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# Early versus late onset depression: sociodemographic and clinical characteristics

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## Abstract

**Background:** Late-onset depression is different from early-onset depression in its sociodemographic and clinical characteristics and risk factors. This study aimed to demonstrate the differences in sociodemographic characteristics as well as clinical presentation between late-onset depression (after the age of 60 years) and early-onset depression (before the age of 45 years) and to determine the sociodemographic risk factors for late onset depression. Fifty-five patients between 18 and 45 years of age (group 1) and 55 patients aged 60 years and above (group 2) diagnosed for the first time with major depressive disorder were compared regarding sociodemographic and clinical characteristics. They were recruited from the psychiatric clinic at Sohag University Hospital. All participants were subjected to a Structured Clinical Interview for DSM-IV (SCID-IV), sociodemographic data form, Beck Depression Inventory-Second Edition (BDI-II), and Apathy Evaluation Scale (AES).

**Results:** The patients in group 2 were more commonly single (29%), employed (74.54%), living in rural areas (56.36%), and had high school education (41.81%). While the patients in group 2 were more commonly widows (18.18%), unemployed (61.81%), had less than high school education (47.27%), and had chronic diseases (78.81%). Significant risk factors for late onset depression are being widow, unemployed, having low socioeconomic status, and having a chronic medical disease. Patients with late-onset depression were more commonly presented with apathy, cognitive impairment, and somatic symptoms, as well as sleep disturbance (mean±SD 57±6, 70.9%, 61.81%, and 81.81%, respectively) than early-onset depression (mean±SD 49±4, 47.27%, 36.36%, and 70.9%, respectively).

**Conclusions:** Cases with late onset depression are featured by being unemployed, widow, having low socioeconomic status and low educational level, suffering from a chronic medical condition and living in an urban area. In late onset depression, somatic symptoms, apathy, sleep disturbances, as well as cognitive impairment are prevalent presenting symptoms.

**Keywords:** Depression, Presentation, Early onset, Sociodemographic, Late onset

## Background

Major depressive disorder (MDD) is still a difficult health issue throughout the life cycle [1]. Early onset depression (EOD) and late onset depression (LOD) are significant public health problems as well as a burden on patients and their families [2]. LOD is a highly pervasive affective condition among the elderly [3]. According to WHO,

about 5.7% of adults older than 60 years have depression [4]. Studies done in Egypt found that the prevalence of depression in elderly above 60 years is about 45% of elderly [5, 6].

Age differences exist in many aspects in MDD patients [7]. In numerous studies, the term late onset depression refers to depressive disorders that manifest during the age of 60 or beyond for the first time [8]. Aging is usually featured with a decline in mental and physical health as well as elevated risks for depression and social isolation [9]. In terms of aetiology, clinical presentation, prognosis, and responsiveness to therapy,

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depression that appears for the first time in old age differs from depression that appears in early life [10].

The elderly differ from young people in terms of main features, including their lifetime burden and chronicity of depression as well as their constellation of risk factors and comorbidities. LOD is likely induced by a combination of risk factors, such as environmental, physiologic, medical, behavioral, and psychosocial factors [11].

Taking in consideration the high prevalence of depression in elderly and its impact on physical health, adherence to medication, and overall quality of life, we considered the present study to highlight this important problem.

### **Aim of the work**

This study aims to demonstrate the differences in sociodemographic characteristics as well as clinical presentation between late-onset depression (after the age of 60 years) and early onset depression (before the age of 45 years), in addition to determining LOD sociodemographic risk factors.

### **Methods**

This cross-sectional study included fifty-five MDD patients aged 18–45 years (group 1) and 55 patients aged 60 years and above (group 2), assuming that age 60 being the lower limit of elderliness [12]. The sample size was calculated using Epi info sample size calculation software with confidence interval 90% and prevalence of depression as 10%. Calculated sample size was 98.

The included patients were diagnosed for the first time with major depressive disorder after a clinical interview depending on DSM-5 diagnostic criteria and application of Beck depression inventory-second edition. Participants were gathered from the psychiatric clinic at Sohag University Hospital from January 2021 to October 2021.

Participants provided full-informed consent to be enrolled in this study. In addition, the Faculty of Medicine's local ethical committee approved this study.

### **Inclusion criteria**

Aging between 18 and 45 years (group 1), aging > 60 years (group 2). We limited the age of the first group to age of 45 years (although the most accepted age for demarcation between early onset and late onset depression is 60 years) to ensure the clear demarcation between early and late onset group without overlap and diagnosed with major depression according to DSM-5 diagnostic criteria and BDI-II.

### **Exclusion criteria**

History of other psychiatric disorders, severe or acute unstable medical illness, or having an intellectual impairment.

### **Tools**

The sociodemographic data form (to obtain participants' sociodemographic data such as sex, age, marital status, residence, occupation, socioeconomic status, educational level, and presence of chronic medical illness (ischemic heart disease, diabetes mellitus, hypertension, cerebrovascular stroke, renal, hepatic, pulmonary, or rheumatological diseases).

Family socioeconomic status scale is designed by Abd El-Twab [13] to assess the socioeconomic status of the participants. It consists of 4 items: parents' job and level of education, income of the family, and life style. It provides an overall score as well as an individual score for every item. The overall score is divided into three categories: high, moderate, and low.

In Structured Clinical Interview for DSM-IV-Clinician Version (SCID-CV) (First et al.) [14], we utilized the Arabic version (El Missiry et al.) [15] to exclude other psychiatric disorders.

Beck Depression Inventory-Second Edition (BDI-II) is a 21-item test that is developed to assess symptoms of depression over the last 2 weeks. The BDI-II is considered one of the most utilized depression instruments due to its shortness, convenience of administration, and reasonably solid psychometric features. Scoring: Items are rated on a 0–3 scales, resulting in a score range of 0–63, with higher scores indicating more severe depression. Scores ranging from 29 to 63 denote severe depression, 20 to 28 moderate depression, and 14 to 19 mild depression, whereas 0 to 13 denote minimal depression [16].

Apathy Evaluation Scale (AES): AES focuses on the hobbies and occupations of the patients in their daily lives as well as their enjoyments and measures the losses in these areas. The scale has 18 items with scores that vary between 18 and 72 to evaluate the indifference in behavioral, cognitive, and emotional areas in the past 4 weeks. The scale has both a self-report form and a clinician form; the clinician form of the scale was used in our study [17].

### **Statistics**

We used SPSS version 22 (Statistical Package for the Social Sciences version Inc., Chicago, IL, USA) package software. Quantitative data were presented in the form of means and standard deviations. Qualitative data were presented in the form of frequencies and percentages. The comparison of mean values was performed utilizing

unpaired *t* tests. A comparison between categorical variables was done by chi-square test. Multivariate logistic regression was used to assess the risk factors for late life depression. A *P* value less than 0.05 is considered statistically significant.

## Results

Table 1 shows that there were no substantial differences between both study groups with respect to sex or socioeconomic status. There is a significant statistical difference between early and late-onset depression groups regarding educational level, residence, marital status, employment, and presence of chronic medical illness, where the patients of the first group were more commonly single (29%), employed (74.54%), live in rural areas (56.36%), had high school education (41.81%), and were free from chronic medical illness (87.27%), while subjects in group 2 were more commonly widow (18.18%), unemployed (61.81%), had less than school education (47.27%), and had chronic diseases (78.81%).

Table 2 shows that elderly depressed patients demonstrated significantly higher scores (mean±SD 57 ± 6) on the apathy scale than younger depressed patients (mean±SD 49 ± 4). Patients with low mood were more common in group 1 (81.81%) than in group 2 (70.9%).

Psychomotor retardation was more prevalent among group 2 (65.45%) than group 1 (30.9%), but agitation was more prevalent among group 1 (61.81%) than group 2 (41.81%). Cognitive impairment and somatic symptoms were more common in group 2 (70.9% and 61.81%, respectively) than group 1 (47.27% and 36.36%, respectively). Sleep disturbance was more common in group 2 (81.81%) than group 1 (70.9%). There were no substantial differences between group 1 and group 2 regarding guilt feeling, social isolation, suicidal ideation, and appetite changes.

Table 3 shows that being a widow, being unemployed, having a low socioeconomic status, and having a chronic medical illness are all significant risk factors for LOD.

**Table 1** Sociodemographic characteristics of early (group 1) and late onset depression (group 2)

Item	Group 1 (N=55)		Group 2 (No=55)		P value
Age (mean ± SD) years	37 ± 6 years		67 ± 4 years		
Gender	N	%	N	%	0.063
Male	20	36.36%	18	32.72%	
Female	35	63.64%	37	67.27%	
Education					0.041*
Illiterate	3	5.45%	7	12.72%	
Less than high school	18	32.72%	26	47.27%	
High school	23	41.81%	15	27.27%	
College	11	20%	7	12.72%	
Residency					0.001*
Rural	31	56.36%	18	32.72%	
Urban	24	43.63%	37	67.27%	
Marital status					0.003*
Single	16	29%	3	5.45%	
Married	30	54.54%	36	65.45%	
Divorced	5	9.09%	6	10.9%	
Widow	4	7.27%	10	18.18%	
Employment					0.001*
Employed	41	74.54%	21	38.18%	
Unemployed	14	25.45%	34	61.81%	
Socio economic status					0.073
Low class	35	63.63%	39	0.9%	
Middle class	14	25.45%	12	21.81%	
High class	6	10.9%	4	7.27%	
Chronic disease					0.0001*
Yes	7	12.72%	43	78.81%	
No	48	87.27%	12	21.81%	

*P* value of 0.05 or less is considered significant

**Table 2** The clinical presentation of patients with EOD (group I) and LOD (group 2)

	Group (I)		Group (II)		P value
Apathy (anhedonia) Mean ± SD	49 ± 4		57 ± 6		0.027*
BDI-II scores	N=55	%	N=55	%	0.078
Mild	3	5.45%	2	3.63%	
Moderate	11	20%	9	16.36%	
Severe	41	74.54%	44	80%	
Low mood	45	81.81%	39	70.9%	0.039*
Psychomotor retardation	17	30.9%	36	65.45%	0.0001*
Agitation	34	61.81%	23	41.81%	0.001*
Cognitive impairment	26	47.27%	39	70.9%	0.0001*
Guilt feeling	25	45.45%	25	45.45%	0.063
Somatic symptoms	20	36.36%	34	61.81%	0.0001*
Social isolation	13	23.63%	15	27.27%	0.371
Suicidal ideation or attempt	8	14.54%	7	12.72%	0.158
Sleep disturbance	39	70.9%	45	81.81%	0.039*
Appetite changes	32	58.18%	33	60%	0.093

P value of 0.05 or less is considered significant

**Table 3** Multivariate logistic regression in LOD

Variable	Odds ratio	P value
Age	0.77	0.43
Sex	1.07	0.09
Education	0.9	0.27
Residency	0.66	0.63
Marital status	4.2	0.02*
Employment	5.2	0.003*
Socioeconomic status	4.4	0.01*
Presence of chronic diseases	6.3	0.002*

P value of 0.05 or less is considered significant

**Discussion**

Depression is a leading cause for disability and contributes significantly to the global disease burden. Comparative data on adults’ and older adults’ depressive disorders is scarce in Upper Egypt.

Our results revealed that low education (47.27%) and illiteracy (12.72%) are more common in late-onset depression, aligning with the results of Schlax et al. [18] and Park et al. [19].

Consistent with the findings of Kim et al. [20] and El-Gilany et al. [5], our study demonstrated an elevated prevalence of LOD in urban areas (67.27%) and this may be explained by lack of social networks in urban rather than rural areas. Nevertheless, Li and colleagues [21] illustrated that LOD symptoms are more prevalent in villages compared to cities since cities have easier

access to health care, better community-level infrastructure, and higher income.

This work revealed that widowed with LOD (18.18%) are more common than widowed with EOD (7.27%) while unmarried with EOD (29%) are more frequent than unmarried with LOD (5.45%), which is consistent with the results obtained by Guo and his colleagues [22], who concluded that the old depressed widowed scored higher in depression scales than others. However, these results could be explained by the nature of the age groups in general, as widowed people are more common in old age and unmarried people are more common in young ages.

We found that unemployment is more prevalent among elderly depressed subjects (61.81%) compared to young subjects (25.45%), which can be attributed to the age of retirement (60 years), which is consistent with the findings of Latif [23] who confirmed that retirement harms mental health by increasing the symptoms of depression. Nonetheless, Mandal et al. [24] indicated that retiring improves elderly Americans’ mental health.

Our results revealed that low socioeconomic status is more prevalent among old depressed patients (70.9%) than young depressed patients (63.63%), which is in agreement with Domenech-Abella et al. [25] and Abdo et al. [6], who stated that low household income is a significant predictor related to old age depression. Domenech-Abella et al. [26] added that financial difficulties in childhood are a risk factor for depression throughout life, even in late life. Our findings revealed that the comorbidity of chronic medical diseases such as diabetes mellitus, hypertension, ischemic heart disease, and stroke represent a higher risk for depression among older adults (78.81%) than young adults (12.72%). Individuals with LOD usually suffer from severe medical comorbidities as well as poor adherence to treatment, as reported by Papadopoulos et al. [27] and Hall et al. [28], who demonstrated that chronic medical illnesses are pervasive in old adults who have depression. Furthermore, Areean and Reynolds [29] illustrated that many psychosocial stressors (particularly ischemic heart diseases and stroke) are considered risk factors for depression in old seniors. However, Groeneweg-Koolhoven et al. [30] stated that patients with early and LOD revealed similar predisposing risk factors.

The present study revealed that low mood is a more prevalent symptom among patients with EOD (81.81%) than patients with LOD (70.9%), which is similar to the results of Groeneweg-Koolhoven et al. [30]

Our results revealed that apathy was highly related to age, as patients with LOD demonstrated higher scores on the apathy scale (57±6) than patients with EOD (49±4), which is compatible with Groeneweg-Koolhoven et al. [30], who observed that apathy as a symptom is more

common in old adults with depression (74.5%) than young adults with depression (53.5%). Additionally, Pimentel et al. [31] observed that apathy is frequent in LOD and is related to poor outcomes.

Our findings suggest that psychomotor retardation is a more common presentation among old seniors with depression (65.45%) than young adults with depression (30.9%) which is consistent with the results of Aziz and Steffens [1], who demonstrated that psychomotor retardation is a prominent feature in the elderly with depression. The current study found that cognitive impairment was more common among depressed elders (70.9%) than patients with early-onset depression (47.27%), which aligns with the results of Morimoto et al. [32] and Hashim et al. [33], who stated that cognitive disturbance is a common symptom in depressed old seniors, on the other side, Alexopoulos [34] cited that age-related cognitive impairment and arteriosclerosis in older adults increase the vulnerability to depression. However, age-related cognitive decline is pervasive in older adults. Byers and Yaffe mentioned that [35] when depression appears in old age, it is difficult to differentiate it from dementia since both illnesses have comparable symptom profiles, particularly when depression impairs cognition and is reported as pseudodementia.

In this study, we found that somatic symptoms were a common presenting symptoms among patients with LOD (61.81%) than patients with EOD (36.36%), which is compatible with the results of Morin et al. [36], who observed that somatic manifestations were common presenting symptoms in older adults with depression, particularly in family practice clinics. However, physical diseases with somatic complaints are common in the aged population.

Our results revealed that sleep disturbance is much more common among depressed old seniors (81.81%) than depressed young patients (70.9%), which aligns with the results of Naismith et al. [37] and El-Gilany et al. [5], who reported that depression in older adults is associated with neuropsychological dysfunction and sleep disturbance. Nevertheless, Naismith et al. [38] stated that sleep-wake disturbance in older people is a risk factor for depression onset and recurrence. However, sleep disturbance is a frequent complaint in old adults without depression. This piece of work focuses on late onset depression that goes unrecognized by some physicians [39]. Physicians should screen elderly patients for depression, especially those who are widow, unemployed, with low socioeconomic status or have chronic medical illness. According to our findings, we should suspect major depression in elderly with multiple unexplained somatic symptoms after exclusion of organic causes. This will save time and money for the patients that are managed in

wrong ways. Also, the presence of somatic complaints is considered a bad prognostic factor in geriatric depression [39]. As insomnia is common presenting symptom in geriatric depression, psychiatrists should tailor the treatment to manage insomnia. In elderly patients presented with cognitive decline, we should put major depression in differential diagnosis as cognitive complaint is a common presenting symptom in late onset depression.

### Strengths

Comparative studies on symptoms and risk factors of depression in young and old adults are limited in Upper Egypt. Patients recruited were unselected and came randomly from the psychiatric clinic. Our work yields clinical insights and provides a direction for future studies on depression across the life span.

### Limitations

As the study is cross-sectional, we did not conclude a cause-effect relationship. There is a possibility of reporting bias as cognitive impairment and sleep disturbance could be a symptom or a cause of depression. It is unclear if these results can be generalized to a population of old and younger adults due to limited number of patients.

### Conclusions

We conclude that sociodemographic characteristics of depression in old adults include widow, unemployed patients with low education, low socioeconomic status, living in urban areas, and commonly having medical comorbidities. The common presenting symptoms in old adults with depression are apathy, psychomotor retardation, somatic symptoms, cognitive impairment, and sleep disturbance.

### Recommendations

All patients with LOD need a diagnostic work-up of somatic and psychosocial risk factors. Proper management of risk factors of depression in the elderly may ameliorate the symptoms with functional and cognitive recovery. Future studies in larger samples would elucidate the generalization of these results.

### Abbreviations

AES: Apathy Evaluation Scale; BDI-II: Beck Depression Inventory-Second Edition; DSM-5: Diagnostic and Statistical Manual of Mental Disorders fifth edition; EOD: Early onset depression; LLD: Late onset depression; MDD: Major depressive disorder; SCID-CV: Structured Clinical Interview for DSM-IV-Clinician Version; WHO: World Health Organization.

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### Authors' contributions

S.H.: Determining the idea of research, application of the questionnaires, statistical analysis, paper writing, revision of the references, and paper submission. O.A.M.: Selecting the idea of research, application of the questionnaires, statistical analysis, and manuscript writing. T. A. S.: Recruiting and interviewing the participants, administrating the questionnaires, collecting the samples, statistical analysis, and writing the manuscript. The authors read and approved the final manuscript.

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### Availability of data and materials

The datasets utilized and/or analyzed in the present study can be provided upon reasonable request from the corresponding author.

### Declarations

#### Ethics approval and consent to participate

The Medical Research Ethics Committee of the Faculty of Medicine, Sohag University, authorized the current study protocol. Informed consent was collected from all subjects recruited in the study. The researchers confirmed each participant's confidentiality and voluntary participation if they agreed to enroll in the present study.

#### Consent for publication

Consent for publishing has been obtained.

#### Competing interests

The authors declare that they have no competing interests.

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### References

- Aziz R, Steffens DC (2013) What are the causes of late-life depression? *Psychiatr Clin North Am* 36(4):497–516. <https://doi.org/10.1016/j.psc.2013.08.001> Epub 2013 Oct 6. PMID: 24229653; PMCID: PMC4084923
- Huang CM, Fan YT, Lee SH, Liu HL, Chen YL, Lin C, Lee TMC (2019) Cognitive reserve-mediated neural modulation of emotional control and regulation in people with late-life depression. *Soc Cogn Affect Neurosci* 14(8):849–860. <https://doi.org/10.1093/scan/nsz054>
- Reynolds CF, Lenze E, Mulsant BH (2019) Assessment and treatment of major depression in older adults. *Handb Clin Neurol* 167:429–435
- Institute of Health Metrics and Evaluation. Global Health Data Exchange (GHDx). <http://ghdx.healthdata.org/gbd-results-tool?params=gbd-api-2019permalink/d780dffbe8a381b25e1416884959e88b> (Accessed 1 May 2021).
- El-Gilany AH, Elkhawaga GO, Sarraf BB (2018) Depression and its associated factors among elderly: a community-based study in Egypt. *Arch Gerontol Geriatr* 77:103–107. <https://doi.org/10.1016/j.archger.2018.04.011> Epub 2018 May 1. PMID: 29734054
- Abdo NM, Eassa S, Abdalla AM (2011) Prevalence of depression among elderly and evaluation of interventional counseling session in Zagazig District –Egypt. *J Am Sci* 7(6):739–748 (ISSN: 1545-1003). <http://www.americanscience.org>
- Xiao L, Zhou JJ, Feng Y, Zhu XQ, Wu WY, Hu YD et al (2019) Does early and late life depression differ in residual symptoms, functioning and quality of life among the first-episode major depressive patients. *Asian J Psychiatr* 16(47):101843
- Naismith SL, Norrie LM, Mowszowski L, Hickie IB (2012) The neurobiology of depression in later-life: clinical, neuropsychological, neuroimaging and pathophysiological features. *Prog Neurobiol* 98:99–143
- Russo-Netzer P, Littman-Ovadia H (2019) "Something to live for": experiences, resources, and personal strengths in late adulthood. *Front Psychol* 31(10):2452
- Rapp MA, Dahlman K, Sano M, Grossman HT, Haroutunian V, Gorman JM (2005) Neuropsychological differences between late-onset and recurrent geriatric major depression. *Am J Psychiatry* 162(4):691–698. <https://doi.org/10.1176/appi.ajp.162.4.691> PMID: 15800140
- Vyas CM, Okereke OI (2020) Late-life depression: a narrative review on risk factors and prevention. *Harv Rev Psychiatry* 28(2):72–99. <https://doi.org/10.1097/HRP.0000000000000240> PMID: 31977599
- Giray H, Meseri R, Saatli G, Yüçetin N, Aydın P, Uçku R (2008) Proposal for elderly health care system in Turkey. *TAF Prev Med Bull* 7:81–86
- Abd El-Tawab AA (2012) Family socio-economic status scale. *Journal of Faculty of Education, Assiut University* 28(1):42–48
- First MB, Spitzer RL, Gibbon M, Williams JBW, Benjamin LS (1997) Structured clinical interview for DSM-IV-clinician version (SCID-CV) (user's guide interview). American Psychiatric Press, Washington, DC
- El Missiry A, Sorour A, Sadek A, Fahy T, Abdel Mawgoud M, Asaad T (2004) Homicide and psychiatric illness: an Egyptian study [MD thesis]. Faculty of Medicine, Ain Shams University, Cairo
- Beck AT, Brown GK (1996) Manual for the BDI-II. The Psychological Corporation, San Antonio
- Clarke DE, Ko JY, Kuhl EA, van Reekum R, Salvador R, Marin RS (2011) Are the available apathy measures reliable and valid? A review of the psychometric evidence. *J Psychosom Res* 70(1):73–97. <https://doi.org/10.1016/j.jpsychores.2010.01.012>
- Schlag J, Junger C, Beutel ME, Munzel T, Pfeiffer N, Wild P et al (2019) Income and education predict elevated depressive symptoms in the general population: results from the Gutenberg health study. *BMC Public Health* 19(1):430
- Park JH, Kim KW, Kim MH, Kim MD, Kim BJ, Kim SK et al (2012) A nationwide survey on the prevalence and risk factors of late life depression in South Korea. *J Affect Disord* 138(1–2):34–40. <https://doi.org/10.1016/j.jad.2011.12.038>
- Kim JM, Stewart R, Shin IS, Yoon JS, Lee HY (2004) Lifetime urban/rural residence, social support and late-life depression in Korea. *Int J Geriatr Psychiatry* 19(9):843–851. <https://doi.org/10.1002/gps.1175> PMID: 15352141
- Li LW, Liu J, Xu H, Zhang Z (2016) Understanding rural-urban differences in depressive symptoms among older adults in China. *J Aging Health* 28(2):341–362. <https://doi.org/10.1177/0898264315591003>
- Guo HJ, Zhang C (2019) A study on the relationship between obesity and depression in the elderly of China. *Sichuan Da Xue Xue Bao Yi Xue Ban* 50(5):725–730 Chinese. PMID: 31762245
- Latif E (2013) The impact of retirement on mental health in Canada. *J Ment Health Policy Econ* 16(1):35–46
- Mandal B, Roe B (2008) Job loss, retirement and the mental health of older Americans. *J Ment Health Policy Econ* 11(4):167–176 PMID: 19096091
- Domènech-Abella J, Mundó J, Leonardi M, Chatterji S, Tobiasz-Adamczyk B, Koskinen S et al (2018) The association between socioeconomic status and depression among older adults in Finland, Poland and Spain: a comparative cross-sectional study of distinct measures and pathways. *J Affect Disord* 241:311–318
- Domènech-Abella J, Mundó J, Miret M, Ayuso-Mateos JL, Sánchez-Niubò A, Abduljabbar AS et al (2021) From childhood financial hardship to late-life depression: socioeconomic pathways. *Aging Ment Health* 25(1):86–93. <https://doi.org/10.1080/13607863.2019.1671313>
- Papadopoulos FC, Petridou E, Argyropoulou S, Kontaxakis V, Dessypris N, Anastasiou A et al (2005) Prevalence and correlates of depression in late life: a population based study from a rural Greek town. *Int J Geriatr Psychiatry* 20(4):350–357
- Hall CA, Reynolds-III CF (2014) Late-life depression in the primary care setting: challenges, collaborative care, and prevention. *Maturitas* 79(2):147–152. <https://doi.org/10.1016/j.maturitas.2014.05.026> Epub 2014 Jun 7. PMID: 24996484; PMCID: PMC4169311
- Arean PA, Reynolds CF (2005) The impact of psychosocial factors on late-life depression. *Biol Psychiatry* 58(4):277–282
- Groeneweg-Koolhoven I, Ploeg M, Comijs HC, Wjg Penninx B, van der Mast RC, Schoevers RA et al (2017) Apathy in early and late-life depression. *J Affect Disord* 223:76–81. <https://doi.org/10.1016/j.jad.2017.07.022> Epub 2017 Jul 10. PMID: 28734148
- Pimontel MA, Kanellopoulos D, Gunning FM (2020) Neuroanatomical abnormalities in older depressed adults with apathy: a systematic review. *J Geriatr Psychiatry Neurol* 33(5):289–303. <https://doi.org/10.1177/089198719882100> Epub 2019 Oct 21. PMID: 31635522

32. Morimoto SS, Kanellopoulos D, Manning KJ, Alexopoulos GS (2015) Diagnosis and treatment of depression and cognitive impairment in late life. *Ann NY Acad Sci* 1345(1):36–46. <https://doi.org/10.1111/nyas.12669> Epub 2015 Feb 5. PMID: 25655026; PMCID: PMC4447532
33. Hashem AH, Nasreldin M, Gomaa MA, Khalaf OO (2017) Late versus early onset depression in elderly patients: vascular risk and cognitive impairment. *Curr Aging Sci* 10(3):211–216. <https://doi.org/10.2174/1874609810666170404105634> PMID: 28382870
34. Alexopoulos GS (2005) Depression in the elderly. *Lancet* 365(9475):1961–1970. [https://doi.org/10.1016/S0140-6736\(05\)66665-2](https://doi.org/10.1016/S0140-6736(05)66665-2) PMID: 15936426
35. Byers AL, Yaffe K (2011) Depression and risk of developing dementia. *Nat Rev Neurol* 7(6):323–331
36. Morin RT, Nelson C, Bickford D, Insel PS, Mackin RS (2020) Somatic and anxiety symptoms of depression are associated with disability in late life depression. *Aging Ment Health* 24(8):1225–1228. <https://doi.org/10.1080/13607863.2019.1597013> Epub 2019 Apr 4. PMID: 30945553
37. Naismith SL, Norrie L, Lewis SJ, Rogers NL, Scott EM, Hickie IB (2009) Does sleep disturbance mediate neuropsychological functioning in older people with depression? *J Affect Disord* 116(1-2):139–143. <https://doi.org/10.1016/j.jad.2008.11.017> Epub 2009 Jan 6. PMID: 19128840
38. Naismith SL, Rogers NL, Lewis SJ, Terpening Z, Diamond K, Norrie L et al (2011) Sleep disturbance relates to neuropsychological functioning in late-life depression. *J Affect Disord* 132(1-2):139–145
39. Fountoulakis KN, O'Hara R, Iacovides A, Camilleri CP, Kaprinis S, Kaprinis G, Yesavage J (2003) Unipolar late-onset depression: a comprehensive review. *Ann Gen Hosp Psychiatry* 2(1):11. <https://doi.org/10.1186/1475-2832-2-11> PMID: 14675492; PMCID: PMC317342

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