Depression among older people in Bali

ORIGINAL ARTICLE

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ABSTRACT

Introduction. Depression is the most common mental disorder. Older adults are more vulnerable to depression and are usually underdiagnosed and untreated. This study aims to determine the prevalence of depression among older adults in Bali and identify its risk factors.

Methods. This study used data from the Dementia Study in Bali 2018. Depression was assessed using a short version of the Center for Epidemiologic Studies Depression (CES-D) scale. Scores of ≥ 10 were categorised as depression and < 10 no depression. Risk factors included age, sex, marital status, educational level, employment status, residential district, urban status, economic status, household members, social participation, hobby activities, activities of daily living (ADL), instrumental activities of daily living (IADL), and comorbidities. Older adults with and without depression were compared to determine any risk factors. Multivariate logit regression was used to determine the association between risk factors and depression.

Results. A total of 774 female and 719 male participants aged 60 to 100 (mean, 70 ± 7.3) years were included. The mean CES-D score was 9.04 ± 5.92 (range, 0–30). Using the cut-off CES-D score of ≥ 10 as depression, 631 (42.3%) participants were considered depressed. The prevalence of depression was similar between male and female participants and increased with age. Among female older adults, depression was associated with being married (odds ratio [OR]=1.53, $p=0.019$), ADL dependent (OR=2.58, $p=0.002$), IADL dependent (OR=1.93, $p=0.033$), having high comorbidity scores (OR=3.53, $p=0.000$), and residing in low socioeconomic districts (OR=2.53, $p=0.026$). Whereas having a household member aged 0–5 years (OR=0.570, $p=0.013$) and being active in a hobby (OR=0.339, $p<0.001$) were associated with lower likelihood of depression.

Conclusion. The prevalence of depression among older adults in Bali was high (42.3%) and increased with age. Female older adults were more likely to be depressed when they were married, ADL and IADL dependent, and had comorbidity scores of 3–4 and ≥ 5 . Having a grandchild in the household and active participation in hobbies were associated with lower risk of depression.

Key words: Aged; Depression; Indonesia; Risk factors

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INTRODUCTION

According to the Riskesdas in 2018, Bali had the highest proportion of household members having a mental disorder in Indonesia.¹ Bali had a high rate of suicide, and 27.4% of the cases involved older adults.² 80% of the cases had mood disorder as the most prominent risk factor.³

Depression is a mental disorder characterised by feelings of sadness, fatigue, guilt, and a general loss of interest in things. It is the largest contributor to disability worldwide.⁴ In 2019, the World Health Organization estimated that 264 million people have depression, nearly half of them are in the South-East Asia and West Pacific regions.⁵ Depression may occur at any age, but older adults are at higher risk, and the prevalence peaks at age 55 to 74 years.⁴

The older population in Indonesia had increased from 4.5% in 1971 to 7.6% in 2010.⁶ The proportion is estimated to increase by 84% from 2015 to 2030.⁷ In Bali, the proportion of people aged ≥ 60 years was 9.76% in 2005.⁸ Population growth and ageing contributed largely to a 37.6% increase in the global burden of mental and substance use disorders between 1990 and 2010.⁹ Improper management of mental health disorders could be costly to the system.

Factors underlying depression among older adults in developed countries have been reported.^{10,11} However, there is poor understanding of depression among older people in low- and middle-income countries. This study aims to determine the prevalence of depression among older adults in Bali and to identify its risk factors and solutions.

METHODS

This study used data from the Dementia Study in Bali conducted in 2018 by SurveyMETER in collaboration with Faculty of Economic and Business Universitas Udayana, Suryani Institute, Alzheimer Indonesia, Faculty of Medicine Unika Atma Jaya and supported by Knowledge Sector Initiative. The survey interviewed older adults from eight regencies and one city in Bali. The percentage of older adults at each district was 11% to 15%, except for Denpasar (5.36%) and Badung (8.65%). 13 villages were randomly chosen from each of the nine regencies/

city; one hamlet (Banjar) was randomly chosen from each village; and 10 households with older persons were interviewed for each cluster.¹² All older persons residing in a selected household were interviewed. The total sample included 1723 older persons in 130 households. Their cognitive, mental health, morbidity, demographic, social, and economic conditions were assessed.

Depression was assessed using a short version of the Center for Epidemiologic Studies Depression (CES-D) scale. CES-D is a valid and reliable self-report questionnaire to measure depressive symptoms in the general population.¹³ The short version consists of 10 items, each is scored 0 to 3, depending on how often each item occurred in the past week: rarely or none (<1 day), some or little of the time (1-2 days), occasionally or a moderate amount of time (3-4 days), and most or all the time (5-7 days). Scores of ≥ 10 were categorised as depression and <10 no depression.¹⁴

Risk factors included age, sex, marital status, educational level, employment status, residential district, urban status (according to the Central Bureau of Statistics of Indonesia¹⁵), economic status, household members, social participation, hobby activities, activities of daily living (ADL), instrumental activities of daily living (IADL), and comorbidities.¹⁶⁻¹⁸ ADL was assessed using the 6-item Katz scale; scores of 0-4 indicate dependent, 5 slightly dependent, and 6 independent.¹⁹ IADL was assessed using the 6-item IADL scale; scores of 0-2 are categorised as dependent, 3-5 slightly dependent, and 6 independent.

Based on the self-administrated comorbidity questionnaire,²⁰ respondents were asked if they had ever been diagnosed with any comorbidities (such as memory disorder, hypertension, diabetes, tuberculosis, asthma, other chronic pulmonary disease, cardiovascular disease, liver disease, stroke, cancer, arthritis, hypercholesterolemia, prostate disease, kidney disease, and gastrointestinal disease). They were asked whether each comorbidity limited their activities (1 for yes, 0 for no); the maximum score is 30, and scores are categorised as 0, 1-2, 3-4, and ≥ 5 .²⁰

There are sex differences in social risk factors for depression among older adults.^{21,22} Older adults

with and without depression were compared using the Chi-square test to determine any risk factors. Multivariate logit regression was used to determine the association between risk factors and depression.

RESULTS

A total of 774 female and 719 male participants aged 60 to 100 (mean, 70 ± 7.3) years were included. The mean CES-D score was 9.04 ± 5.92 (range, 0-30). The mean duration of schooling was 4 years. The mean per capita expenditure per month in the household was 724 484 rupiahs (US\$ 51). The mean scores of ADL and IADL were 5.5 ± 1.15 and 4.8 ± 1.79 , respectively. The mean comorbidity score was 2.2 ± 2.28 (TABLE 1).

Using the cut-off CES-D score of ≥ 10 as depression,¹⁴ 631 (42.3%) participants were considered depressed. The prevalence of depression was similar between male and female participants and increased with age. The prevalence was highest among those aged ≥ 80 years (56.3%), followed by the 70 to 79 years age-group (41.8%) and the 60 to 69 years age-group (39.5%).

In univariate analysis, depression was associated with age-group, education, having a household member aged 0 to 5 years, social participation, hobby activities, residential district, ADL, IADL, and comorbidity (TABLE 2). Comparing male and female participants with depression, the prevalence of depression was higher in male than female participants when being unmarried (49.2% vs 40.3%, $p=0.045$) and having a household member aged 0 to 5 years (41.3% vs 31.8%, 0.044) [TABLE 2].

In multivariate logit regression, risk factors associated with depression were education level of no schooling (odds ratio [OR]=2.113, $p<0.001$) and elementary level (OR=1.816, $p=0.001$), residential districts of Badung (OR=1.745, $p=0.042$), Bangli (OR=2.343, $p=0.004$), Karangasem (OR=2.374, $p=0.003$), and Klungkung (OR=1.861, $p=0.02$), ADL dependent (OR=2.261, $p<0.001$) and slightly dependent (OR=1.471, $p=0.015$), IADL dependent (OR=1.827, $p=0.005$) and slightly dependent (OR=1.528, $p=0.002$), and comorbidity scores of 0-2 (OR=1.382, $p=0.029$), 3-4 (OR=1.512, $p=0.016$), and ≥ 5 (OR=3.088, $p<0.001$). Whereas being active in a hobby (OR=0.402, $p<0.001$) was associated with lower likelihood of depression (TABLE 3).

TABLE 1
Sociodemographic characteristics of participants

Variable	Mean $\pm$ SD (range)
Center for Epidemiologic Studies Depression score	9.04 $\pm$ 5.92 (0-30)
Sex (male=1)	0.48 $\pm$ 0.49 (0-1)
Age, y	69.6 $\pm$ 7.30 (60-100)
Marital status (married=1)	0.66 $\pm$ 0.47 (0-1)
Education, y	4.42 $\pm$ 5.72 (0-21)
Employment status (employed=1)	0.57 $\pm$ 0.49 (0-1)
Household member aged 0-5 years (yes=1)	0.21 $\pm$ 0.40 (0-1)
Household member aged 35-55 years (yes=1)	0.56 $\pm$ 0.49 (0-1)
Social participation (yes=1)	0.69 $\pm$ 0.46 (0-1)
Active in hobby (yes=1)	0.54 $\pm$ 0.49 (0-1)
Monthly household expenditure per capita, IDR	724 484 $\pm$ 567 480 (29 333-8 430 000)
Region (urban=1)	0.50 $\pm$ 0.50 (0-1)
District	
Badung (n=174)	0.11 $\pm$ 0.32 (0-1)
Bangli (n=165)	0.11 $\pm$ 0.31 (0-1)
Buleleng (n=154)	0.10 $\pm$ 0.30 (0-1)
Denpasar (n=171)	0.11 $\pm$ 0.31 (0-1)
Gianyar (n=167)	0.11 $\pm$ 0.31 (0-1)
Jembrana (n=156)	0.10 $\pm$ 0.30 (0-1)
Karangasem (n=174)	0.11 $\pm$ 0.32 (0-1)
Klungkung (n=169)	0.11 $\pm$ 0.32 (0-1)
Tabanan (n=163)	0.11 $\pm$ 0.31 (0-1)
Activities of Daily Living score	5.46 $\pm$ 1.15 (0-6)
Instrumental Activities of Daily Living score	4.77 $\pm$ 1.79 (0-6)
Comorbidity score	2.22 $\pm$ 2.28 (0-16)

Among male participants, risk factors for depression were education level of no schooling (odds ratio [OR]=2.171, $p=0.01$) and elementary level (OR=1.804, $p=0.012$), residential districts of Gianyar (OR=2.237, $p=0.036$), Karangasem (OR=2.504, $p=0.032$), and Klungkung (OR=2.643, $p=0.013$), IADL slightly dependent (OR=1.699, $p=0.009$), and comorbidity scores of ≥ 5 (OR=3.310, $p<0.001$). Whereas being active in a hobby (OR=0.446, $p<0.001$) was associated with lower likelihood of depression (TABLE 3).

TABLE 2
Prevalence of depression by sociodemographics among all, male, and female older adults in Bali

Variable	No.	Depression		t-stat	p value	Depression				t-stat	p value
		Yes	No			Male		Female			
		% (n)	% (n)			No.	% (n)	No.	% (n)		
Participants	1493	42.3 (631)	57.7 (862)	-45.14	<0.001	719	42.28 (304)	774	42.25 (327)	-0.01	0.989
Age group, y											
60-69	793	39.5 (313)	60.5 (480)	2.33	0.020	383	38.9 (149)	410	40.0 (164)	0.32	0.752
70-79	524	41.8 (219)	58.2 (305)	0.27	0.787	261	43.7 (114)	263	39.9 (105)	-0.87	0.385
≥80	176	56.3 (99)	43.7 (77)	-4.02	<0.001	75	54.7 (41)	101	57.4 (58)	0.36	0.717
Marital status											
Married	988	42.1 (416)	57.9 (572)	0.17	0.862	589	40.8 (240)	399	44.1 (176)	1.05	0.293
Unmarried	505	42.6 (215)	57.4 (290)	-0.17	0.862	130	49.2 (64)	375	40.3 (151)	-1.78	0.045
Education											
No schooling	484	51.0 (247)	49.0 (237)	-4.78	<0.001	126	54.8 (69)	358	49.7 (178)	-0.97	0.331
Elementary	761	42.2 (321)	57.8 (440)	0.06	0.947	420	44.5 (187)	341	39.3 (134)	-1.45	0.146
Secondary or above	248	25.4 (63)	74.6 (185)	5.95	<0.001	173	27.8 (48)	75	20.0 (15)	-1.29	0.199
Employment status											
Employed	851	41.4 (353)	58.5 (498)	0.71	0.481	469	40.5 (190)	382	42.7 (163)	0.64	0.525
Unemployed	642	43.3 (278)	56.7 (364)	-0.71	0.481	250	45.6 (114)	392	41.8 (164)	-0.94	0.349
Household member age, y											
0-5	308	36.7 (113)	63.3 (195)	2.23	0.026	160	41.3 (66)	148	31.8 (47)	-1.73	0.044
35-55	840	40.6 (341)	59.4 (499)	1.480	0.139	397	41.6 (163)	443	40.2 (178)	-2.26	0.796
Social participation											
Yes	1035	40.1 (415)	59.9 (620)	2.55	0.011	527	40.4 (213)	508	39.7 (202)	-0.21	0.830
No	458	47.2 (216)	52.8 (242)	-2.55	0.011	192	47.4 (91)	266	47.0 (125)	-0.09	0.932
Active in hobby											
Yes	800	29.9 (239)	70.1 (561)	10.80	<0.001	369	29.5 (109)	431	30.2 (130)	0.19	0.848
No	693	56.6 (392)	43.4 (301)	-10.80	<0.001	350	55.7 (195)	343	57.4 (197)	0.45	0.648
Economic status											
Poor	598	43.5 (260)	56.5 (338)	0.77	0.437	282	43.3 (122)	316	43.7 (138)	0.10	0.920
Not poor	895	41.5 (371)	58.5 (524)	-0.77	0.437	437	41.6 (182)	458	41.3 (189)	-0.12	0.908
Urban status											
Rural	746	45.9 (343)	54.0 (403)	2.91	0.004	355	44.2 (157)	391	47.6 (186)	0.91	0.360
Urban	747	38.5 (288)	61.5 (459)	-2.91	0.004	364	40.4 (147)	383	36.8 (141)	-1.00	0.317
District											
Badung	174	37.9 (66)	62.1 (108)	1.23	0.219	89	35.9 (32)	85	40.0 (34)	0.55	0.585
Bangli	165	60.0 (99)	40.0 (66)	-4.93	<0.001	73	53.4 (39)	92	65.2 (60)	1.54	0.123
Buleleng	154	39.6 (61)	60.4 (93)	0.70	0.482	70	40.0 (28)	84	39.3 (33)	-0.09	0.928
Gianyar	167	46.7 (78)	53.3 (89)	-1.23	0.218	82	51.2 (42)	85	42.4 (36)	-1.15	0.254
Jembrana	156	38.5 (60)	61.5 (96)	1.06	0.310	86	40.7 (35)	70	35.7 (25)	-0.63	0.528
Karangasem	174	48.8 (85)	51.2 (86)	-1.87	0.061	81	49.4 (40)	93	48.4 (45)	-0.13	0.896
Klungkung	169	49.7 (84)	50.3 (85)	-2.08	0.037	80	51.2 (41)	89	48.3 (43)	-0.38	0.705
Tabanan	163	34.9 (57)	65.1 (106)	1.98	0.045	79	35.5 (28)	84	34.5 (29)	-0.12	0.903
Denpasar	171	23.9 (41)	76.0 (130)	5.18	<0.001	79	24.0 (19)	92	23.9 (22)	-0.02	0.983
Activities of daily living											
Dependent	168	72.0 (121)	28.0 (47)	-8.48	<0.001	72	69.4 (50)	96	73.9 (71)	0.64	0.521
Slightly dependent	263	52.5 (138)	47.5 (125)	-3.71	<0.001	124	54.0 (67)	139	51.1 (71)	-0.48	0.633
Independent	1062	35.0 (372)	65.0 (690)	9.12	<0.001	523	35.8 (187)	539	34.3 (185)	-0.49	0.625
Instrumental activities of daily living											
Dependent	217	65.9 (143)	34.1 (74)	-7.77	<0.001	101	63.4 (64)	116	68.1 (79)	0.73	0.465
Slightly dependent	445	49.7 (221)	50.3 (224)	-3.79	<0.001	214	51.9 (111)	231	47.6 (110)	-0.89	0.371
Independent	831	32.1 (267)	67.9 (564)	9.12	<0.001	404	31.9 (129)	427	32.3 (138)	0.12	0.900
Comorbidity score											
0	413	33.4 (138)	66.6 (275)	4.30	<0.001	212	32.1 (68)	201	34.8 (70)	0.59	0.555
1-2	578	38.4 (222)	61.6 (356)	2.40	0.016	254	38.2 (97)	324	38.6 (125)	0.09	0.923
3-4	306	46.1 (141)	53.9 (862)	-1.51	0.130	144	44.4 (64)	162	47.5 (77)	0.53	0.590
≥5	196	66.3 (130)	33.7 (66)	-7.45	<0.001	109	68.8 (75)	87	63.2 (55)	-0.82	0.413

TABLE 3
Risk factors for depression among all, male, and female older adults in Bali

Risk factors	All subjects (n=1493)		Male (n=719)		Female (n=774)	
	Odds ratio (95% CI)	p Value	Odds ratio (95% CI)	p Value	Odds ratio (95% CI)	p Value
Age-group, y (ref: 60-69 y)						
70-79	0.848 (0.653-1.101)	0.215	0.979 (0.674-1.422)	0.913	0.734 (0.499-1.081)	0.117
≥80	1.217 (0.815-1.818)	0.337	1.098 (0.601-2.008)	0.761	1.288 (0.732-2.267)	0.380
Marital status (ref: unmarried)						
Married	1.207 (0.932-1.563)	0.154	0.837 (0.539-1.299)	0.427	1.530 (1.072-2.183)	0.019
Education (ref: secondary or above)						
No schooling	2.113 (1.408-3.171)	<0.001	2.171 (1.199-3.931)	0.010	2.617 (1.280-5.349)	0.008
Elementary	1.816 (1.257-2.624)	0.001	1.804 (1.138-2.860)	0.012	2.090 (1.048-4.169)	0.036
Employment status (ref: unemployed)						
Employed	1.177 (0.911-1.522)	0.212	1.083 (0.731-1.606)	0.691	1.224 (0.856-1.751)	0.268
Household member aged 0-5 y (ref: no)						
Yes	0.760 (0.565-1.023)	0.070	0.951 (0.627-1.440)	0.811	0.570 (0.366-0.888)	0.013
Household member aged 35-55 y (ref: no)						
Yes	0.850 (0.656-1.101)	0.217	0.912 (0.631-1.318)	0.623	0.816 (0.560-1.190)	0.292
Social participation (ref: no)						
Yes	1.067 (0.808-1.409)	0.646	1.107 (0.727-1.685)	0.635	1.047 (0.713-1.538)	0.815
Hobby (ref: not active)						
Active	0.402 (0.315-0.513)	<0.001	0.446 (0.315-0.631)	<0.001	0.339 (0.235-0.488)	<0.001
Economic status (ref: poor)						
Not poor	1.093 (0.852-1.402)	0.484	1.104 (0.766-1.591)	0.595	1.116 (0.785-1.586)	0.541
Region (ref: rural)						
Urban	1.068 (0.823-1.385)	0.620	1.151 (0.789-1.679)	0.464	1.026 (0.707-1.489)	0.892
District (ref: Denpasar)						
Badung	1.745 (1.021-2.982)	0.042	1.873 (0.862-4.066)	0.113	1.603 (0.742-3.462)	0.229
Bangli	2.343 (1.314-4.178)	0.004	2.061 (0.884-4.807)	0.094	2.537 (1.116-5.767)	0.026
Buleleng	1.684 (0.965-2.938)	0.066	1.939 (0.843-4.457)	0.119	1.515 (0.700-3.283)	0.292
Gianyar	1.491 (0.882-2.519)	0.136	2.237 (1.054-4.749)	0.036	0.956 (0.448-2.044)	0.908
Jembrana	1.266 (0.725-2.210)	0.407	1.757 (0.789-3.917)	0.168	0.843 (0.372-1.914)	0.684
Karangasem	2.374 (1.350-4.175)	0.003	2.504 (1.082-5.792)	0.032	2.198 (0.995-4.855)	0.051
Klungkung	1.861 (1.102-3.144)	0.020	2.643 (1.226-5.700)	0.013	1.303 (0.619-2.742)	0.485
Tabanan	1.063 (0.605-1.866)	0.831	1.341 (0.591-3.042)	0.483	0.865 (0.390-1.919)	0.721
Activities of Daily Living score (ref: independent)						
Dependent	2.261 (1.475-3.464)	<0.001	1.784 (0.955-3.334)	0.069	2.580 (1.413-4.712)	0.002
Slightly dependent	1.471 (1.079-2.006)	0.015	1.542 (0.980-2.428)	0.061	1.429 (0.920-2.220)	0.112
Instrumental activities of daily living score (ref: independent)						
Dependent	1.827 (1.203-2.774)	0.005	1.720 (0.936-3.161)	0.081	1.927 (1.056-3.516)	0.033
Slightly dependent	1.528 (1.163-2.008)	0.002	1.699 (1.142-2.527)	0.009	1.394 (0.937-2.075)	0.101
Comorbidity score (ref: 0)						
0-2	1.382 (1.034-1.847)	0.029	1.435 (0.945-2.179)	0.090	1.427 (0.935-2.179)	0.100
3-4	1.512 (1.081-2.114)	0.016	1.336 (0.828-2.157)	0.236	1.936 (1.185-3.163)	0.008
≥5	3.088 (2.070-4.607)	<0.001	3.310 (1.905-5.751)	<0.001	3.531 (1.919-6.498)	<0.001

Among female participants, risk factors for depression were being married (OR=1.530, $p=0.019$), education level of no schooling (odds ratio [OR]=2.617, $p=0.008$) and elementary level (OR=2.090, $p=0.036$), residential district of Bangli (OR=2.537, $p=0.026$), ADL dependent (OR=2.580, $p=0.002$), IADL dependent (OR=1.927, $p=0.033$), and comorbidity scores of 3-4 (OR=1.936, $p=0.008$) and ≥ 5 (OR=3.531, $p<0.001$). Whereas having a household member aged 0-5 years (OR=0.570, $p=0.013$) and being active in a hobby (OR=0.339, $p<0.001$) were associated with lower likelihood of depression (TABLE 3).

DISCUSSION

Consistent with previous studies,^{21,22} there were slight differences in risk factors between male and female older adults in Bali. Although employment and economic status were not associated with depression, such associations have been reported in other studies.²³⁻²⁵ The prevalence of depression among older adults in Bali was 42.3%, which is higher than the 31.7% in West Java,²⁶ 11.3% in Yogyakarta,¹² and 24.9% in the entire nation,²⁷ as well as 14.5% in South Korea,²³ 39.6% in Vietnam,²⁸ and 32.9% in Thailand.²⁹

Opposite to previous studies,^{16,18,28} female older adults in Bali were more likely to be depressed if they were married (compared with unmarried), probably because married women may feel overwhelmed by family responsibility such as the obligation to maintain husband's necessities in the house.^{30,31} In addition, female older adults in Bali were less likely to be depressed if having a grandchild in the household, consistent with a study in Greece.²¹ Although grand-parenting can be a burden, the bond between female older adults and grandchildren is beneficial for well-being and can reduce the feeling of loneliness in late-life.³²

The impact of no or low education on depression was more noticeable in female than male older adults in Bali. Low educational status is associated with higher prevalence of depression in Korean older adults.³³ Men with better education have a lower prevalence of mental disorder.³⁴ In the United States, the prevalence of depression is higher among individuals with <12 years of education.³⁵ Each additional year of education can decrease the log odds

ratio of being depressed by 3%.³⁶ Education plays a role in obtaining better working conditions, higher incomes, and improving the overall knowledge of health. Only 17% of our participants had higher than primary schooling.

Old adults in Bali who were active in a hobby were less likely to be depressed. High engagement in hobbies is associated with decreased mortality and depression.^{17,37} Staying busy with enjoyable activities provides relief to the mind. Older adults have less time and energy to worry if they keep busy with their interests.³⁸ Singing (through a choir, karaoke, or at home) can release endorphins.³⁹ Dancing can increase strength and balance in older adults.⁴⁰ Listening to and playing music are beneficial for relaxing the body and mind.⁴¹

Neighbourhoods can be a stressor to elicit depression.⁴² The risk of depression was higher in male older adults living in Gianyar, Karangasem, and Klungkung and in female older adults living in Bangli, compared to Denpasar. According to Statistics Bali in 2018,⁴³ residents of Karangasem, Klungkung, and Bangli have the lowest years of schooling, with a mean of 5.52 years, 6.8 years, and 7.4 years, respectively. They also have the lowest life expectancy of around 69.83 years and have the lowest poverty line in Bali. In rural China, poor socioeconomic status results in poor access to healthcare, particularly mental health services, resulting in difficulties in diagnosis and treatment of depression.²⁴

Female older adults who were ADL and IADL dependent and male older adults who were IADL slightly dependent were more likely to have depression. It implied that female older adults were at higher risk of depression, consistent with a study in rural China.⁴⁴ Older women engage in lower physical activity than older men, resulting in a higher reduction in ADL and a lower degree of independence.⁴⁵ Dependence may generate a feeling of guilt, sadness, and self-blamed that causes depression in the long term.^{46,47}

The risk of depression increased with higher comorbidity scores. The impact of comorbidity on depression was higher in female older adults, consistent with one study.⁴⁸ Chronic diseases reduce quality of life owing to associated pain and functional impairment.⁴⁹ The prevalence of

depression is higher in patients with pain.⁵⁰ The three chronic illnesses with the strongest associations to depression are all related to pain.⁵¹ Disability is a stressful condition that imposes an increased level of dependency and requires adjustments to a new way of living.⁵² Disability in self-care, social activities, and participation in society are associated with depression.⁵³ People with disabilities have higher levels of secondary conditions such as chronic pain, fatigue, difficulties maintaining friends, and feeling isolated.⁵⁴

This study has limitations. Its cross-sectional design can only determine the association between risk factors and depression. It is not possible to determine causation. Longitudinal studies of the population are warranted. People living in institutions such as hospitals or nursing homes were not included; the prevalence of depression among those living in institutions is higher than those living in the community.⁵⁵ The self-report nature of the study may result in reporting bias; respondents may not be truthful about symptoms related to depression.

CONCLUSION

The prevalence of depression among older adults in Bali was high (42.3%) and increased with age. Female older adults were more likely to be depressed when they were married, ADL and IADL dependent, and had comorbidity scores of 3-4 and ≥ 5 . Having a grandchild in the household and active participation in hobbies were associated with lower risk of depression.

DECLARATION

The authors have no conflict of interest to disclose.

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