



## Impact of attendance in a daycare centre on depression among elderly in rural Puducherry: A pre- & post-intervention study

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Received June 2, 2015

**Background & objectives:** Depression is higher in the elderly and in the rural areas in India. There is a need for interventions to reduce depression among the elderly and improve their quality of life (QOL). This study was conducted to assess the impact of attendance at a community-based daycare centre in rural Puducherry, India, on depression, cognitive impairment (CI) and QOL of the elderly.

**Methods:** This was a before and after intervention study with a daycare centre set up in the village Thondamanatham in Puducherry, India, between January 2013 and January 2014. Socializing activities were held at the centre with psychological counselling. Depression was measured using Geriatric Depression Scale (GDS, short form), CI using the Hindi Mini-Mental Status Examination and QOL using WHO QOL BREF.

**Results:** There were 99 males and 164 females; of whom 42.2 per cent attended the daycare centre at least once a month. Significantly higher proportions of elderly had depression among those with lower frequency of attendance at the daycare centre. Irrespective of the pre-intervention status, attendance at the daycare centre reduced the probability of depression by about 51 per cent. There was an improvement in the WHO QOL scores in the social domain among those who attended more than once a month.

**Interpretation & conclusions:** GDS scores decreased and WHO QOL scores increased with increasing attendance at the daycare centre. Thus, the intervention was found to be effective in reducing depression and improving QOL of the elderly.

**Key words** Cognitive impairment - daycare centre - depression - elderly - quality of life

Elderly population (aged >60 yr) constituted 7.5 per cent of the total population of India in 2011, numbering approximately 76 million as per the census<sup>1</sup>. In addition to the physical health problems, mental health status also worsens as age advances. Singh *et al*<sup>2</sup> studied the psychosocial profile of the elderly in an urban area of Meerut, north India and

found that 25.1 per cent had an unfavourable attitude towards life; the common reasons for which were illness (73.1%) and loneliness (66.7%). The percentage share of elderly in rural areas is higher, 8.1 compared to 7.9 in urban areas of India<sup>3</sup>; 75 per cent of the total elderly population lives in rural areas<sup>4,5</sup>. Rural elderly have been worst affected by the process of changing

family structure in the Indian villages, rural to urban migration of younger people and weakening social fabric of rural areas. This makes them more vulnerable given the poorer access to social services and health facilities.

The prevalence of depression, a common mental disorder, has been reported to be high among the elderly. A community-based study of depression done by Poongothai *et al*<sup>6</sup> in Chennai; The Chennai Urban Rural Epidemiology Study (CURES) found the prevalence to be 15 per cent among the urban South Indian population. The prevalence increased to 25.7 and 30 per cent among the females and males aged more than 60 yr. The prevalence of depression has been reported to be higher among the Indian elderly and more in rural areas<sup>7,8</sup>. The median prevalence rate of geriatric depression in the world was reported to be 10.3 per cent with interquartile range (IQR) between 4.6 and 16.0 per cent, whereas the median prevalence rate of depression in Indian elderly was 21.9 per cent with IQR between 11.6 and 31.1 per cent<sup>7</sup>. The prevalence among elderly in rural areas has been found to range from 53.7 per cent in Singur block of Hooghly district in West Bengal to 42.7 per cent in a village in the Kancheepuram district of Tamil Nadu<sup>9,10</sup>. Depression is also known to be a risk factor for cognitive impairment (CI) among elderly<sup>8,9,11-13</sup>. Depression in elderly with mild CI is associated with risk of conversion to dementia, which can lead to inability in performing the activities of daily living and therefore, worsen their quality of life (QOL)<sup>14</sup>. To address depression among elderly, problems of loneliness and lack of emotional and social support need to be tackled.

Daycare centres for the elderly are common in the western countries and such centres are established as part of routine services to provide health and social programmes for elderly attendee during the day. By relieving the family members and caregivers of the burden of taking care of the elderly so that they can concentrate on other responsibilities during the day; it can strengthen the relationship between the elderly and their family members. Daycare centres can also offer rehabilitation programmes, social interaction with peers and participation in campaigns, meals and physical activities. It is a chance to socialize and have fun in a community-based group<sup>15</sup>. Such activities in the daycare centre are expected to improve the QOL of the elderly. Bilotta *et al*<sup>16</sup> found that attendance in a daycare centre was an independent correlate of the QOL among older outpatients suffering from

depressive disorders without dementia in Italy. The Berlin Declaration on the QOL for elderly emphasizes on the need for such studies to investigate which type of intervention is optimal and how such interventions can be implemented to improve QOL of the elderly in real life situations<sup>17</sup>. Although the concept of daycare centre is relatively new in India, such facilities are fast coming up in the cities. This intervention study was undertaken to assess the impact of attendance at a community based daycare centre at rural Puducherry, India, on depression among the elderly. We also tried to observe the impact on CI and QOL of the elderly.

## Material & Methods

### Procedure

This was a before and after intervention study wherein a daycare centre was set up in an *Anganwadi* centre in the village Thondamanatham in Puducherry, India, between January 2013 and January 2014 by the Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry. The sample size was calculated assuming a change in the prevalence of depression from 30 to 20 per cent, power 80 per cent, alpha error 5 per cent, as 294 using G\*Power 3 software<sup>18</sup>. Among the villages under the service area of the rural health centre of the JIPMER, village Thondamanatham had 290 elderly in 2012 (unpublished data). Therefore, this village was selected for the study. Details of the activities carried out at the daycare centre are given in Table I.

Problem-solving therapy (PST, a form of psychological therapy) was conducted in 4-5 sessions, with each session of 20-30 min. Those identified as having moderate level of depressive symptoms were selected for this intervention. Brief intervention (BI) was a specific form of counselling for elderly whose substance use was at moderate risk to their health level. It was a one-time counselling lasting 7-10 min. These were planned to be administered during the routine daycare visit. Those who did not attend the daycare were given either at home or workplace. PST was difficult to administer as each session was 20-30 min and has to be individual based. Coverage of eligible elderly and completion of all sessions for PST were low. However, BI was given to all eligible elderly.

The Independent variables were (i) Socio-demographic details (age, gender, education, employment, income and marital status); (ii) Morbidity status (self-reported major physical morbidity and

neuropsychiatric problems); and (iii) Alcohol, Smoking and Substance Involvement Screening Test (ASSIST)<sup>19</sup>.

Dependent variables included primary outcome for depression measured using Geriatric Depression Scale (GDS, short form) with a cut-off of  $>5$ <sup>20</sup>. Secondary outcomes were as follows: (i) CI - measured using Hindi Mini-Mental Status Examination (HMMSE) with a cut-off of  $<19$  - validated to assess the level of cognition in rural elderly in India<sup>21</sup>; and (ii) WHO QOL

BREF - assessed as self-report over the past one month with four domains mainly physical, psychological, social and environmental. The raw scores are transformed to 0-100 scale<sup>22</sup>.

*Statistical analysis:* For statistical analysis, statistical software, SPSS Version 20.0 (IBM Corp., Armonk, NY, USA) was used. The GDS, HMMSE and WHO QOL scores were tested for normality. As both the Shapiro–Wilk and Kolmogorov–Smirnov tests were highly significant, non-parametric tests were used for hypothesis testing. First, Chi-square test was done to find out the association between attendance at the daycare centre and the status of depression and of CI. Then, GDS and HMMSE scores were considered as ranks and Kruskal–Wallis test was performed to find the difference in scores between the various categories of attendance. Analysis of variance (ANOVA) was performed to test whether there was difference in the mean post-intervention scores in all the four domains of WHO QOL across the different categories of attendance at the daycare centre. Impact of attendance at the daycare centre was assessed by comparing the pre- and post-intervention scores of GDS, CI and all the domains of WHO QOL among those who attended the daycare centre using the Wilcoxon signed-rank tests. For multivariate analysis, binary logistic regression was done using forward stepwise approach for building the model. The variables found to be significant at  $P < 0.1$  in univariate analysis were entered into the

Table I. Activities carried out under the project	
Day Care Centre	
Group discussions	
Health Education sessions by staff and medical personnel from JIPMER Rural Health Centre (JIRHC)	
Physiotherapy sessions	
Medical check-up	
TV viewing	
Reading and discussions on newspaper items and magazines	
Playing games	
Informal interaction among the elderly	
Homes of the elderly	
Pre- and post-intervention surveys	
Psychological counselling - PST for depression and BI for substance abuse	
Routine visits to the houses of the elderly to encourage them to visit the daycare centre and in the process interact with them and find out issues and problems in visiting daycare centre (qualitative interviews)	
Work site (for the elderly who were not found at home during the day)	
Pre- and post-intervention surveys	
Psychological counselling - PST for depression and BI for substance abuse	
Community level	
Health camps for the elderly were conducted twice during the study period with specialists from medicine, ophthalmology, psychiatry, orthopaedics and physiotherapy. Screening for diabetes was done for all along with routine laboratory investigation as advised	
Others	
Training and supervision of PST and BI by the psychiatrist	
GDS screened elderly were reinterviewed independently by the psychiatrist for confirmation of the depression as per ICD-10 Chapter V	
PST, problem-solving therapy; BI, brief intervention; GDS, Geriatric Depression Scale; ICD-10, International Classification of Diseases, Tenth Edition	

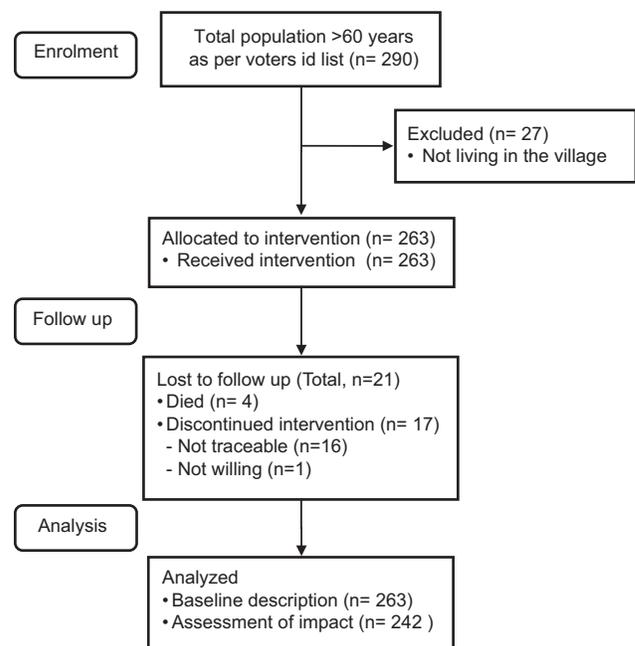


Fig. 1. Flow chart showing study design

**Table II.** Sociodemographic characteristics of the study population at baseline

Variables	Categories	Males (%)	Females (%)
Age group (yr)	60-69	54 (54.5)	86 (52.4)
	70-79	32 (32.3)	60 (36.6)
	80 and above	13 (13.1)	18 (11.0)
Education status	Illiterate	37 (37.4)	125 (76.2)
	Primary (1-5)	28 (28.3)	24 (14.6)
	Secondary (6-10)	30 (30.3)	15 (9.1)
	Higher (11 and above)	4 (4.0)	0
Marital status	Married	89 (89.9)	69 (42.1)
	Widowed	10 (10.1)	95 (57.9)
Employment status	Employed	35 (35.4)	19 (11.6)
	Not employed	64 (64.6)	145 (88.4)
PCI (₹), n=241*	<660	4 (4.0)	9 (5.5)
	660-1319	38 (38.4)	69 (42.1)
	1320-2199	24 (24.2)	42 (25.6)
	2200-4399	22 (22.2)	33 (20.1)
Tobacco use in the last three months	Absent	59 (59.6)	100 (61.0)
	Present	40 (40.4)	64 (39.0)
Alcohol use in the last three months	Absent	51 (51.5)	155 (94.5)
	Present	48 (48.5)	9 (5.5)
Major physical morbidity	Absent	9 (9.1)	21 (12.8)
	Present	90 (90.9)	143 (87.2)
Neuropsychiatric problems	Absent	54 (54.5)	82 (50.0)
	Present	45 (45.5)	82 (50.0)
Total		99	164

\*Data on income was not available for 22 participants. PCI, per capita income

model for logistic regression. All tests were two-tailed, and statistical corrections for multiple tests were not carried out.

## Results

There were 290 elderly in the village as per the voters list. However, 27 were not living in the village (Fig. 1). Of the 263 living in the village, 99 were males and 164 were females. The baseline characteristics of the population are given in Table II. In both the genders, little more than half were in the 60-69 yr age group and nearly 1/3<sup>rd</sup> in the 70-79 yr. There were more females in the >80 yr compared to males. More females were illiterate (76.2%) compared to males (37.4%). There were lesser females with secondary education and none had studied higher secondary and above. Almost 60 per cent of the elderly females were widowed compared to 10 per cent of the males. More elderly

males (35.4%) were employed than females (11.6%). The economic status of males and females were almost same with slightly higher proportion of females in the lower classes. Tobacco use in the past three months was almost 40 per cent in both genders whereas alcohol use in past three months was 48.5 per cent in males and 5.5 per cent in females. Morbidity status was assessed through self-reported conditions and symptoms. If any elderly had symptoms pertaining to musculoskeletal, cardiovascular, renal, respiratory and gastrointestinal systems, they were considered as having major physical problems. About 91 per cent of the males and 87 per cent of females had some major physical problem. Neuropsychiatry problems such as headache, dizziness, syncope, tremors and gait disturbance were more in females (50%) than in males (45.5%).

Loss to follow up during the one year of intervention was 7.9 per cent (21/263). The characteristics of those

**Table III.** Characteristics of elderly lost to follow up

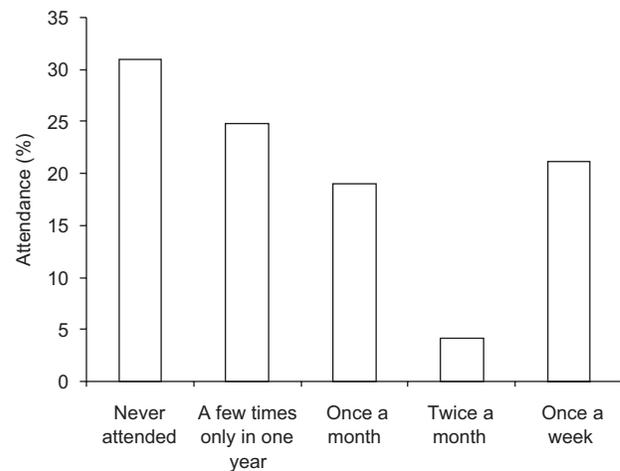
Variable	Categories	n (%)
Age groups	60-69	7 (33.3)
	70-79	11 (52.4)
	80 and above	3 (14.3)
Gender	Male	14 (66.7)
	Female	7 (33.3)
Marital status	Married	13 (61.9)
	Widowed	8 (38.1)
Per capita income (₹)	<660	1 (4.8)
	660-1319	12 (57.1)
	1320-2199	4 (19.0)
	2200-4399	1 (4.8)
	4400 and above	3 (14.3)
Major physical morbidity	Present	20 (95.2)
Cognitive impairment	Present	7 (33.3)
Depression	Present	19 (90.5)
Total		21 (100)

lost to follow up are given in Table III. Most of them were males and 19 out of 21 had screened positive for depression.

At the end of one year, among the 242 elderly individuals available, 239 (98.7%) were aware of the daycare centre. Of those who were aware, 233 (97.4%) had come to know about the centre from the project staff who had visited their houses. The attendance at the daycare centre during the study period is given in Fig. 2.

*Impact of intervention on depression, CI and WHO QOL:* There were 167 elderly who attended the daycare centre at least once. About 42.2 per cent of the elderly in the village attended the daycare centre at least once a month and availed the services at the centre. When asked whether they were satisfied with the services at the daycare centre, 165 out of 167 (98.8%) answered in positive.

Overall depression pre-intervention was 63.1 per cent and post-intervention was 76.9 per cent. At the baseline, the prevalence was higher in females (67.1%) than males (56.6%). Among the 242 elderly available during the post-intervention survey, the prevalence of depression at the baseline was 60.7 per cent. Even though there was an increase in the prevalence of depression among these 242 from 60.7 to 76.9 per cent, the difference was not significant.

**Fig. 2.** Frequency of attendance at the daycare centre.

The frequency of attendance at the daycare centre was used to quantify the intervention as this was the focus of intervention and most activities were held at the daycare centre. Thus, the impact of the intervention on the prevalence of depression, CI and WHO QOL was assessed with frequency of attendance. The attendance at the daycare centre in the past one year was considered as an ordinal variable with three categories - 'Never attended', 'Attended less than once a month' and 'Attended more than once in a month' (Table IV). There was an increase in the prevalence of depression in all the categories of attendance, but the increase was least in the more than once a month group, 7.4 per cent points increase compared to 25.3 and 18.1 per cent in the never attended and less than once a month groups. The difference in post-intervention proportions of depression between the groups was significant ( $P < 0.001$ ). There was an increase in GDS scores within the never attended and less than once a month categories but not among those who attended the daycare centre more than once a month. This difference in post-intervention scores between the groups was significant ( $P = 0.001$ ). Similarly, the proportion of CI increased among never attended and less than once a month groups whereas there was a decline among those who attended the daycare centre more than once a month. There was a significant decline ( $P < 0.01$ ) in WHO QOL scores of the physical, psychological and environmental domains in all the categories.

Attendance of more than once a month was considered minimum for the daycare centre to make some impact on the dependent variables. Hence, in keeping with the objective of assessing the impact of attendance at the daycare centre on depression, the

**Table IV.** Pre- and post-intervention scores of Geriatric Depression Scale, Hindi Mini Mental Status Examination and quality of life as per the categories of attendance at the daycare centre

Variables	Frequency of attendance		
	Never attended (n=75)	Less than once a month (n=72)	More than once a month (n=95)
<b>Depression</b>			
Pre-intervention prevalence (%)	66.7	58.3	57.9
Median score (IQR) pre-intervention	7 (2-11)	7.5 (2-11)	6 (2-10)
Post-intervention prevalence (%)	92	76.4	65.3#
Median score (IQR) post-intervention	10 (8-11)**	8 (5-10)	6 (4-9)***
<b>Cognitive impairment</b>			
Pre-intervention prevalence (%)	12	6.9	11.6
Median score pre-intervention (IQR)	22 (20-26)	23 (21-26)	22 (21-26)
Post-intervention prevalence (%)	16	15.3	10.5
Median score post-intervention (IQR)	23 (20-26)	22 (20-25)	23 (21-26)
<b>WHO QOL physical domain</b>			
Median pre-intervention score	50 (38-56)	53 (19)	56 (44-63)
Median score post-intervention	38 (31-44)**	38 (31-44)**	44 (31-44)**
<b>WHO QOL psychological domain</b>			
Median score pre-intervention	44 (38-56)	44 (38-56)	50 (38-56)
Median score post-intervention	31 (25-38)**	38 (31-44)**	44 (31-50)**
<b>WHO QOL social domain</b>			
Median score pre-intervention	31 (25-50)	47 (25-75)	31 (31-50)
Median score post-intervention	31 (25-50)	31 (25-56)**	56 (31-76)**
<b>WHO QOL environmental domain</b>			
Median score pre-intervention	63 (50-75)	63 (56-75)	69 (56-75)
Median score post-intervention	44 (38-50)**	38 (25-44)**	31 (25-44)**

\*\* $P < 0.01$  for difference in pre- and post-scores using Mann-Whitney U-test; # $\chi^2 = 16.858$ ,  $P < 0.001$ ; \*\*\*Kruskal-Wallis test statistic=41.604,  $df=2$ ,  $P=0.001$ . QOL, quality of life; IQR, interquartile range

difference in pre- and post-intervention scores of GDS, CI and four domains of WHO QOL were analyzed among those who attended the daycare centre at least once a month. All the scores among the 95 elderly who attended the daycare centre at least once a month were non-normal in distribution. There were no differences in the median scores of GDS (6, IQR 8 vs 6, IQR 5) and CI (22, IQR 5 vs 23, IQR 5), but the differences in the scores in all the four domains of QOL were significant in these 95 elderly. There was a decline in the scores in all the domains except social where there was an increase. The proportion of elderly with depression in this group increased in the post-intervention from 57.9 to 65.3 per cent, but this increase was not significant.

On bivariate analysis, post-intervention depression status was found to have significant association with occupation ( $P=0.044$ ), presence of major physical morbidity ( $P=0.042$ ), ever use of tobacco ( $P=0.019$ ),

high risk alcohol intake ( $P=0.044$ ) and attendance at daycare centre of more than once a week ( $P < 0.001$ ). For the bivariate and multivariate analysis, frequency of attendance at daycare centre was considered a dichotomous variable clubbing 'Less than a month' with 'Never attended' because this was the group which attended the daycare centre only a few times in a year which was practically equivalent to not attending at all. Multivariate analysis using binary logistic regression was conducted to assess how frequency of attendance was associated with the depression and CI at the end of the intervention period. It was seen that after controlling for other variables such as age, gender, pre-intervention depression status, employment status, physical ailments and substance use, only the frequency of attendance to the centre and tobacco use were the independent predictors of post-intervention depression status (Table V). Lower frequency of attendance and

**Table V.** Multivariate analysis of association of depression at post-intervention with other variables

Variables	OR	Lower limit of 95% CI	Upper limit of 95% CI	P
Frequency of attendance at daycare centre				
Never attended/less than once a month			Reference	
Attended	0.487	0.248	0.957	0.001
Tobacco use in past three months				
Absent			Reference	
Present	2.900	1.560	5.391	0.037

CI, confidence interval; OR, odds ratio

**Table VI.** Scores of post-intervention quality of life domains across the frequency of attendance

Variables	Never attended (A)	Less than once a month (B)	More than once a month (C)	P (ANOVA)	Post hoc analysis (Bonferroni)
Physical	36.2	40.6**	41.3***	<0.001	A < B = C
Psychological	33.1	39.0***	42.0***	<0.001	A < B = C
Social	38.7	49.5**	56.0***	<0.001	A < B = C
Environmental	40.6	35.2*	35.1**	<0.05	A > B = C

P \* < 0.05, \*\* < 0.01, \*\*\* < 0.001 compared to category (A). Shown as scores in the various QOL domains. QOL, quality of life; ANOVA, analysis of variance

presence of tobacco use were associated with the presence of depression with GDS. Attendance at the daycare centre reduced the probability of depression by 51 per cent. Tobacco use in past three months increased the risk of depression by about three times. The model explained 9.8 per cent of the variance.

The relationship of frequency of attendance with the post-intervention QOL was assessed (Table VI). It was seen that frequency of attendance at daycare centre was associated with better QOL on physical, psychological and social domains, but not on environmental domain. This may be because interventions in this study were psychosocial and would have had little effect on the environmental domain of the QOL of the elderly.

### Discussion

Depression is one of the top five leading causes of years lived with disability and contributing significantly to the global burden of diseases<sup>23</sup>. Depression is also one of the priority condition for mental health gap action programme (mhGAP)<sup>24</sup>. It has been projected that proportion of elderly will exceed that of young ones aged 0-14 yr in India by the year 2042<sup>25</sup>.

In our study over a period of one year of intervention, there was an overall increase of the prevalence of depression among the study participants. This could have been because these elderly were older

and physically more disabled and infirm a year later, which was supported by the decline in WHO QOL scores in the physical domain. The post-intervention prevalence was also affected by the loss to follow up of participants, 2/3<sup>rd</sup> of whom were males and 90 per cent with depression. The post-intervention prevalence was possibly lower with the loss to follow up of this group. However, it is difficult to comment upon the impact of this loss to follow up on the outcome measures in this study design (without a control group). The post-intervention prevalence of depression depends not only on the continuation of the participants in the study but also on their attendance at the daycare centre. In this study, more female elderly were followed up than men. Higher proportion of these women was widowed, which could also have contributed to higher prevalence of depression among them. Although depression is known to be higher among female elderly<sup>8,9</sup>, the reasons are not well understood and need to be studied further.

On comparing the pre- and post-intervention GDS scores, among those who attended the daycare centre at least once a month, there was no improvement in the scores. In these two groups, there was no decline in the scores of CI, signifying that there was no worsening in their cognitive status. As expected, the prevalence of CI in the group that attended the daycare centre more than once a month decreased over this one-year period

whereas it increased in the never attended and less than once a month group.

There was a decrease in the post-intervention QOL scores of physical, psychological and environmental domains, which was expected given the worsening physical health with increasing age. However, the scores in the social domain increased significantly among those attending the daycare centre more than once indicating that the interactions among the elderly themselves facilitated by the centre and with the daycare centre staff improved their social well-being. Decline in scores in the other domains could also have been contributed by better awareness and greater expectations among the previously unaware rural elderly following the health education and discussion sessions held at the daycare.

When the outcomes were assessed as per the frequency of attendance at the daycare centre, post-intervention depression scores were found to be significantly lower in the groups with higher attendance. Post-intervention WHO QOL scores in the physical, social and psychological domains were also significantly higher among the elderly with higher attendance, the difference being present between those who never attended and those who attended at least a few times. Attendance at the daycare centre was found to be a protective factor, conferring 51 per cent protection from depression. Current use of tobacco doubled the risk of depression among the elderly.

Our study had some limitations. PST and other activities at the daycare can be considered as cointerventions. However, as many activities were present in this study, it was difficult to point out what activity at home level, workplace level and community level might have brought the change in the prevalence of depression. Therefore, all the activities were considered as components of the single intervention.

From this study, it was concluded that attendance at the daycare centre had an impact on the depression status, CI and QOL of the elderly. When attendance at the daycare centre was categorized into an ordinal variable, both proportion of elderly with depression and the GDS scores decreased with increasing attendance. Irrespective of the pre-intervention depression status, attendance at the daycare centre reduced the probability of depression by about 51 per cent and there was an improvement in the WHO QOL scores in the social domain. Therefore, this community-based intervention comprising a composite set of activities in the daycare

centre, set up in the village, was found to be effective in reducing depression and improving social QOL of the elderly population in this village.

**Conflicts of Interest:** None.

## References

- Office of the Registrar General and Census Commissioner, India. *Provisional Population Totals: India: Census 2011*. Available from: <http://www.censusindia.gov.in/2011-prov-results/indiaatglance.html>, accessed on December 12, 2015.
- Singh N, Chopra H, Singh JV, Bhatnagar M, Garg SK, Bajpai SK. The psychosocial profile of the elderly people in urban area of Meerut city. *J Indian Acad Geriatr* 2009; 5 : 165-70.
- Office of the Registrar General and Census Commissioner, India. *2011 Census Data*. Population Enumeration Data. Available from: <http://www.censusindia.gov.in>, accessed on December 12, 2015.
- Central Statistics Office, Ministry of Statistics & Programme Implementation Government of India. *Situation Analysis of The Elderly in India*. New Delhi: Central Statistics Office; 2011. p. 27.
- International Institute for Population Sciences (IIPS) and Macro International. *National Family Health Survey (NFHS-3), 2005-06*. Vol. I. Mumbai: IIPS; 2007.
- Poongothai S, Pradeepa R, Ganesan A, Mohan V. Prevalence of depression in a large urban South Indian population - the Chennai Urban Rural Epidemiology Study (CURES-70). *PLoS One* 2009; 4 : e7185.
- Barua A. Trend of the prevalence of geriatric depression: A modern silent epidemic. *Int J Collab Res Intern Med Public Health* 2013; 5 : 37-47.
- Maity M, Mukhopadhyay B. Depression in Late Life: A Comparative Study among Elderly Inhabiting in Different Environmental Settings. In: *Book of Proceedings, Vol. 1: International Congress on Social & Cultural Studies, 2012 Sep 4-8; Port Harcourt, Nigeria; 2012*. Granada, Spain: International Association for Teaching and Learning; 2012. p. 225-35.
- Maulik S, Dasgupta A. Depression and its determinants in the rural elderly of West Bengal - A cross sectional study. *Int J Biol Med Res* 2012; 3 : 1299-302.
- Sinha SP, Shrivastava SR, Ramasamy J. Depression in an older adult rural population in India. *MEDICC Rev* 2013; 15 : 41-4.
- Sengupta P, Benjamin AI. 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 Public Health* 2015; 59 : 3-8.
- Barua A, Ghosh MK, Kar N, Basilio MA. Socio-demographic factors of geriatric depression. *Indian J Psychol Med* 2010; 32 : 87-92.
- Nair V, Ayers E, Noone M, Johnson B, Verghese J. Depressive symptoms and mild cognitive impairment: Results from the Kerala-Einstein study. *J Am Geriatr Soc* 2014; 62 : 197-9.
- Lyketsos CG, Lopez O, Jones B, Fitzpatrick AL, Breitner J, DeKosky S. Prevalence of neuropsychiatric

- symptoms in dementia and mild cognitive impairment: Results from the cardiovascular health study. *JAMA* 2002; 288 : 1475-83.
15. Vinay P, Prerna P, Asha K, Sudha S. General & Mental Health and Life Attitude: A Comparative Study of the Elderly Living with Family and at Day Care Centre. *Open Access Scientific Reports* 2012; 1 : 214. Available from: <http://www.omicsonline.org/scientific-reports/srep214.php>, accessed on May 21, 2015.
  16. Bilotta C, Bergamaschini L, Spreafico S, Vergani C. Day care centre attendance and quality of life in depressed older adults living in the community. *Eur J Ageing* 2010; 7 : 29-35.
  17. Fernandez-Ballesteros R, Frensch PA, Hofer SM, Park DC, Pinquart M, Silbereisen RK, *et al.* Berlin declaration on the Quality of Life for Older Adults: closing the gap between scientific knowledge and intervention. *Z Gerontol Geriatr* 2009; 42 : 163-4.
  18. Faul F, Erdfelder E, Lang AG, Buchner A. G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods* 2007; 39 : 175-91.
  19. Humeniuk R, Ali R, Babor TF, Farrell M, Formigoni ML, Jittiwutikarn J, *et al.* Validation of the alcohol, smoking and substance involvement screening test (ASSIST). *Addiction* 2008; 103 : 1039-47.
  20. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey MB, *et al.* Development and validation of a geriatric depression screening scale: A preliminary report. *J Psychiatr Res* 1982-1983; 17 : 37-49.
  21. Ganguli M, Ratliff G, Chandra V, Sharma SD, Gilby J, Pandav R, *et al.* A Hindi version of the MMSE: The development of a cognitive screening instrument for a largely illiterate rural elderly population in India. *Int J Geriatr Psychiatry* 1995; 10 : 367-77.
  22. Skevington SM, Lotfy M, O'Connell KA; WHOQOL Group. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A report from the WHOQOL group. *Qual Life Res* 2004; 13 : 299-310.
  23. Institute of Health Metrics and Evaluation, University of Washington. *GBD Profile: India*. Available from: [http://www.healthdata.org/sites/default/files/files/country\\_profiles/GBD/ihme\\_gbd\\_country\\_report\\_india.pdf](http://www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_india.pdf), accessed on September 15, 2017.
  24. World Health Organization. *mhGAP: Mental Health Gap Action Programme: Scaling Up Care for Mental, Neurological and Substance Use Disorders*. Geneva: WHO; 2008.
  25. Chatterji S, Kowal P, Mathers C, Naidoo N, Verdes E, Smith JP, *et al.* The health of aging populations in China and India. *Health Aff (Millwood)* 2008; 27 : 1052-63.

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