep disturbance and depression recurrence in community-dwelling older adults: A prospective study. *American Journal of Psychiatry* 2008;165:1543-1550.
14. Blay SL, Andreoli SB, Fillenbaum GG, Gastal FL. Depression morbidity in later life: Prevalence and correlates in a developing country. *American Journal of Geriatric Psychiatry* 2007;15(9):790-799.
15. Cole MG, Dendukuri N. Risk factors for depression among elderly community subjects: A systematic review and meta-analysis. *American Journal of Psychiatry* 2003;160:1147-1156.
16. Huang CQ Dong BR, Pu YS, Zhang Y, Liu Q-X. Collaborative care interventions for depression in the elderly: A systematic review of randomized controlled trials. *Journal of Investigative Medicine* 2009;57:446-455.
17. Huang CQ, Dong BR, Lu ZC, Yue JR, Liu Q-X. Chronic diseases and risk for depression in old age: A meta-analysis of published literature. *Ageing Research Reviews* 2009; Jun 11. [Epub ahead of print].
18. Huang CQ, Zhang XM, Dong BR, Lu ZC Dr, Yue JR, Liu Q-X. Health status and risk for depression among the elderly: A meta-analysis of published literature. *Age and Aging* 2009;38(11):1-8.
19. Blazer D, Williams CD. Epidemiology of dysphoria and depression in an elderly population. *American Journal of Psychiatry* 1980;137(4):439-444.
20. Bruce ML, McAvay GJ, Raue PJ, Brown EL, Meyers BS, Keohane DJ, Jagoda DR, Weber C. Major depression in elderly home health care patients. *American Journal of Psychiatry* 2002;159(8):1367-1374.
21. Carnethon MR, Biggs ML, Barzilay JI, Smith NL, Vaccarino V, Bertoni AG, Arnold A, Siscovick D. Longitudinal association between depressive symptoms and incident type 2 diabetes mellitus in older adults: The cardiovascular health study. *Archives of Internal Medicine* 2007;167(8):802-807.
22. Carvalhais SMM, Lima-Costa MF, Peixoto SV, Firmo JOA, Castro-Costa E., Uchoa E. The influence of socio-economic conditions on the prevalence of depressive symptoms and its covariates in an elderly population with slight income differences: The Bambuí Health and Aging Study (BHAS). *International Journal of Social Psychiatry* 2008;54(5):447-456.
23. Cassidy K, Kotynia-English R, Acres J, Flicker L, Lautenschlager NT, Almeida OP. Association between lifestyle factors and mental health measures among community-dwelling older women. *Australian and New Zealand Journal of Psychiatry* 2004; 38(11-12):940-947.
24. Chi I, Yip PS, Chiu HF, Chou KL, Chan KS, Kwan CW, Conwell Y. Prevalence of depression and its correlates in Hong Kong's Chinese older adults. *American Journal of Geriatric Psychiatry* 2005;13(5):409-416.
25. Chong MY, Tsang HY, Chen CS, Tang TC, Chen CC, Yeh TL, Lee YH, Lo HY. Community study of depression in old age in Taiwan: Prevalence, life events and socio-demographic correlates. *British Journal of Psychiatry* 2001; 178(1):29-35.
26. Chow ES, Kong BM, Wong MT, Draper B, Lin KL, Ho SK, Wong CP. The prevalence of depressive symptoms among elderly Chinese private nursing home residents in Hong Kong. *International Journal of Geriatric Psychiatry* 2004;19(8): 734-740.

27. Friedman B, Conwell Y, Delavan RL. Correlates of late-life major depression: A comparison of urban and rural primary care patients. *American Journal of Geriatric Psychiatry* 2007;15(1):28-41.
28. Goldberg EL, Van Natta P, Comstock GW. Depressive symptoms, social networks and social support of elderly women. *American Journal of Epidemiology* 1985; 121(3):448-456.
29. Tsai YF. Self-care management and risk factors for depressive symptoms among elderly nursing home residents in Taiwan. *Journal of Pain Symptom Management* 2006;32(2):140-147.
30. Heok KE, Meng KS, Calvins SL, Swee L. Comorbidity of depression in the elderly—An epidemiological study in a Chinese community. *International Journal of Geriatric Psychiatry* 1996;11:699-704.
31. Kivela SL, Pahkala K, Laippala P. Prevalence of depression in an elderly population in Finland. *Acta Psychiatrica Scandinavica* 1988;78(4):401-413.
32. Kulaksizoglu IB, Gurvit H, Polat A, Harmanci H, Cakir S, Hanagasi H, Bilgic B, Emre M. Unrecognized depression in community-dwelling elderly persons in Istanbul. *International Psychogeriatrics* 2005;17(2):303-312.
33. McDougall FA, Matthews FE, Kvaal K, Dewey ME, Brayne C. Prevalence and symptomatology of depression in older people living in institutions in England and Wales. *Age and Ageing* 2007;36:562-568.
34. O'Hara MW, Kohout FJ, Wallace RB. Depression among the rural elderly. A study of prevalence and correlates. *Journal of Nervous and Mental Diseases* 1985;173(10): 582-589.
35. Sewitch MJ, McCusker J, Dendukuri N, Yaffe MJ. Depression in frail elders: Impact on family caregivers. *International Journal of Geriatric Psychiatry* 2004; 19(7):655-665.
36. Sonnenberg CM, Beekman AT, Deeg DJ, van Tilburg W. Sex differences in late-life depression. *Acta Psychiatrica Scandinavica* 2000;101(4):286-292.
37. Sun C, Tikellis G, Klein R, Steffens DC, Larsen EK, Wong TY. Depressive symptoms and age-related macular degeneration in older people: The cardiovascular health study. *Ophthalmic Epidemiology* 2007;14(3):127-133.
38. Tiemeier H, van Tuijl HR, Hofman A, Kiliaan AJ, Breteler MM. Plasma fatty acid composition and depression are associated in the elderly: The Rotterdam Study. *American Journal of Clinical Nutrition* 2003;78(1):40-46.
39. Tsai YF, Yeh SH, Tsai HH. Prevalence and risk factors for depressive symptoms among community-dwelling elders in Taiwan. *International Journal of Geriatric Psychiatry* 2005;20(11):1097-1102.
40. Tsai YF. Self-care management and risk factors for depressive symptoms among Taiwanese institutionalized older persons. *Nursing Research* 2007;56(2): 124-131.
41. Forsell Y. Predictors for depression, anxiety and psychotic symptoms in a very elderly population: Data from a 3-year follow-up study. *Social Psychiatry and Psychiatric Epidemiology* 2000;35(6):259-263.
42. Geerlings SW, Twisk JW, Beekman AT, Deeg DJ, van Tilburg W. Longitudinal relationship between pain and depression in older adults: Sex, age and physical disability. *Social Psychiatry and Psychiatric Epidemiology* 2002;37(1): 23-30.

43. Giltay EJ, Zitman FG, Kromhout D. Dispositional optimism and the risk of depressive symptoms during 15 years of follow-up: The Zutphen Elderly Study. *Journal of Affective Disorders* 2006;91(1):45-52.
44. Livingston G, Watkin V, Milne B, Manela MV, Katona C. Who becomes depressed? The Islington community study of older people. *Journal of Affective Disorders* 2000; 58(2):125-133.
45. Maraldi C, Volpato S, Penninx BW, Yaffe K, Simonsick EM, Strotmeyer ES, Cesari M, Kritchevsky SB, Perry S, Ayonayon HN, Pahor M. Diabetes mellitus, glycemic control, and incident depressive symptoms among 70- to 79-year-old persons: The health, aging and body composition study. *Archives of Internal Medicine* 2007;11;167(11):1137-1144.
46. Meller I, Fichter MM, Schröppel H. Risk factors and psychosocial consequences in depression of octo- and nonagenerians: Results of an epidemiological study. *European Archives of Psychiatry and Clinical Neuroscience* 1997;247:278-287.
47. Phifer JF, Murrell SA. Etiologic factors in the onset of depressive symptoms in older adults. *Journal of Abnormal Psychology* 1986;95:282-291.
48. Roberts RE, Shema SJ, Kaplan GA, Strawbridge WJ. Sleep complaints and depression in an aging cohort: A prospective perspective. *American Journal of Psychiatry* 2000;157(1):81-88.
49. Schoevers RA, Beekman AT, Deeg DJ, Geerlings MI, Jonker C, van Tilburg W. Risk factors for depression in later life: Results of a prospective community based study (AMSTEL). *Journal of Affective Disorders* 2000;59(2):127-137.
50. Stek ML, Vinkers DJ, Gussekloo J, van der Mast RC, Beekman AT, Westendorp RG. Natural history of depression in the oldest old: Population-based prospective study. *British Journal of Psychiatry* 2006;188:65-69.
51. Whyte EM, Mulsant BH, Vanderbilt J, Dodge HH, Ganguli M. Depression after stroke: A prospective epidemiological study. *Journal of the American Geriatric Society* 2004;52(5):774-778.
52. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D. Meta-analysis of observational studies in epidemiology: A proposal for reporting. *Journal of the American Medical Association* 2000;283(15):2008-2012.

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