

Depressive Symptoms in the Ageing Male Population Residing in Old Age Homes and with their Families in Punjab State

Kulvir Singh¹, S. P. Singh² and Ginjinder Kaur³

Department of Human Genetics, Punjabi University Patiala, India
E-mail: ¹<kulvir.singh.hb@gmail.com>, ²<swinder1951@gmail.com>, ³<ginjinderkaur@gmail.com>

KEYWORDS Body Composition. Depression. Old Age Home. Obesity. Waist Circumference

ABSTRACT The present study envisaged to estimate prevalence of depressive symptoms and associated risk factors in 400 male subjects (200 old age home based subjects and 200 family based subjects) aged 60 years and above. Depressive symptoms were prevalent in 68.5 percent of old age home based subjects and 31.5 percent of family based subjects. Among the former, being normal weight ($B=-1.22$, $p<0.01$), overweight ($B=-1.48$, $p=0.01$) and higher educational status ($B=-3.30$, $p<0.001$) were associated negatively, while systolic blood pressure >120 mmHg and having a male child ($B=0.92$, $p=0.03$) were associated positively with depressive symptoms. In family based subjects, being overweight ($B=-1.98$, $p<0.001$), obese ($B=-1.73$, $p<0.01$) and having a male child ($B=-1.34$, $p<0.01$) were associated negatively with depressive symptoms. Underweight male elderly were at highest risk of depressive symptoms. The association of having a male child with depressive symptoms pointed towards the importance of children support in later life.

INTRODUCTION

According to the India Census (2011), the percentage of elderly population above 60 years of age has gone up from six to eight percent during 1991 to 2011, and is projected to increase to twenty percent by 2050 (United Nations 2013). The states of Kerala, Goa, Tamil Nadu and Punjab had 12.6, 11.2, 10.4 and 10.3 percent of 60+ population respectively (BKPAI 2013). These four states account for the highest percentage of the elderly population. Singh (2001) studied the ageing trends in Punjab and found that the rate of growth of the 60 plus population (2.81%) in the state is higher than that for the general population (2.10%). Given to the higher growth of elderly population, the old age dependency ratio in Indian population increased from 2001 (13.1%) to 2011 (14.2%) (Central Statistics Office 2016).

Depression among elderly population is a major health concern, causing adverse effects on their health. Worldwide, depression is the leading cause of ill health and disability, and it has highest prevalence in the older adults (5.5%

in male elderly) and 4.4 percent of world population is suffering from depression, eighteen percent increase was observed in people with depression between 2005 and 2015 (WHO 2017). Depression is a common mental disorder that is associated with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration (WHO 2017). For healthy ageing of the older adult, both psychological and physical wellness are equally important (Johnson et al. 2011). Depression is a leading cause of loss of productivity (Ebmeier et al. 2006) and physical disability among older adults (Lin and Wu 2011; Bowen and Ruch 2015). Elderly suffering from depressive symptoms were at increased risk of mortality (Edward and Munro 2009). About two percent of the patients suffering from depression commit suicide (Bostwick and Pankratz 2000). Improvement in depressive symptoms dilutes the negative effect of cognitive decline (Li and Conwell 2009). Reducing depression and physical disability, both promote healthy ageing (Jeste et al. 2013).

Recent changes in occupational structure, migration, urbanization and decline in the family size, have changed the family structure, where adult children do not always live with their parents. The preference for home-based care is changing. In India, the public provision of the old age care has always been less, and the fam-

Address for correspondence:

Ginjinder Kaur

Assistant Professor

Department of Human Genetics, Punjabi University
Patiala, India

E-mail: ginjinderkaur@gmail.com

ily system played a key role in the protection of the old. The children are the major source of social support to the parents (Knodel and Debavalya 1997). About 2.73 percent of elderly care in India occurs in institutionalized or formal setting (Jamuna 2003) and only six percent Indian elderly are staying in the setting where their immediate relatives are not living (Rajan and Kumar 2003). Elderly not staying with their children are at higher risk of adverse psychological and cognitive outcomes (Jariwala et al. 2010; Sethi et al. 2013). Social support in the later ages of life reduced the risk of depression (Wan et al. 2013). Psychological health and quality of life among old age home based elderly subjects depends upon the various psychological, social, and economic factors (Reddy et al. 2012; Kumar et al. 2017).

In the light of these changes, living arrangements of the elderly have emerged as an important area of research. Therefore, there is a need to determine various factors associated with the psychological health status of old age home based subjects and family based subjects. The present study was conducted with the view to determine various factors associated with depressive symptoms among the old age home based and family based elderly subjects, aged 60 years and above.

Objectives

To compare the prevalence of depressive symptoms according to various risk factors between the elderly residing in old age homes and those residing with their families.

METHODOLOGY

In the present cross-sectional study, the data of 400 male subjects aged 60 years and above (200 living in old age home and 200 living with family) was collected from various districts of Punjab. The sample was collected by convenient sampling method from 2013 to 2016 from various districts of Punjab. Ethical clearance had been obtained from Institution Clinical Ethical Committee, Punjabi University, Patiala. Data on anthropometric measurements (height, weight, waist circumference, hip circumference) and other information were obtained for each subject. Consent was obtained from each subject during the collection of data.

All the anthropometric measurements were taken by using standard anthropometric techniques (Lohman et al. 1988). Height and weight were measured to the nearest 1 millimeter and 0.5 kilograms respectively. The subjects who were not able to stand straight due to major disabilities or some other reason, were excluded from the study. Circumferences were measured using steel tape to the nearest 1 centimeter (cm).

BMI was categorized into following categories: less than 18.5 kg/m² underweight; 18.5–23 kg/m² increasing but acceptable risk; 23–27.5 kg/m² increased risk; and 27.5 kg/m² or higher high risk (WHO 2004). WHR was categorized into two groups: up to 0.89 and ≥ 0.90 , and waist circumference was also categorized into groups: up to 90 cm and >90 cm.

Depressive symptoms were measured by Epidemiologic Studies Depression scale (CES-D). The Center for Epidemiologic Studies Depression scale (CES-D) is a short self-report scale designed to measure depressive symptomatology in the general population. It has been developed by Radloff (1977). Beekman et al. (1997) concluded that the criterion validity of the CES-D was very satisfactory in the sample of older adults. The possible range of scores for CESD is between 0 and 60, with a higher score indicating more symptoms of depression and a lower score indicating otherwise. A score of 16 has widely been used as a standard threshold indicating possible clinical depression (Radloff 1977; Weissman et al. 1977; Huba et al. 1995). Depression questionnaire (CESD-20) was checked for reliability by test-retest method (reliability=0.959). The internal consistency coefficient Cronbach's alpha was 0.946, indicating very high reliability.

RESULTS

Depressive symptoms were found in 68.5 percent of old age home based subjects and 31.5 percent of family based subjects. The mean depressive symptom score in old age home based subjects and family based subjects was 19.96 \pm 7.48 and 11.18 \pm 10.24 respectively. Depressive symptom score at all the age groups (60–69 years, 70–79 years and ≥ 80 years), was significantly greater among old age home based subjects than the family based subjects ($t=4.74$, $p<0.001$; $t=7.69$, $p<0.001$; $t=9.78$, $p<0.001$). There was no effect of age on the level of de-

pressive symptoms among both the groups of elderly ($f=1.58, p=0.20$; $f=0.48, p=0.01$). It means the depressive symptoms observed in 60-69 years age group did not increase in intensity with ageing (Table 1).

Age and duration of residence in the old age home had no effect on the prevalence of depressive symptoms among the male older adults. Among old age home based subjects, the prevalence of depressive symptoms was lower in those educated up to matric (60.5%), and secondary and higher education (13.3%) standard as compared to uneducated (81.7%) old age home based subjects. While among family based subjects, the prevalence of depressive symptoms was almost similar at all the educational standards (uneducated=30.9%, matric=35.1%, and secondary and higher=28.6%). Among old age home based subjects, older adults with no personal source of income had a higher percentage (70.4%) of depression cases as compared to those with some personal source of income (54.2%). Among family based subjects, personal source of income had no effect on the prevalence of depression (Table 2).

The prevalence of depressive symptoms decreased with increasing body mass index categories among old age home based subjects (underweight= 82.4%, normal weight= 52.5%, overweight= 36.8%, obese= 33.3%). Among family based subjects, the prevalence of depressive symptoms decreased from underweight (54.1%) to overweight (19.1%) categories and then increased slightly in obese (25%) older adults. In old age home based subjects as well as family based subjects, the percentage of elderly adults suffering from depressive symptoms was higher in the category of those with waist circumference lower than and equal to 90 cm (71.34% and 47.7% respectively), as compared to those in

category with waist circumference greater than 90 cm. Similarly, in the old age home based subjects as well as family based subjects, the prevalence of depressive symptoms was higher in category with waist to hip ratio up to 0.89 (74.6% and 65% respectively), as compared to those in the category with waist to hip ratio greater than or equal to 0.90. Among old age home based subjects, the prevalence of depressive symptom was higher among those with systolic blood pressure higher than 120 mmHg (70.4%) as compared to those with systolic blood pressure lower than 120 mmHg. While among family based subjects, blood pressure had no effect on the prevalence of depressive symptoms (Table 2).

After adjusting for various covariates, among the old age home based subjects being normal weight ($B=-1.22, p<0.01$), overweight ($B=-1.48, p=0.01$) and educational status up to secondary or higher ($B=-3.30, p<0.001$) were associated independently with lower risk of depression, while the systolic blood pressure higher than 120 mmHg and having a male child ($B=0.92, p=0.03$) was associated independently with higher risk of suffering from depressive symptoms. On the other hand, among the family based subjects being overweight ($B=-1.98, p<0.001$), obese ($B=-1.73, p<0.01$), waist to hip ratio greater than or equal to .90 ($B=-1.22, p<0.01$) and having a male child ($B=-1.34, p<0.01$) were associated independently with lower risk of suffering from depressive symptoms (Table 3).

DISCUSSION

In the present study, the higher incidence of depression was observed in old age homes based subjects (68.5%) as compared to family based elderly (31.5%). The higher incidence of depressive symptoms among the old age home based

Table 1: Difference in depressive symptom score with advancing age among old age home based subjects and family based subjects

Measurements	Age group	Old age home based elderly	Family based elderly	t-test	Old age home based elderly	Family based elderly
		Mean \pm SD	Mean \pm SD		F (p)	F (p)
Depression Score	60-69 years	18.77 \pm 7.978	11.08 \pm 11.427	4.74***	1.58(0.21)	0.48 (0.67)
	70-79 years	20.39 \pm 6.955	10.26 \pm 8.500	7.69***		
	\geq 80 years	21.86 \pm 8.866	13.14 \pm 5.726	3.87***		
	Total	19.96 \pm 7.481	11.18 \pm 10.247	9.78***		

*Mildly significant <0.05, **Moderately significant <0.01, ***Highly significant <0.001

Table 2: Prevalence of depressive symptoms among old age home based subjects and family based subject

Measurements	Old age home based subjects (N=200)			Family based subjects (N=200)		
	n	Depressed	Non-depressed	n	Depressed	Non-depressed
<i>Age (years)</i>						
60-69	62	39 (62.9%)	23 (37.1%)	122	39 (32.0%)	83 (68.0%)
70-79	116	83 (71.6%)	33 (28.4%)	56	15 (26.8%)	41 (73.2%)
≥ 80	22	15 (68.2%)	7 (31.8%)	22	9 (40.9%)	13 (59.1%)
<i>Duration in Old Age Home (years)</i>						
<10	143	92 (64.3%)	51 (35.7%)		-	-
≥ 10	57	45 (78.9%)	12 (21.1%)		-	-
<i>Education Status</i>						
Uneducated	109	89 (81.7%)	20 (18.3%)	149	46 (30.9%)	103 (69.1%)
Matric	76	46 (60.5%)	30 (39.5%)	37	13 (35.1%)	24 (64.9%)
Secondary/higher	15	2 (13.3%)	13 (86.7%)	14	4 (28.6%)	10 (71.4%)
<i>Personal Source of Income</i>						
Yes	14	13 (54.2%)	11 (45.8%)	116	38 (32.8%)	78 (67.2%)
No	176	124 (70.5%)	52 (29.5%)	84	25 (29.8%)	59 (70.2%)
<i>Number of Children</i>						
No child	25	14 (56.0%)	11 (44.0%)	15	6 (40.0%)	9 (60.0%)
Upto 3	99	74 (74.7%)	25 (25.3%)	63	16 (25.4%)	47 (74.6%)
More than 3	76	49 (64.5%)	27 (35.5%)	122	41 (33.6%)	81 (66.4%)
<i>Number of Male Child</i>						
No male child	04	22 (55.0%)	18 (45.0%)	20	10 (50.0%)	10 (50.0%)
Upto 1	144	107 (74.3%)	37 (25.7%)	160	48 (30.0%)	112 (70.0%)
More than 1	16	8 (50.0%)	8 (50.0%)	20	5 (25.0%)	15 (75.0%)
<i>Body Mass Index (kg/m²)</i>						
<18.50 kg/m ²	119	98 (82.4%)	21 (17.6%)	37	20 (54.1%)	17 (45.9%)
18.50-23.00 kg/m ²	59	31 (52.5%)	28 (47.5%)	36	15 (41.7%)	21 (58.3%)
23.01-27.50 kg/m ²	19	7 (36.8%)	12 (63.2%)	68	13 (19.1%)	55 (80.9%)
>27.50 kg/m ²	3	1 (33.3%)	2 (66.7%)	59	15 (25.4%)	44 (74.6%)
<i>Waist Circumference (cm)</i>						
Up to 90 cm	181	129 (71.34)	52 (28.7%)	65	31 (47.7%)	34 (52.3%)
>90 cm	19	8 (42.1)	11 (57.9%)	126	30 (23.8%)	96 (76.2%)
<i>Waist to Hip Ratio</i>						
Up to 0.89	130	97 (74.6%)	33 (25.4%)	20	13 (65.0%)	7 (35.0%)
≥0.90	69	39 (56.5%)	30 (43.5%)	180	50 (27.8%)	130 (72.2%)
<i>Systolic Blood Pressure (mmHg)</i>						
≤120	14	6 (42.9%)	8 (57.1%)	66	20 (30.3%)	46 (69.7%)
>120	186	131 (70.4%)	55 (29.6%)	134	43 (32.1%)	91 (67.9%)
<i>Diastolic Blood Pressure (mmHg)</i>						
≤ 80	46	30 (65.2%)	16 (34.8%)	58	17 (29.3%)	41 (70.7%)
>80	514	107 (69.5%)	47 (30.5%)	142	46 (32.4%)	96 (67.6%)

subjects may be attributed to the fact that institutionalization limits the social relations, reduced interest in activities, orients thoughts toward death and even to suicide, while family based subjects are more optimistic than institutionalized older adults (Montano 1999; Runcan et al. 2010; Runcan 2012; Sarin et al. 2016). Nagaraj et al. (2011) also found that old age home based subjects had higher prevalence of depression (36%) as compared to home based subjects (22%). However, the percentage of depressed elderly was comparatively lower as compared to present study. Kumar et al. (2017) observed depression in 85.81 percent of old age home based

subjects. Studies conducted among old age home based subjects of India found the prevalence of depression from twenty-five to ninety-five percent (Jariwala et al. 2010; Narkhede et al. 2012; Singh et al. 2012; Chalise 2014; Goud and Nikhade 2015; Kumar et al. 2017). Among family based subjects from Punjab region and Northern part of India, the prevalence of depression was recorded from 8.9 to seventy-seven percent (Sood et al. 2006; Goyal and Kajal 2014; Sekhon et al. 2015; Sengupta and Benjamin 2015; Buvneshkumar et al. 2018). Grover and Malhotra (2015) reviewed Indian literature on the incidence of depressive symptoms and reported the prevalence

Table 3: Binary logistic regression analysis to determine factors associated independently with depression

Variables	B	S.E	p	Adjusted odds ratio	95% confidence interval
<i>Old Age Home Based Subjects[†]</i>					
<i>Body Mass Index (kg/m²)</i>					
Underweight			Referent		
Normal weight	-1.22	0.40	0.00**	0.29	0.13-0.64
Overweight	-1.48	0.61	0.01*	0.22	0.06-0.74
Obese	-2.34	1.28	0.06	0.09	0.00-1.18
<i>Educational Status</i>					
Uneducated			Referent		
Upto metric	-0.78	0.38	0.04	0.45	0.21-0.97
Secondary or higher	-3.30	0.84	0.00***	0.03	0.00-0.19
<i>Systolic Blood Pressure (mmHg)</i>					
<120			Referent		
>120	1.55	0.66	0.01*	4.74	1.30-17.32
<i>Number of Male Children</i>					
None					
1 male children	0.92	0.44	0.03*	2.52	1.06-6.01
More than equal to 2	-0.22	0.67	0.74	0.79	0.21-3.02
<i>Family based subjects[‡]</i>					
<i>Body Mass Index (kg/m²)</i>					
Underweight			Referent		
Normal weight	-0.55	0.49	0.26	0.57	0.21-1.51
Overweight	-1.98	0.49	0.00***	0.13	0.05-0.36
Obese	-1.73	0.49	0.00**	0.17	0.06-0.46
<i>Waist to Hip Ratio</i>					
<0.89			Referent		
≥90	-1.22	0.36	0.00**	0.29	0.14-0.59
<i>Number of Male Children</i>					
None			Referent		
1 male children	-1.34	0.54	0.01*	0.26	0.08-0.76
More than equal to 2	-1.56	0.76	0.04	0.20	0.04-0.93

[†]-2 Log likelihood=188.740, [†]Hosmer and Lemeshow test (p) = 0 .624

[‡] -2 Log likelihood=215.292, [‡]Hosmer and Lemeshow test (p) = 0.918

*Mildly significant <0.05, **Moderately significant <0.01, ***Highly significant <0.001

of 8.9 percent to 62.16 percent among the family based subjects.

The researchers' study revealed that with increasing BMI in both the groups of elderly, the percentage of elderly experiencing depressive symptoms decreased. Among old age home based elderly, the normal weight (OR=0.29) and overweight (OR=0.22) elderly were at significantly lower risk of depressive symptoms as compared to under-weight older adults. On the other hand, among family based elderly overweight (OR=0.13) and obese (OR=0.17) elderly were at lower risk of depressive symptoms as compared to underweight family based subjects. As observed by the current study, Cho et al. (2018) and Oh et al. (2018) also found that underweight elderly men had significantly higher risks (OR=1.77 and OR=1.776 respectively) and over-

weight elderly men had a significantly lower risk of depression (OR= 0.821 and OR=0.522 respectively). Similarly, Ho et al. (2008) found decrease in incidence of depression with increasing BMI categories (16.9% in underweight, 14.2% in normal weight, 12.1% in overweight to obese). Pushparani et al. (2017) and Sirohi et al. (2017) investigated the association between BMI and depression in the Indian population and revealed that incidence of depression was higher among underweight elderly. However, longitudinal study conducted by Dearborn et al. (2018) reported that body mass index and depression did not have inverse relationship among older adults. The negative association between body mass index and depressive symptoms among older adults may be attributable to the protective effect of body mass index on muscle mass and bone mineral density (Barrera et al. 2004;

Lee et al. 2007; Jiang et al. 2015). The higher muscle mass and bone mineral density is vital for maintaining greater activity in later ages, and reduced the incidence of depressive symptoms (Spirduso 1975; Ho et al. 2008; Burns et al. 2010; Batista et al. 2014; Hsu et al. 2014). The lower BMI and waist to hip ratio of elderly indicate poor nutritional status, which may lead to the depression among the underweight older adults (Kaur and Mal 2017).

There was no effect of age on the level of depressive symptoms among old age home based subjects as well as family based subjects from 60 years to ≥ 80 years. It can be elaborated that the depressive symptoms observed in 60-69 years age group did not increase in intensity with ageing. Similarly findings were presented by Jariwala et al. (2010) and Buvneshkumar et al. (2018) showing no proportional difference in prevalence of depression between age group less than 70 years and 70 years and above in elderly residing old age homes as well as those residing with their families. Behera et al. (2016) also observed non-significant odds of incidence of depression with advancing age groups in elderly from rural community of northern India. Other studies conducted in different cities of India also presented similar findings of non-significant association of depression with age (Sinha et al. 2013; Goyal and Kajal 2014; Thirthahalli et al. 2014). In present study, percentage of depressed had not increased significantly from age group 60-69 years (32%) to 70-79 years (26.8%) to 80 years and above (40.9%). On the other hand, Goud and Nikhade (2015) observed significant increase percentage of depressed elderly in old age homes from young old (47.92%) to mild old (57.69%) to old old (83.33%). Some other studies conducted among old age homes residents of Nepal and India also observed contrasting results among old age homes residents and found a significant positive correlation between age and depression (Narkhede et al. 2012; Chalise 2014; Maktha and Kumar 2015). The contrasting results observed in old age homes residents may be because in present study only those elderly were included, who were residing in old age homes from at least last 5 years.

Among old age home based subjects, depressive symptoms were significantly lower in higher education levels than those among uneducated elderly in the present study (81.7% in

uneducated, 60.5% in up to matric level and 13.3% in high education level). On the other hand, among elderly residing with their families education level was not associated with the depressive symptoms. Findings similar to old age home based elderly of present study were reported by Thirthahalli et al. (2014), observing lower depression in higher education level among slum dwelling elderly (43.3% in uneducated, 35.6% in middle level, 33.3% in primary level and 22.7% in higher education level). Different studies conducted to investigate the association of depression and education status in various populations of Indian elderly observed inconsistent results. Goyal and Kajal (2014) found that illiterate elderly from Punjab had higher depression as compared to that among literate elderly from Punjab. On the other hand, Buvneshkumar et al. (2018) found higher depression in literate older adults, whereas Behera et al. (2016) observed no association between depression and education level among older adults. Education improves the communication and cognitive abilities, which allowed the elderly to share their problems more easily. Educated elderly are also more aware of their health problems and public health facilities. Therefore, the older adults with education were socially and economically more independent and were lesser vulnerable to depression. The uneducated older men were observed to be less active, which is a risk factor for higher depression (OR=2.394) (Cho et al. 2018).

In old age home based subjects having a male child was associated positively with depressive symptoms, while among family based subjects, it was associated negatively with depressive symptoms. The association of the having a male child with depressive symptoms pointed toward the importance of children support in later life (Runcan et al. 2010).

CONCLUSION

Prevalence of depressive symptoms among the old age home based subjects was twice as compared to family based subjects. There was no effect of age on the level of depressive symptoms among both the groups of elderly. Among old age home based subjects being normal weight, overweight and educational status up to secondary and higher were associated independently with a lower risk of depression, while higher systolic blood pressure and having a male

child was associated independently with a higher risk of suffering from depressive symptoms. On the other hand, among family based subjects being overweight, obese, waist to hip ratio greater than or equal to .90 and having a male child were associated independently with lower of suffering from depressive symptoms.

RECOMMENDATIONS

Family based elderly were lesser vulnerable to depression. This may be because family acts as a cushion against physical and economical pressures of older age. In the later life, maintaining higher weight than normal may be protective against depressive symptoms.

ACKNOWLEDGMENTS

The present study was carried out from the grant received as fellowship from MANF, UGC, New Delhi to the first author. The researchers thank all the subjects for their full participation without whose cooperation the study would have not been completed.

REFERENCES

- Barrera G, Bunout D, Gattas V, Maza MP, Leiva L, Hirsch S 2004. A high body mass index protects against femoral neck osteoporosis in healthy elderly subjects. *Nutrition*, 20(9): 769-771.
- Batista FS, Gomes GAO, D'Elboux MJ, Cintra FA, Neri AL, Guariento ME, Souza MLR 2014. Relationship between lower-limb muscle strength and functional independence among elderly people according to frailty criteria: A cross-sectional study. *Sao Paulo Med J*, 132(5): 282-289.
- Beekman ATF, Deeg DJH, Limbeek JV, Braam AW, Vries MZD, Tilburg WV 1997. Criterion validity of the center for epidemiologic studies depression scale (CES-D): Results from a community-based sample of older subjects in the Netherlands. *Psychological Medicine*, 27: 231-235.
- Behera P, Sharan P, Mishra AK, Nongkynrih B, Kant S, Gupta SK 2016. Prevalence and determinants of depression among elderly persons in a rural community from northern India. *Natl Med J India*, 29: 129-135.
- Bostwick JM, Pankratz VS 2000. Affective disorders and suicide risk: A re-examination. *American Journal of Psychiatry*, 157(12): 1925-1932.
- Bowen ME, Ruch A 2015. Depressive symptoms and disability risk among older White and Latino adults by nativity status. *Journal of Aging and Health*, 27(7): 1286-1305.
- Building a Knowledge Base on Population Ageing in India (BKPAI) 2013. *The Status of Elderly in Punjab, 2011*. New Delhi: United Nations Population Fund.
- Burns JM, Johnson DK, Watts A, Swerdlow RH, Brooks WM 2010. Reduced lean mass in early alzheimer disease and its association with brain atrophy. *Arch Neurol*, 67(4): 428-433.
- Buvneshkumar M, John KR, Logaraj M 2018. A study on prevalence of depression and associated risk factors among elderly in a rural block of Tamil Nadu. *Indian J Public Health*, 62: 89-94.
- Central Statistics Office 2016. *Elderly in India- Profile and Programmes 2016*. India: Ministry of Statistics and Programme Implementation, Government of India.
- Chalise HN 2014. Depression among elderly living in Briddashram (old age home). *Advances in Aging Research*, 3: 6-11.
- Cho J, Jin Y, Kang H 2018. Weight status, physical activity, and depression in Korean older adults. *Journal of Epidemiology*, 28(6): 292-299.
- Dearborn PJ, Robbins MA, Elias MF 2018. Challenging the "jolly fat" hypothesis among older adults: High body mass index predicts increases in depressive symptoms over a 5-year period. *J Health Psychol*, 23(1): 48-58.
- Ebmeier KP, Donaghey C, Steele JD 2006. Recent developments and current controversies in depression. *Lancet*, 367(9505): 153-167.
- Edward KL, Munro I 2009. Nursing considerations for dual diagnosis in mental health. *International Journal of Nursing Practice*, 15(2): 74-79.
- Goud AA, Nikhade NS 2015. Prevalence of depression in older adults living in old age home. *IAIM*, 2(11): 1-5.
- Goyal A, Kajal KS 2014. Prevalence of depression in elderly population in the southern part of Punjab. *Family Med Prim Care*, 3(4): 359-361.
- Grover S, Malhotra N 2015. Depression in elderly: A review of Indian research. *J Geriatr Ment Health*, 2: 4-15.
- Ho RC, Niti M, Kua EH, Ng TP 2008. Body mass index, waist circumference, waist-hip ratio and depressive symptoms in Chinese elderly: A population-based study. *Int J Geriatr Psychiatry*, 23(4): 401-408.
- Hsu YH, Liang CK, Chou MY, Liao MC, Lin YT, Chen LK, Lo YK 2014. Association of cognitive impairment, depressive symptoms and sarcopenia among healthy older men in the veterans' retirement community in southern Taiwan: A cross-sectional study. *Geriatrics and Gerontology International*, 14: 102-108.
- Huba GJ, Melchior LA, Staff of the Measurement Group, HRSA/HAB's SPNS Cooperative Agreement Steering Committee 1995. *Module 26: CES-D Form Scoring Instruments*. Culver City, California: The Measurement Group.
- Jamuna D 2003. Issues of elder care and elder abuse in the Indian context. *Journal of Ageing and Social Policy*, 15(2): 125.
- Jariwala V, Bansal RK, Patel S, Tamakuwala B 2010. A study of depression among aged in Surat city. *Natl J Community Med*, 1: 47-49.
- Jeste DV, Savla GN, Thompson WK 2013. Older age is associated with more successful aging: Role of resil-

- ience and depression. *The American Journal of Psychiatry*, 170(2): 188-196.
- Jiang Y, Zhang Y, Jin M, Gu Z, Pei Y, Meng P 2015. Aged-related changes in body composition and association between body composition with bone mass density by body mass index in Chinese Han men over 50-year old. *PLoS One*, 10: e0130400.
- Johnson CS, Duraiswamy M, Desai R, Frank L 2011. Health service provider's perspectives on healthy ageing in India. *Ageing Int*, 36: 445-462.
- Kaur B, Mal HK 2017. Association between malnutrition and depression among elderly of selected rural area of district Faridkot, Punjab. *Int J Com Health and Med Res*, 3(1): 41-45.
- Knodel JE, Debavalya N 1997. Living arrangements and support among the elderly in South-East Asia: An introduction. *Asia-Pacific Population Journal*, 12(4): 5-16.
- Kumar R, Satapathy S, Adhish VS, Nripsuta S 2017. Study of psychiatric morbidity among residents of government old age homes in Delhi. *J Geriatr Ment Health*, 4: 36-41.
- Lee JSW, Auyeung TW, Timothy K, Lau EMC, Leung PC, Woo J 2007. Associated factors and health impact of sarcopenia in older Chinese men and women: A cross-sectional study. *Gerontology*, 53: 404-410.
- Li LW, Conwell Y 2009. Effects of changes in depressive symptoms and cognitive functioning on physical disability in home care elders. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 64A(2): 230-236.
- Lin I, Wu H 2011. Does informal care attenuate the cycle of ADL/IADL disability and depressive symptoms in late life? *Journal of Gerontology*, 66B: 585-594.
- Lohman TG, Roche AF, Marforell ER 1988. *Anthropometric Standardization Reference Manual*. Campaign IL: Human Kinetics Books.
- Maktha S, Kumar MV 2015. Study on level of depression among elderly residing in an old age home in Hyderabad, Telangana. *The International Journal of Indian Psychology*, 3(1): 6.
- Montano CB 1999. Primary care issues related to the treatment of depression in elderly patients. *Journal of Clinical Psychiatry*, 60: 45-51.
- Nagaraj AK, Mathew J, Nanjegowda RB, Majgi SM, Purushothama SM 2011. Psychiatric morbidity among elderly people living in old age homes and in the community: A comparative study. *Online J Health Allied Sci*, 10: 5.
- Narkhede V, Likhari S, Rana A 2012. A study on depression in elderly inmates living in old age homes in Gujarat. *Indian J Res Rep Med Sci*, 2: 21-23.
- Oh J, Chae JH, Kim TS 2018. Age-specific association between body mass index and depression: The Korea national health and nutrition examination survey 2014. *Int J Obes (Lond)*, 42(3): 327-333.
- Pushparani JP, Chitrasena S, Ramasubramanian R 2017. A study on the prevalence of depression and its associated factors among the elderly in Kancheepuram district, South India. *Nat J Res Community Med*, 6(4): 230-233.
- Radloff LS 1977. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1: 385-401.
- Rajan IS, Kumar S 2003. Living arrangement among Indian elderly: Evidences from National family health survey. *Economic and Political Weekly*, 38(1): 75-80.
- Reddy NB, Pallavi M, Reddy NN, Reddy CS, Singh RK, Pirabu RA 2012. Psychological morbidity status among the rural geriatric population of Tamil Nadu, India: A cross-sectional study. *Indian J Psychol Med*, 34: 227-231.
- Registrar General and Census Commissioner 2011. *Census 2011*. India: Ministry of Home Affairs, Government of India.
- Runcan PL, Barbata C, M Hategan, Alexiua MT 2010. The emergence of depression in the elderly. *Procedia Social and Behavioral Sciences*, 2: 4966-4971.
- Runcan PL 2012. Elderly Institutionalization and depression. *Procedia—Social and Behavioral Sciences*, 33: 109-113.
- Sarin K, Punyaapriya P, Sethi S, Nagar I 2016. Depression and hopelessness in institutionalized elderly: A societal concern. *Open Journal of Depression*, 5: 21-27.
- Sekhoni H, Minhas S, Ahmed S, Garg R 2015. A study of depression in geriatric population in a rural area of north India. *Scholars Academic Journal of Biosciences (SAJB)*, 3(1A): 26-29.
- Sengupta P, Benjamin AI 2015. Prevalence of depression and associated risk factors among the elderly in urban and rural field practice areas of a tertiary care institution in Ludhiana. *Indian J of Public Health*, 59(1): 3-8.
- Sethi V, Verma V, Singh U 2013. Impact of ageing on depression and activities of daily livings in normal elderly subjects living in old age homes and communities of Kanpur, UP. *Int J Med Res Health Sci*, 2: 243-249.
- Singh KP 2001. Ageing trends in an agrarian state - A case study of Punjab. *Guru Nanak Journal of Sociology*, 22(1): 15-28.
- Singh AP, Kumar KL, Reddy CM 2012. Psychiatric morbidity in geriatric population in old age homes and community: A comparative study. *Indian J Psychol Med*, 34: 39-43.
- Sinha SP, Shrivastava SR, Ramasamy J 2013. Depression in an older adult rural population in India. *MED-ICC Review*, 15(4): 41-44.
- Sirohi A, Kaur R, Goswami AK, Mani K, Nongkynrih B, Gupta SK 2017. A study of falls among elderly persons in a rural area of Haryana. *Indian J Public Health*, 61: 99-104.
- Sood A, Singh P, Gargi PD 2006. Psychiatric morbidity in non-psychiatric geriatric inpatients. *Indian J Psychiatry*, 48: 56-61.
- Spiriduso WW 1975. Reaction and movement time as a function of age and physical activity level. *Journal of Gerontology*, 30(4): 435-440.
- Thirithahalli C, Suryanarayana SP, Sukumar GM, Bharath S, Rao GN, Murthy NS 2014. Proportion and factors associated with depressive symptoms among elderly in an urban slum in Bangalore. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 91(6): 1065-1075.
- United Nations 2013. *World Population Prospects: The 2012 Revision*. New York: Population Division of

- the Department of Economic and Social Affairs of the United Nations Secretariat, United Nation.
- Wan MA, Din NC, Ahmad M, Ghazali SE, Ibrahim N, Said Z, Ghazali AR, Shahar S, Razali R, Maniam T 2013. Loneliness and depression among the elderly in an agricultural settlement: mediating effects of social support. *Asia Pac Psychiatry*, 5(1): 134-139.
- Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ 1977. Assessing depressive symptoms in five psychiatric populations: A validation study. *American Journal of Epidemiology*, 106: 203-214.
- World Health Organisation Expert Consultation 2004. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*, 363: 157-163.
- World Health Organization 2017. *Depression and Other Common Mental Disorders: Global Health Estimates*. Geneva: WHO.

Paper received for publication on March 2018
Paper accepted for publication on August 2018