

# Indian Journal of GERONTOLOGY

*(a quarterly journal devoted to research on ageing)*

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## Contents

1. Effect of Bioactive Compound (-)-Epicatechin of <i>Phyllanthus Niruri</i> on Hepatic Stress Markers and Lipid Metabolic Profiles in D-galactosamine Induced Hepatitis in Aged Rats	1
<i>B. Shanmugam, K.R. Shanmugam, S. Ravi, K. Sathyavelu Reddy</i>	
2. Lower and Upper Body Flexibility Alterations in Senior Population of Punjab as a Function of Life Style Differences	13
<i>Pawandeep Kaur and Nishan Singh Deol</i>	
3. Impact of Out-of-Pocket Expenditure in Healthcare Seeking Behaviour of Geriatric Population in Rural Kerala	29
<i>Sindhu Joseph</i>	
4. Impact of Positive Health Resources on Psychological Distress in Elderly with Chronic Illness: Revelations from Latent Profile Analysis	45
<i>Naga Seema, P. Shulamite Sharon, Suvashisa Rana and Anuradha Nautiyal</i>	
5. Psychological States, Self-esteem, Leisure Motivation and Quality of Life among Institutionalized and Non-institutionalized Older Adults	68
<i>Padmaja Gadiraju, Sofiya Thomas, and C. Vanlalbruaii</i>	
6. Mobility Pattern of Elderly Population in Kolkata	81
<i>Sanchari Chandra and Sabiha Baig</i>	
7. Healthy Space for Ageing: Embedding Smart Home Technology	98
<i>Jayashree Dey</i>	
8. Retirement Transitions and Social Support among Teachers	113
<i>Deepthi Saligram and Venkatesha Murthy, C.G.</i>	
9. 'Ageing and Alone': Analysing Health Implications of being a Left Behind Elderly Parents in Kashmir	128
<i>Shahida Akhtar, Wakar Amin Zargar, and Shazia Manzoor</i>	
10. Impact of Covid-19 Pandemic on Mental Health of Community-Dwelling Older Adults	142
<i>Moghe Supriya A., and Nupoor Kulkarni</i>	

## NEWS & VIEWS

### ATTENTION PLEASE

Those who are interested in becoming a member of *Indian Gerontological Association* (IGA) are requested to send their Life Membership fee, Rs. 2000/- (Rupees Two thousand) or Annual Membership Rs. 500/- (Rupees Five hundred only). Membership fee is accepted only by D.D. in favour of Secretary, Indian Gerontological Association or Editor, Indian Journal of Gerontology. Only Life members have the right to vote for Association's executive committee. Members will get the journal free of cost. Life Membership is only for 10 years.

### REQUEST

Readers are invited to express their views about the content of the journal and other problems of senior citizens. Their views will be published in the Readers' Column. Senior citizens can send their problems to us through our web site: [www.gerontologyindia.com](http://www.gerontologyindia.com) Their identity will not be disclosed. We have well-qualified counsellors on our panel. Take the services of our counselling centre - RAHAT.

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### *We are Working to Protect the Rights and Social Welfare of the Elderly*

**Indian Gerontological Association** (Registration No 212/ 1968) is an independent grassroots non-profit organization based in Jaipur (Rajasthan). Our efforts **empower** and **support** the underprivileged elderly in rural and urban communities.

We strive to **ensure social justice and welfare for people over 60**, focusing on those elders who are the most disadvantaged such as elderly women. We protect the civil liberties of elderly citizens as a part of the **struggle for individual rights and social progress** in India.

Currently, the elderly community comprises approximately 10% of the total population of India. This number will increase to nearly 25% within the next twenty years. **Neglected and abandoned by society and sometimes their own families, elders are increasingly subject to conditions of disease and poverty.** They lack access to health care, and often face serious discrimination as well as physical and emotional abuse.

As a public interest group, **we work for and with the elderly to protect their rights and access to a better quality of life.** We seek to both empower and serve by working directly with rural communities. By facilitating the growth of citizen's groups, raising public awareness on aging, promoting public action and participation, and advocating public policy changes, Indian Gerontological Association hopes to alter the current trends in elder relations for the better.

### *Our work includes*

- Community Centers for the Elderly that Offer Communal Support and Interaction
- Training on Legal Rights by Offering the Elderly Practical Knowledge on Their Rights
- Public Hotline for the Elderly that Offers Legal Referrals and Assistance
- Public Accessibility for the Elderly Advocating More Available Access to the Public Sphere
- Use of various forms of media to Raise Public Awareness on Elder Rights
- Counselling and Helping elderly to Relieve Psychological Stress and Depression
- Elder Women's Cooperatives that Provide Grants and Assistance to Elderly Women
- Public Awareness Raising to Promote Public Action for Helping Disadvantaged Elderly
- Field Study of Rural Areas to Analyze Challenges Faced by Aging Rural Population

### *Our plan of action includes*

- Campaign for Elder Rights
- Campaign Against Elder Abuse especially toward Elderly Women
- Training of Social Workers and Caregivers
- Capacity Building of Civil Servants or organizations Working on Aging
- Research & Publication

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## Effect of Bioactive Compound (-)-Epicatechin of *Phyllanthus Niruri* on Hepatic Stress Markers and Lipid Metabolic Profiles in D-galactosamine Induced Hepatitis in Aged Rats

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### ABSTRACT

*The present study was designed to explore the hypolipidemic and hepatoprotective effects of Phyllanthus Niruri (PN) bioactive compound (-)-Epicatechin in D-galactosamine induced hepatitis in rats. Rats were distributed into normal controls (NC), (-)-epicatechin treated (Et), hepatitis control (Hc), hepatitis+ (-)-epicatechin (H+Et), hepatitis+silymarin treated (H+St). After 21 days of treatment, lipid peroxidation (MDA), total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL), very low-density lipoprotein cholesterol (VLDL), high-density lipoprotein cholesterol (HDL), bilirubin (BL), urea (UR), creatinine (CR) are estimated in serum. In D-galactosamine-induced hepatitis rats, we observed increased levels of MDA, TC, TG, LDL, VLDL, BL, and decreased levels of HDL, UR, CR. However (-)-epicatechin supplementation normalized all the lipid metabolic profiles and also hepatic stress*

*markers. Furthermore, histopathological examinations have also proved that (-)-epicatechin pre-treatment decreased the tissue damage in hepatitis conditions. This is the first reported data on the hypolipidemic activity of (-)-epicatechin. Our experimental findings indicate the potential benefits of (-)-epicatechin in hepatitis conditions.*

**Keywords:** (-) Epicatechin, Hepatitis, Hypolipidemic activity, Hepatic damage, Rats.

Ageing is characterized by reduced skeletal muscle mass and increased adiposity. Physiological ageing is characterized by a gradual loss of cognitive performance, expressed as a decline in memory, reasoning, mental capacity, and spatial ability. In addition, age-related changes in body composition intrinsically connect with the biology of ageing resulting in frailty, dementia, Alzheimer's, diabetes, cardiovascular diseases, liver-related disorders. The proportion of the population over 65 years has been increasing worldwide, and low birth rate and longevity have contributed to this growth of the aged population. According to a report by United Nations, in the next 35 years, the number of people aged 60 and above around the world is projected to get more than double, reaching almost 2.1 billion people. Demographic projections also suggest that the world's 60+ population is expected to be around 2 billion by 2030, up from 900 million in 2015.

Hepatitis is a major cause of liver disease leading to many health consequences, like liver cirrhosis and hepatic carcinoma. There is also a global concern due to its high impact on the older population's health in terms of mortality and morbidity (Fyiad *et al.*, 2012). World Health Organization reported 130 to 150 million people infected with hepatitis worldwide representing a global prevalence of 3 per cent (WHO, 2014).

A recent estimation showed that hepatitis infection was the tenth leading cause of death and accounted for 7,86,000 deaths each year around the world but the death rate for older people is higher when compared to younger people. (GBD, 2013). During hepatitis condition, several organs appear affected in aged people and liver being the worst affected organ. Hepatitis also alters protein, lipid, and



antioxidant enzyme systems. Hence, hepatitis remains a serious clinical challenge and a health problem of major concern.

There are several traditional medicines recommended for the treatment of hepatitis. It has been reported that many herbs and their bioactive compounds possess hypolipidemic, hepatoprotective, and other beneficial substances. In the present study, we selected *Phyllanthus niruri* as a therapeutic plant against hepatitis in old rats. PN contains a series of phenols, alkaloids, terpenoids, and tannins (Shanmugam *et al.*, 2017), which are reported to show hepatoprotective, anti-hepatitis, anti-inflammatory, antidiabetic, antiviral, and other properties. (Baiguera *et al.*, 2018). PN contains many compounds like phyllanthin, hypophyllanthin, quercetin, geraniin, fraterusterol, gallocatechin, limonene, lupeol, phyllnirurin, cymene, estradiol, niranthin, mirphyllinastragalin, catechin, (+), (-)-epicatechin, catechin-3-o-gallate, epicorilagin, etc. Our study demonstrated that the administration of (-)-epicatechin may improve the damaged liver tissue in hepatitis rats. Interestingly, (-)-epicatechin treatment in aged rats ameliorated the hepatic tissue in hepatitis rats.

(-)-Epicatechin is a flavonol belonging to the group of flavonoids. (-)-Epicatechin is present in many plants. High quantities can be found in cocoa, tea, grapes, and phyllanthus. The present study was designed to explore the hypolipidemic and hepatoprotective effect of (-)-epicatechin in D-galactosamine-induced hepatitis in aged rats. This is the first study of the hypolipidemic and hepatoprotective effect of (-)-epicatechin in hepatitis-induced rats of the senile age group.

## Materials and Methods

### Chemicals

D-galactosamine were purchased from Sigma Chemical Co. (St. Louis, MO, USA) and all other chemicals obtained from Fisher Scientific (Pittsburg, PA, USA), Merck (Mumbai, India), Ranbaxy (New Delhi, India) and Qualigens (Mumbai, India).

### *Animals and Experimental Design*

Male Wistar rats ( $3000 \pm 20$  g) obtained from Indian Institute of Science, Bangalore, were kept under standard laboratory conditions (temperature ( $27 \pm 2^\circ\text{C}$ ), natural light-dark cycle (photoperiod of 12 h light and 12 h), and humidity 55–60 per cent. The rats were maintained on a standard pellet diet (M/s Hindustan Lever Ltd., Mumbai) and provided access to water *ad libitum*. The study design was approved by the animal ethical committee (Resolution No. 10/08/a/CPCSCA/IAEC/SVU/09–10/ZOOL/KRS/Dt.25.09.2009). After 7 days of acclimatization, animals were divided into five groups of six rats each.

*Group I Normal Control (NC)*: Old rats received saline for 21 days and served as normal control.

*Group II Bioactive ((-)-Epicatechin) compound control treatment (Et)*: old rats were given bioactive compound of *Phyllanthus niruri* ((-)-epicatechin–50 mg/kg b/w) for 21 days.

*Group III Hepatitis Control (Ht)*: A single injection of D-galactosamine (800 mg/kg b/w) was given intraperitoneally to the old rats for the induction of hepatitis 48 hours before sacrifice.

*Group IV Hepatitis + Bioactive compound ((-)-Epicatechin–50mg/Kg b/w) treatment (H+Et)*: Pre-treatment of (-)-epicatechin was administered orally to the old rats for 21 days and a single injection of D-galactosamine (800 mg/kg b/w) was given intraperitoneally for the induction of hepatitis 48 hours before sacrifice.

*Group V Hepatitis + Silymarin treatment (H+St)*: Pre-treatment of standard drug silymarin (100 mg/kg b/w) was administered orally to the old rats for 21 days and a single injection of D-galactosamine (800 mg/kg b/w) was given intraperitoneally for the induction of hepatitis 48 hours before sacrifice.

After 21 days of treatment, all the aged rats were sacrificed for blood sampling and serum was separated and frozen at  $-80^\circ\text{C}$  for further analysis.

### ***Estimation of Lipid Metabolic Profiles***

Total cholesterol, triglyceride, low-density lipoprotein cholesterol, very-low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol were estimated in the serum using kit methods.

### ***Estimation of the thiobarbituric acid reactive substances TBARS***

The extent of serum lipid peroxidation in terms of thiobarbituric acid reactive substance formation was measured as described by Ohkawa *et al.*, (1979).

### ***Estimation of Serum Markers***

The biochemical parameters like bilirubin (BL), urea (UR), creatinine (CR) were measured in serum by using commercially available kits following the manufacturer's protocol.

### ***Protein Estimation***

Protein content was estimated by the method of Bradford, (1976).

### ***Statistical Analysis***

Results are expressed as means  $\pm$  standard deviation (SD). Variance analysis was done with Duncan's multiple comparison Tests on data were carried out using the SPSS (Version 15; SPSS Inc., Chicago, IL, USA) and M.S. Office, excel software for the significance of the main effects (factors), and treatments along with their interactions. Statistical significance was set at  $P < 0.05$ . The p-values are presented with obtained data.

## **Results**

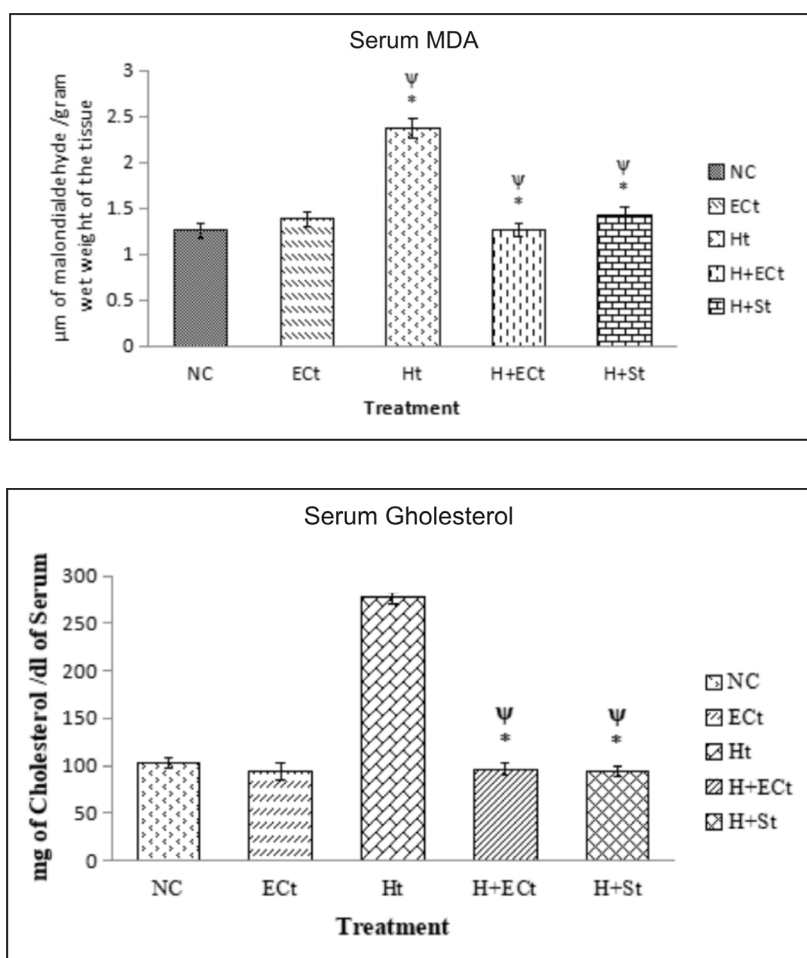
### ***Effect of (-)-Epicatechin on Lipid metabolic Profiles***

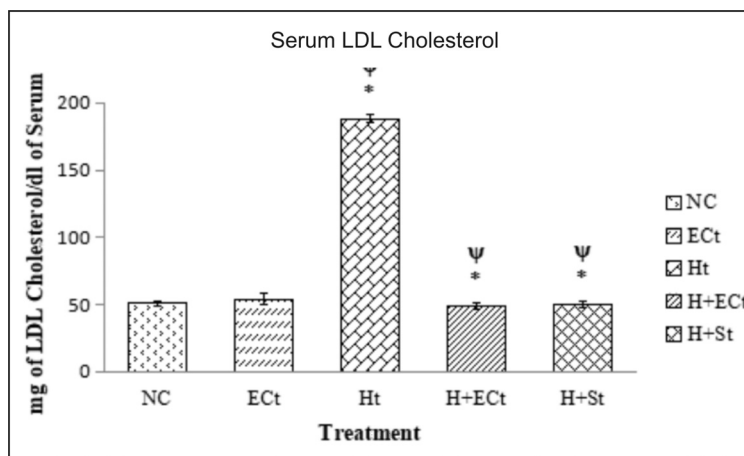
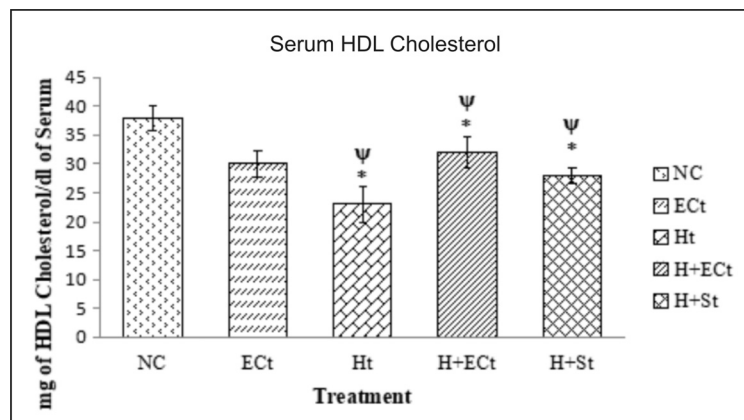
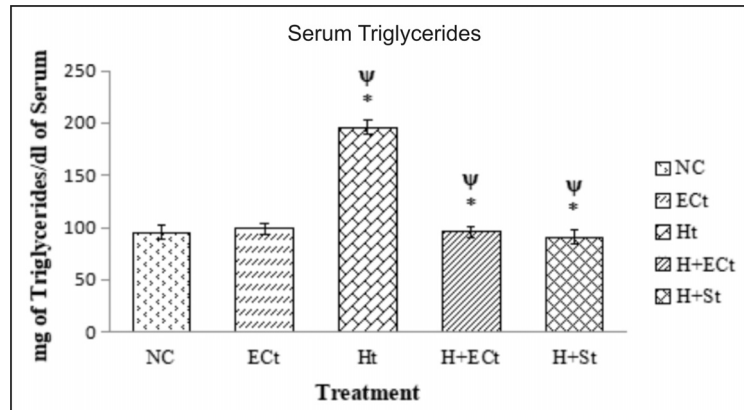
In this study, the lipid metabolic profiles total cholesterol, triglycerides, LDL, VLDL levels are increased and HDL levels are decreased in the serum of aged hepatitis subjects. However, with (-)-epicatechin pre-treatment in old-aged hepatitis rats, these lipid metabolic profile levels came near to normal levels. (Figure 1). Insert here

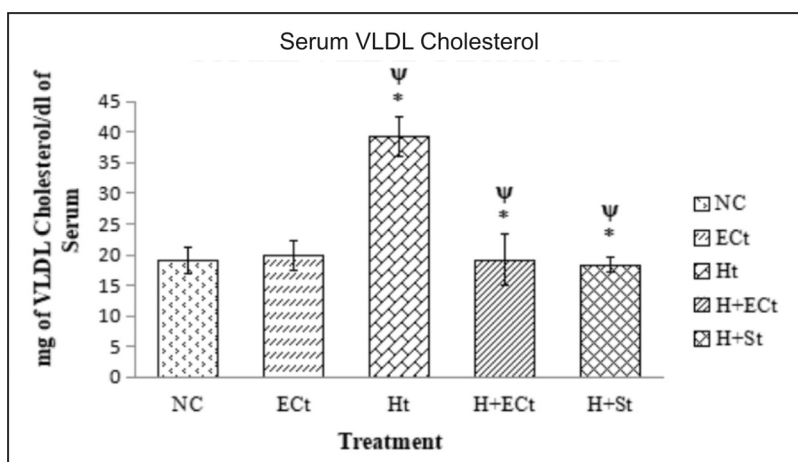
MDA levels are also upregulated in aged hepatitis rats. However with (-)-epicatechin supplementation MDA level downregulated in aged hepatitis rats. (Figure 1).

**Figure 1**

*Effects of (-)-Epicatechin and silmyrin on Lipid Metabolic Profiles (MDA, Cholesterol, Triglycerides, HDL, LDL & VLDL) levels in the serum of aged hepatitis rats. Data are expressed as means  $\pm$  SD ( $n = 6$ ). \* The values are significant compared to the following: control (\* $p < 0.001$ ), hepatic (\* $p < 0.01$ ) (Dunnett's multiple comparison test).*







#### *Effect of (-)-Epicatechin on BL, UR & CR in Hepatitis Rats*

In the present investigation, urea (UR) and creatinine (CR) levels decreased and bilirubin (BL) levels increased in aged hepatitis rats. Whereas with (-)-epicatechin supplementation in old hepatic rats, we observed elevated levels of UR & CR and depleted levels of BL suggestive of hepatoprotective effect of (-)-epicatechin.

**Table 1**

*Effect of (-)-Epicatechin on Serum markers (BL, Urea, Creatinine) in aged hepatitis rats*

Groups	Bilirubin (mg/dL)	Urea (mg/dL)	Creatinine (mg/dL)
Group I (NC)	0.62 (±0.2)	36 (±6.24)	0.23 (±0.02)
Group II (Et)	0.68 (±0.2)	42 (±3.05)	0.28 (±0.106)
Group III (Ht)	3.2* (±0.48)	28 (±5.49)	0.102 (±0.046)
Group IV (H+Et)	0.54* (±0.62)	38 (±4.26)	0.26 (±0.049)
Group V (H+St)	0.68* (±0.024)	32 (±3.92)	0.24 (±0.063)

All the values are means ± SD of six individual observations.

\* Significant at  $p < 0.001$  with respect to normal control.

## Discussion

Increasing evidence indicates that oxidative stress causes liver injury, cirrhosis development, and carcinogenesis (Farzaei *et al.*, 2018). The present study was focused on investigating the hypolipidemic role of (-)-epicatechin against D-galactosamine-induced hepatitis and finding its possible mode of action in aged hepatitis rats.

The liver is the major site of cholesterol and phospholipid synthesis and metabolism. Lipid-related abnormalities are most common in hepatitis conditions. Alterations in lipid metabolism have been reported in D-GalN induced hepatitis conditions in rats. In this study, we observed elevated levels of MDA, total cholesterol, triglycerides, LDL, VLDL, and reduced levels of HDL in old hepatitis rats, when compared to control rats. These lipid disorders are due to alterations in lipid metabolism in hepatitis.

Malondialdehyde (MDA) is a natural metabolic product of lipid peroxidation. In this study, we observed higher levels of MDA in old hepatitis rats. But pre-treatment with the (-)-epicatechin protected the liver from D-galactosamine-induced hepatitis. This may be due to the suppression of toxic free radical production during hepatitis conditions. Hence, with (-)-epicatechin pre-treatment, MDA levels decreased in old hepatitis rats. This is the first reported data on the effect of (-)-epicatechin on MDA in aged hepatitis rats.

Higher levels of LDL, VLDL are due to decreased activity of lipoprotein lipase. Increased VLDL levels in old hepatitis rats are due to the increased concentration of free fatty acids. These lipid abnormalities in hepatitis rats may be due to alterations in lipid metabolism. Numerous studies have reported the increased levels of LDL, VLDL, and reduction in the HDL levels during D-galactosamine-induced liver injury (Arain *et al.*, 2017). Lipid disorders, most often encountered in liver diseases also include increased levels of LDL and VLDL (Arain *et al.*, 2017). (-) Epicatechin may reduce the activity of lipoprotein lipase in old hepatitis conditions. This may cause a reduction in LDL, VLDL levels in hepatitis rats. (-)-Epicatechin treatment has a profound effect on the lipid and lipoprotein metabolism in aged hepatitis rats. So, LDL, VLDL decreased with (-)-epicatechin in old-aged hepatitis rats.

HDL one of the beneficial lipoprotein (Brown *et al.*, 2010), could be helped through the scavenging of cholesterol from the extrahepatic tissues. In our study, we reported decreased levels of HDL in old hepatitis rats. HDL depletion might be attributed to an alteration in lipoprotein lipase and LCAT activity during hepatitis conditions. However, with (-)-epicatechin pre-treatment HDL levels are increased in old hepatitis rats. These alterations may be due to the hypolipidemic effect of (-)-epicatechin. Hence, all the lipid metabolic profiles MDA, TC, TG, LDL, VLDL, HDL are normalized with (-)-epicatechin supplementation in hepatitis condition.

Bilirubin, urea, and creatinine are indicators of liver function because a majority of proteins are synthesized in the liver. In this study, we reported that urea, creatinine levels are decreased and total bilirubin levels increased in old hepatitis rats. It shows the hepatotoxicity in hepatitis rats, supporting the previous study of Arvind Kumar and Sangeeta 2017. In hepatitis condition, the liver cell is unable to excrete bilirubin, urea, creatinine and therefore all these substances are mixed in the serum (Ibid.). So, higher total bilirubin (BL) levels are reported in hepatitis rats.

An increase in BL in hepatitis rats appears indicative of hepatic cell damage and disturbance of hepatocellular functions. As a result, BL levels increased in aged rats in contrast to decreased CR level and UR levels. Depletion in CR levels might be due to increased production of free radicals and a decrease in the breakdown of creatinine phosphate during the hepatitis condition. UR levels might have decreased due to the failure of the liver to convert amino acids and ammonia to urea. There are several reports on the depletion of urea during hepatitis conditions (Glavind *et al.*, 2016). D-galactosamine induction may alter the urea cycle and lead to depletion of urea in hepatitis rats. Whereas (-)-epicatechin pre-treatment urea, creatinine levels elevated and bilirubin levels depleted in old hepatitis rats. This may be due to the modulation of serum markers by (-)-epicatechin in old hepatitis rats. (Table 1).

## Conclusion

This is the first reported data on the hypolipidemic and hepatoprotective effect of (-)-epicatechin in hepatitis conditions. In



conclusion, (-)-epicatechin bioactive compound isolated from *Phyllanthus niruri* shows hypolipidemic and hepatoprotective effects against hepatitis in aged rats. But, the mechanism of its protective and hypolipidemic action is not known. Further studies are, therefore needed to know the mechanism and other related metabolic pathways alterations by (-)-epicatechin in aged hepatitis condition.

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## Lower and Upper Body Flexibility Alterations in Senior Population of Punjab as a Function of Life Style Differences

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### ABSTRACT

*This study aimed to investigate the lower and upper body flexibility alterations in randomized senile/senior population of Punjab as a function of life style differences. Participants (N=180) with low physical activity (N=90) and with high physical activity (N=90) senior population from Punjab were selected to act as subjects for the study. The study was delimited to the senior male with low and high physical activity senile population recruited at age group 60–70, 71–80, and 81–90 years respectively. For the purpose of data collection, with low and high physical activity group of the subjects were divided into three categories, i.e. category I (60–70 Years; N=30), category II (71–80 Years; N=30), and category III (81–90 Years; N=30) respectively. The chair sit and reach test was used to measure the lower body flexibility and back scratch was used to assess the upper body flexibility. Statistical Package for Social Science (SPSS) version 23 was used to analyse the lower and upper body flexibility in male with low and high physical activity senile population, after collecting data One Way ANOVA (Analysis of Variance), Least Significant Difference (LSD) Post Hoc test was employed. The level of significance to test the hypotheses was 0.05,*

*( $P < 0.05$ ). Results of the studies in both variables found that there was a statistically significant difference in both the variables with  $p$  value of the lower and upper body flexibility .000 ( $P < 0.05$ ) of male with low and high physical activity senile population of Punjab. In conclusion, the lower and upper body flexibility changes with ageing. The study has revealed that changes in age-related decline of lower and upper body flexibility.*

**Keywords:** lower and upper body flexibility, low and high physical activity, and senile population.

Elder's adults apply more time in physical exercises (PA) or less time in low physical activity behaviours exhibit enhanced functional fitness (FF). Last year studies contains that physically active elders female have competition forms of flexibility or range of motion that are most parallel to younger competition than to their elders inactive peers (Rikli and Busch, 1986).

Therefore, it is essential for elders female to continue activity to recover functional (FF) fitness. Many studies have reported that opposite parts of activity involvement in elders adults enhance flexibility, (Stathokostas, *et al.*, 2012; Sousa and Sampaio, 2005) walking competition, (Malatesta, *et al.*, 2010) Recently, continue multimodal drill, created on joint aerobic (Presence of oxygen) and resistance activity, has proved effectiveness in enhancing functional fitness (FF) in elder males and females, (Sousa, *et al.*, 2014) (Sousa and Mendes, 2013) but to our information, no studies have evaluated the effect of the similar drill package in opposite age groups of the adult population.

The effects of Nordic walking on physical fitness, body composition, in the senile population. Evaluation with a walking (alone) training, effect sizes showed that Nordic Walking enhanced the flexibility (range of motion) of the lower body. Nordic Walking with resistance or weight, effect sizes showed that Nordic Walking enhanced the lower body flexibility (range of motion). (Al-Rahamneh, *et al.*, 2015) the senior fitness test chair sit and reach test (CSRT), Back scratch test (BST). Good and comparable values of Chair sit and reach test (CSRT) related to the US norms. (Ruiz-Montero, *et al.*, 2015) conducted. The aim of this study was to evaluate the physical fitness and quality of life related to the health of a sample population of senior

citizen female from Spain and Serbia. Serbian participants experienced higher physical fitness, such as upper body flexibility and lower body flexibility (Matos-Duarte, *et al.*, 2017) flexibility or range of motion was calculated at four altered times through chair sit and reach (CSR) and back scratch tests (BST). The outcomes display that the members who took part in this yearlong study achieved skilled positive outcomes in flexibility or range of motion in the zones.

It is generally found in most of the studies that changes in age-related decline range of motion and the ageing process is always a reduction in physical activity. This study aimed to assess the lower and upper body flexibility of alteration and randomized in senile population with low and high physical activity. The study was entitled the 'Lower and Upper Body Flexibility Alterations in Randomized Senile Population of Punjab as a Function of Life Style Difference'.

## **Materials and Methods**

### ***Subjects***

The study was conducted with the purpose to investigate the lower and upper body flexibility alterations in randomized senile population of Punjab as a function of life style difference. The study was conducted on senile male population with low and high physical activity; the age level was divided into three categories, i.e. of 60–70, 71–80, and 81–90 years respectively. A total number of (N=180) senile male participants with low and high physical activity were selected to act as subjects for the study.

Observation of Variables:

- Lower Body Flexibility
- Upper Body Flexibility

Criteria Measures

- Chair sit and reach test: To measure the Lower Body Flexibility.
- Back Scratch Test: To assess the Upper Body Flexibility.

Table 1

<i>Low</i>	<i>(Age group level)</i>	<i>(N=90)</i>	<i>HIGH</i>	<i>(Age group level)</i>	<i>(N=90)</i>
<i>Physical</i>	60-70 Years	(N=30)	<i>Physical</i>	60-70 Years	(N=30)
<i>Activity</i>	71-80 Years	(N=30)	<i>Activity</i>	71-80 Years	(N=30)
	81-90 Years	(N=30)		81-90 Years	(N=30)

Table 1 showing category, age group, and number of subjects selected for the study

### Self-Reported Questionnaire

A self-reported questionnaire as per WHO guidelines was constructed to identify the high physical activity of individuals. The questionnaire includes several types of questions related to types of activity performed, i.e. moderate-intensity aerobic physical activity, e.g. walking, brisk walking, and other activities of gardening 150 minutes/week or vigorous-intensity aerobic physical activity, e.g. jogging, running, dancing, bicycle riding, aerobics exercise/gym, some yoga exercises, stretching exercises and callisthenic exercises 75 minutes/week or an equal combination of moderate and vigorous-intensity activity throughout the week. Respondents were questioned to mark (yes or no). The overall responses were analysed to classify the type of individuals as per their activity type performed and were classified accordingly.

### Procedure of Testing

- Chair Sit and Reach Test

*Tools Required:* Ruler, pen, paper and chair.

*Method Used:* The participants sit on the edge of a chair, with one leg bent at knee with 90° angle, foot placed flat on the floor and other leg was placed keeping knee straight and heel on the floor. The participants were instructed to inhale a deep breath, and then as they exhale try to reach with finger tips towards front of the toes by bending at the hip. The back should be kept straight and head up. Participants were also instructed to avoid bouncy or fast movements that can cause any form of injury and the knee should be kept straight when trying to reach the toes. The distance was calculated between the fingertips and the toes. If the fingertips touch the toes then the mark is zero. If they did not touch, the distance between the fingers and the toes (negative

marks) was calculated, if they intersect, calculate by how much (a positive marks) and give two (2) chances.

*Scoring:* The score was noted to the adjacent 1/2 inch or 1 cm as the distance touched, either a negative or positive marks. Record which leg was used for quantity (Jones and Rikli, 2002).

### **Back Scratch Test**

- *Tools Required:* Ruler, pen and paper.

*Method Used:* This test item was done in the standing position. Located one hand over the head and back above the shoulder and reach as far as likely down the middle of your back, your palm touching your body and the fingers directed downwards. Other arm behind your back, palm facing outer and fingers upwards and reach up as far as likely make an effort to touch or overlap the middle fingers of other hand. An examiner was essential to direct the tester so that the fingers were aligned and to calculate the distance among the tips of the central fingers. If the fingertips touch then the mark was zero. If they did not touch, calculate the distance among the fingers tips (a negative mark), if they overlap calculate by how much (a positive marks). Practice dual times and then test two (2) attempts.

*Scoring:* Record the finest score to the nearby centimeter or 1/2 inch. The highest score the best the outcomes (Jones and Rikli, 2002).

### **Analysis of Data**

Statistical Package for Social Science (SPSS) version 23 was used to analyse the data, after collecting the data One Way ANOVA (Analysis of Variance), Least Significant Difference (LSD) Post Hoc test to determine individual group differences were employed. The level of significance to test the hypotheses was set at 0.05 ( $P < 0.05$ ) and were considered significant for findings.

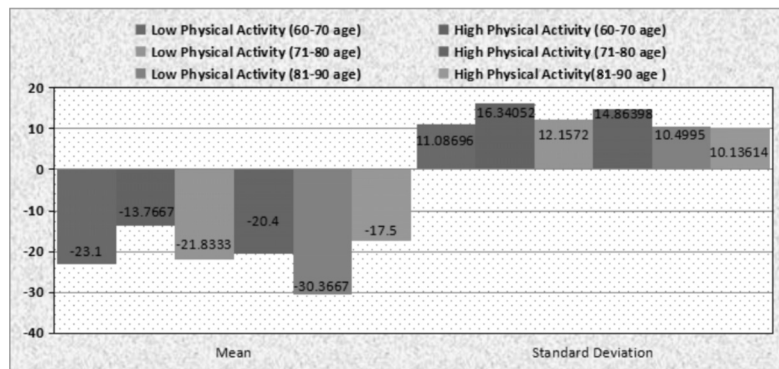
### **Results**

The results found significant differences alterations in randomized senile population of Punjab: 60–70 age, 71–80 age, and 81–90 age for their lower and upper body flexibility. It is evident from Table 2 (b) that the results of Analysis of Variance (ANOVA) alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity; 60–70

age, 71–80 age and 81–90 age on lower body flexibility were found to be statistically significant ( $P > 0.05$ ). Since the obtained “F” ratio 5.840\* (.000) was found statistically significant and Table 3 (b) that the results of Analysis of Variance (ANOVA) alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity: 60–70 age, 71–80 age and 81–90 age on upper body flexibility were found to be statistically significant ( $P > 0.05$ ). Since the obtained “F” ratio 17.714\* (.000) was found statistically significant.

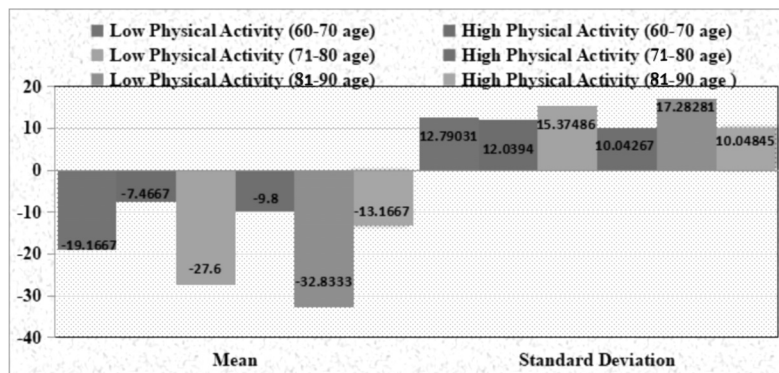
**Figure 1**

*Mean and standard deviation results with regard to lower body flexibility alterations in randomized senile population of Punjab*



**Figure 2**

*Mean and standard deviation results with regard to upper body flexibility alterations in randomized senile population of Punjab*





**Table 2 (a)**  
*Mean and Standard deviation results with regard to lower body flexibility alterations in randomized senile population of Punjab*

<i>Lower Body Flexibility</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error</i>
Low Physical Activity (60–70 age)	30	–23.1000	11.08696	2.02419
High Physical Activity (60–70 age)	30	–13.7667	16.34052	2.98336
Low Physical Activity (71–80 age)	30	–21.8333	12.15726	2.21960
High Physical Activity (71–80 age)	30	–20.4000	14.86398	2.71378
Low Physical Activity (81–90 age)	30	–30.3667	10.49953	1.91694
High Physical Activity (81–90 age)	30	–17.5000	10.13614	1.85060
Total	180	–21.1611	13.55855	1.01059

Table 2 (a) revealed that the total number of subjects for the study was 180. The mean and standard deviation values of lower body flexibility with low and high physical activity senile population of Punjab in 60–70 age, 71–80 age and 81–90 age were  $-23.1000 \pm 11.08696$ ,  $-13.7667 \pm 16.34052$ ,  $-21.8333 \pm 12.15726$ ,  $-20.4000 \pm 14.86398$ ,  $-30.3667 \pm 10.49953$  and  $-17.5000 \pm 10.13614$  respectively.

**Table 2 (b)**  
*Analysis of Variance (ANOVA) results with regard to lower body flexibility alterations in randomized senile population of Punjab*

<i>Source of variance</i>	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F-ratio</i>	<i>Sig.</i>
Between Groups	4,728.428	5	945.686	5.840*	.000
Within Groups	28,177.900	174	161.942		
Total	32,906.328	179			

\* Sign indicated significant difference at 0.05 level (The table values required for significance at 0.05 level with df (5, 174) = 2.21 respectively).

It is evident from Table 2 (b) that the results of Analysis of Variance (ANOVA) alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity; 60–70 age, 71–80 age and 81–90 age on lower body flexibility were found to be statistically significant ( $P > 0.05$ ). Since the obtained “F” ratio 5.840\* (.000) was found statistically significant.

**Table 2 (c)**  
*Analysis of Least Significant Difference (LSD) post hoc test with regard lower body flexibility alterations in randomized senile population of Punjab*

<i>Group (A)</i>	<i>Group (B)</i>	<i>Mean Difference (A-B)</i>	<i>Sig.</i>
Low Physical Activity (60-70 age) (Mean = -23.1000)	High Physical Activity (60-70 age)	-9.33333*	.005
	Low Physical Activity (71-80 age)	-1.26667	.700
	High Physical Activity (71-80 age)	-2.70000	.412
	Low Physical Activity (81-90 age)	7.26667*	.028
	High Physical Activity (81-90 age)	-5.60000	.090
High Physical Activity (60-70 age) (Mean = -13.7667)	Low Physical Activity (60-70 age)	9.33333*	.005
	Low Physical Activity (71-80 age)	8.06667*	.015
	High Physical Activity (71-80 age)	6.63333*	.045
	Low Physical Activity (81-90 age)	16.60000*	.000
	High Physical Activity (81-90 age)	3.73333	.257
Low Physical Activity (71-80 age) (Mean = -21.8333)	Low Physical Activity (60-70 age)	1.26667	.700
	High Physical Activity (60-70 age)	-8.06667*	.015
	High Physical Activity (71-80 age)	-1.43333	.663
	Low Physical Activity (81-90 age)	8.53333*	.010
	High Physical Activity (81-90 age)	-4.33333	.189
High Physical Activity (71-80 age) (Mean = -20.4000)	Low Physical Activity (60-70 age)	2.70000	.412
	High Physical Activity (60-70 age)	-6.63333*	.045
	Low Physical Activity (71-80 age)	1.43333	.663
	Low Physical Activity (81-90 age)	9.96667	.003
	High Physical Activity (81-90 age)	-2.90000	.379
Low Physical Activity (81-90 age) (Mean = -30.3667)	Low Physical Activity (60-70 age)	-7.26667*	.028
	High Physical Activity (60-70 age)	-16.60000*	.000
	Low Physical Activity (71-80 age)	-8.53333*	.010
	High Physical Activity (71-80 age)	-9.96667*	.003
	High Physical Activity (81-90 age)	-12.86667*	.000
High Physical Activity (81-90 age) (Mean = -17.5000)	Low Physical Activity (60-70 age)	5.60000	.090
	High Physical Activity (60-70 age)	-3.73333	.257
	Low Physical Activity (71-80 age)	4.33333	.189
	High Physical Activity (71-80 age)	2.90000	.379
	Low Physical Activity (81-90 age)	12.86667*	.000

\* Significant at  $F_{0.05} = 2.21$

A glance at Table 2 (c) and Figure 1 showed that the mean value of lower body flexibility with low physical activity age category 60–70 were –23.1000 whereas the high physical activity age category 60–70 had a mean value of –13.7667 and the mean difference between both the groups was found –9.33333\*. The p-value sig .005 shows that the high physical activity age category 60–70 had demonstrated better on lower body flexibility than their low physical activity age category 60–70 significantly.

The mean value of with low physical activity age category 71–80 was –21.8333 whereas the high physical activity age category 71–80 had a mean value of –20.4000. The mean difference between these groups was found –1.43333. The p-value sig .663 showed that the high physical activity age category 71–80 had demonstrated better on lower body flexibility than their low physical activity age category 71–80 insignificantly.

The mean value of the low physical activity age category 81–90 was –30.3667 whereas the high physical activity age category 81–90 had a mean value of –17.5000 and the mean difference between both groups was found –12.86667\*. The p-value sig .000 shows that the high physical activity age category 81–90 had demonstrated significantly better on lower body flexibility than their low physical activity age category 81–90.

**Table 3 (a)**

*Mean and standard deviation results with regard to upper body flexibility alterations in randomized senile population of Punjab*

<i>Lower Body Flexibility</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error</i>
Low Physical Activity (60–70 age)	30	–19.1667	12.79031	2.33518
High Physical Activity (60–70 age)	30	–7.4667	12.03940	2.19808
Low Physical Activity (71–80 age)	30	–27.6000	15.37486	2.80705
High Physical Activity (71–80 age)	30	–9.8000	10.04267	1.83353
Low Physical Activity (81–90 age)	30	–32.8333	17.28281	3.15539
High Physical Activity (81–90 age)	30	–13.1667	10.04845	1.83459
Total	180	–18.3389	15.98713	1.19161

Table 3 (a) revealed that the total number of subjects for the study was 180. The mean and standard deviation values of upper body flexibility with low and high physical activity senile population of Punjab in 60–70 age, 71–80 age and 81–90 age were  $-19.1667 \pm 12.79031$ ,  $-7.4667 \pm 12.03940$ ,  $-27.6000 \pm 15.37486$ ,  $-9.8000 \pm 14.86398$ ,  $-32.8333 \pm 17.28281$  and  $-13.1667 \pm 10.04845$  respectively.

**Table 3 (b)**

*Analysis of Variance (ANOVA) results with regard to upper body flexibility alterations in randomized senile population of Punjab*

Source of variance	Sum of Squares	Df	Mean Square	F-ratio	Sig.
Between Groups	15,432.361	5	3,086.472	17.714*	.000
Within Groups	30,317.967	174	174.241		
Total	45,750.328	179			

\* Sign indicated significant difference at 0.05 level (The table values required for significance at 0.05 level with df (5, 174) = 2.21 respectively).

It is evident from Table 3 (b) that the results of Analysis of Variance (ANOVA) alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity; 60–70 age, 71–80 age and 81–90 age on upper body flexibility were found to be statistically significant ( $P > 0.05$ ). Since the obtained “F” ratio 17.714\* (.000) was found statistically significant.

**Table 3 (c)**

*Analysis of Least Significant Difference (LSD) post hoc test with regard upper body flexibility alterations in randomized senile population of Punjab*

Group (A)	Group (B)	Mean Difference (A-B)	Sig.
Low Physical Activity (60–70 age) (Mean = -19.1667)	High Physical Activity (60–70 age)	-11.70000*	.001
	Low Physical Activity (71–80 age)	8.43333*	.014
	High Physical Activity (71–80 age)	-9.36667*	.007
	Low Physical Activity (81–90 age)	13.66667*	.000
	High Physical Activity (81–90 age)	-6.00000	.080

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High Physical Activity (60–70 age) (Mean = -7.4667)	Low Physical Activity (60–70 age)	11.70000*	.001
	Low Physical Activity (71–80 age)	20.13333*	.000
	High Physical Activity (71–80 age)	2.33333	.494
	Low Physical Activity (81–90 age)	25.36667*	.000
Low Physical Activity (71–80 age) (Mean = -27.6000)	High Physical Activity (81–90 age)	5.70000	.096
	Low Physical Activity (60–70 age)	-8.43333*	.014
	High Physical Activity (60–70 age)	-20.13333*	.000
	High Physical Activity (71–80 age)	-17.80000*	.000
High Physical Activity (71–80 age) (Mean = -9.8000)	Low Physical Activity (81–90 age)	5.23333	.126
	High Physical Activity (81–90 age)	-14.43333*	.000
	Low Physical Activity (60–70 age)	9.36667*	.007
	High Physical Activity (60–70 age)	-2.33333	.494
Low Physical Activity (81–90 age) (Mean = -32.8333)	Low Physical Activity (71–80 age)	-17.80000*	.000
	Low Physical Activity (81–90 age)	23.03333*	.000
	High Physical Activity (81–90 age)	3.36667	.325
	Low Physical Activity (60–70 age)	-13.66667*	.000
High Physical Activity (81–90 age) (Mean = -13.1667)	High Physical Activity (60–70 age)	-25.36667*	.000
	Low Physical Activity (71–80 age)	-5.23333	.126
	High Physical Activity (71–80 age)	-23.03333*	.000
	High Physical Activity (81–90 age)	-19.66667*	.000
	Low Physical Activity (60–70 age)	6.00000	.080
	High Physical Activity (60–70 age)	-5.70000	.096
	Low Physical Activity (71–80 age)	14.43333*	.000
	High Physical Activity (71–80 age)	-3.36667	.325
	Low Physical Activity (81–90 age)	19.66667*	.000

\* Significant at  $F_{0.05} = 2.21$ 

A glance at Table 3 (c) and Figure 2 showed that the mean value of upper body flexibility with low physical activity age category 60–70 were -19.1667 whereas the high physical activity age category 60–70 had a mean value of -7.4667 and the mean difference between both the groups was found -11.70000\*. The p-value sig .001 shows that the high physical activity age category 60–70 had demonstrated better on upper body flexibility than their low physical activity age category 60–70 significantly.

The mean value of low physical activity age category 71–80 was -27.6000 whereas the high physical activity age category 71–80 had a

mean value of -9.8000. The mean difference between these groups was found -17.80000\*. The p-value sig .000 showed that the high physical activity age category 71-80 had demonstrated better on upper body flexibility than their low physical activity age category 71-80 significantly.

The mean value of low physical activity age category 81-90 was -32.8333 whereas the high physical activity age category 81-90 had a mean value of -13.1667 and the mean difference between both groups was found -19.66667\*. The p-value sig .000 shows that the high physical activity age category 81-90 had demonstrated significantly better on upper body flexibility than their low physical activity age category 81-90.

### Discussion

The study was designed to scrutinize lower and upper body flexibility alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity. A total 180 participants between age group of 60-70, 71-80 and 81-90 years from Punjab were selected respectively. The researcher had selected following variables as the lower and upper body flexibility:

This study showed that the mean value of lower body flexibility with low physical activity age category 60-70 was -23.1000, 71-80 was -21.8333, 81-90 was -30.3667, and the mean value of lower body flexibility the high physical activity age category 60-70 was -13.7667, 71-80 was -20.4000, and 81-90 was -17.5000 respectively. Lower body flexibility changes with aging. These results of the study confirmed the findings of (Furtado, *et al.*, 2015) evaluate of covariance obtained significant enhancement in all functional fitness tests between pre- and post-tests in the independent-living groups except in the chair sit-and-reach for the independent-living 70-74. ANCOVA also reveals a significant failure performance in all functional fitness tests for day care (DC) groups except in the chair sit-and-reach for the DC 70-74 and DC 75-79. Independent-living female are more fit than institutionalized day care senior female. (Fielding, *et al.*, 2017) sedentary male and female aged 70 and 89 years who had useful borders were randomized

to an arranged enough intensity walking, resistance and flexibility physical exercises program or a health education program. In continuous physical exercises contribution had significant and clinically telling effects on these results. (Al-Rahamneh, *et al.*, 2015). The senior fitness test (SFT); 30-second chair stand test, 30-Second arm curl test, Chair sit and reach test (CSRT), Back scratch test (BST). Good and comparable values of 30-second chair stand test (CST), 30-Second arm curl test, and Chair sit and reach test (CSRT) related to the US norms.

The results of the study revealed that among three different age levels of male with low and high physical activity; 60–70, 71–80 and 81–90 on upper body flexibility were found to be statistically significant. This study showed that the mean value of upper body flexibility with low physical activity age category 60–70 was  $-19.1667$ , 71–80 was  $-27.6000$ , 81–90 was  $-32.8333$ , and the mean value of upper body flexibility the high physical activity age category 60–70 was  $-7.4667$ , 71–80 was  $-9.8000$ , and 81–90 was  $-13.1667$  respectively. Upper body flexibility changes with aging. These results of the study confirmed the findings of (Al-Rahamneh, *et al.*, 2015) the senior fitness test (SFT); 30-second chair stand test (CST), 30-Second arm curl test (ACT), Chair sit and reach test (CSRT), Back scratch test (BST). Good and comparable values of 30-second chair stand test (CST), 30-Second arm curl test (ACT) and Chair sit and reach test (CSRT) related to the US norms. (Ruiz-Montero, *et al.*, 2015) conducted the aim of this study was to evaluate the physical fitness and quality of life related to the health of a sample population of senior citizen female from Spain and Serbia. Serbian participants experienced higher physical fitness, such as upper body flexibility, lower body flexibility, agility and aerobic endurance. (Matos-Duarte, *et al.*, 2017) flexibility or range of motion was calculated at four altered times through chair sit and reach (CSR) and back scratch tests (BST). The outcomes display that the members who took part in this yearlong study, skilled positive outcomes in flexibility or range of motion in the zones.

### Conclusion

In conclusion, the lower and upper body flexibility changes with aging. The results strongly confirm significant differences alterations in randomized senile population of Punjab as a function of life style differences of male with low and high physical activity in 60–70 age, 71–80 age, and 81–90 age for their lower and upper body flexibility. The high physical activity age category 60–70 had demonstrated better on lower and upper body flexibility than their low physical activity age category 60–70 significantly. The high physical activity age category 71–80 had demonstrated better on lower body flexibility than their low physical activity age category 71–80 insignificantly. The high physical activity age category 71–80 had demonstrated better on upper body flexibility than their low physical activity age category 71–80 significantly. The high physical activity age category 81–90 had demonstrated significantly better on lower and upper body flexibility than their low physical activity age category 81–90.

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## Impact of Out-of-Pocket Expenditure in Healthcare Seeking Behaviour of Geriatric Population in Rural Kerala

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### ABSTRACT

*The study aimed to investigate the impact of healthcare expenditure of 405 rural elderly (Female=181 and Male=224), age varying from 60 years and above, on their healthcare-seeking behaviour. A structured questionnaire was used in the data collection. The findings of the study revealed that financial matters influence the healthcare-seeking behaviour of the rural elderly in Kerala and the huge Out-of-Pocket payments (OOP) force them to delay or deny healthcare needs. The study also establishes that the elderly seek treatment for their ailments regardless of their income due to the increased health consciousness and family support. These findings necessitate immediate attention and action of the health care authorities and policymakers to formulate and implement a geriatric healthcare policy to prevent households from impoverishment and poverty.*

**Keywords:** Geriatric Care, Healthcare Seeking Behaviour, Out of Pocket Expenditure, Delayed Care, Denied Care

Health status declines when age increases and consequently many physical, psychological, and behavioural issues emerge. Globally

geriatric population is under the threat of non-communicable diseases (UN 2012) and sometimes it converges with an infectious disease like the COVID-19, thus making the health situation more complex and fatal.

Indian geriatric care has been severely affected by the limited resources and the insufficient public healthcare facilities in delivering equitable healthcare due to the large population size. It was reported that around 33.1 per cent of the elderly were unable to meet their healthcare needs in 2001 (Rajan and Aiyar, 2008). Later, Arokiasamy (2016) stated that one-third of the older population suffers from short-term illnesses which are so common among women.

Kerala records the highest out-patient (OP) consultation (per 1,000 population) compared to the other Indian states (Mukherjee and Levesque, 2012) which indicates higher morbidity levels (Alam, *et al.*, 2012). The common illnesses of the geriatric population, in a 2010 study, were paralysis, urinary problems, CVD (Cardiovascular Disease), and cancer (Sandhya, 2010). Subsequently, another study reported that, in 2011, hypertension, diabetes mellitus, cataract and CVD were the prevalent diseases (Alam, *et al.*, 2012). In 2016, it was CVD, diabetes, musculoskeletal diseases, and respiratory diseases (Karan, *et al.*, 2016). Similarly, during 2016–2017, Madore, *et al.*, (2018) found diabetes, hypertension, and abdominal obesity as the most prevalent diseases. In 2020, it was reported that 70 lakhs of the geriatric population above 65 years of age suffer from hypertension, diabetes, cancer, kidney disease, CVD, and respiratory problems. Based on all these earlier studies, it can be presumed that Kerala is under the threat of NCDs such as Diabetes, Hypertension, Cancer, Heart and Respiratory Diseases where the geriatric population accounts for about 20 per cent of the total population (Census of India, 2011). These ‘multi-morbidity conditions lead to a higher rate of Health Care Utilisation (HCU) and consequent health care expenditure among the geriatric population who tend to seek healthcare and spend a huge amount of money to extend their life span. According to Garg and Karan (2009), during 1999–2000, about 32.5 million Indians fell below the poverty line through the Out-of-Pocket (OOP) healthcare expenditure where the expense for drugs alone constitutes 70 per cent of the total payment.

Despite having the status of a state with the most expensive healthcare in India, in Kerala, the share of the private sector was the highest in India with 90.27 per cent and the public sector accounted for only 9.73 per cent (State Planning Board, 2014). There is a huge difference between the government and private healthcare facilities in terms of healthcare expenditure wherein private facilities require a higher amount of INR 17,396, compared to the government facilities (INR 7,480) (Alam, *et al.*, 2013). In Kerala, the average IP expense per person in the private healthcare institution is INR 22,989, whereas public sector expenditure is INR 11,065, and an OP visit costs around INR 525 in private while it is INR 391 in the public sector. A study in 2012 shows that a person in Kerala spends around INR 6,000 as OOP per year for healthcare (State Planning Board, 2014). The study further revealed that, in Kerala, the highest out-of-pocket expenditure pushed about 12 per cent of rural households and 8 per cent of urban households below the poverty line (BPL) in 2004 (State Planning Board, 2014). The average OOP expenditure for IP care in government was INR 6,267 against INR 30,800 in the private sector (State Planning Board, 2014). The main OOP health expenditure is for medicines and doctor consultation (Table 4). For one episode of hospitalization costs around INR 14, 647 (Alam, *et al.*, 2012). There is a disparity in healthcare spending based on gender and place of residence, in Kerala.

Despite the outnumbered studies describing the healthcare expenditure and the consequent effects, the results are inconsistent (Alam, *et al.*, 2012, Garg, and Karan, 2009; State Planning Board, 2014; Philip and Ravindran, 2017). Likewise, the study outcomes associated with the healthcare-seeking behaviour and the impact of OOP healthcare expenditure on the geriatric population in Kerala are also inconclusive. In this context, a more systematic analysis is required to fill the above gaps, and therefore the study planned to measure the OOP expenditure of the geriatric population in Kerala and its impact on their healthcare-seeking behaviour. Kerala has gained attention for its finest healthcare indicators and three-tier public healthcare system necessitating a study to bring out the nature of healthcare access of the geriatric population, particularly when they face both financial constraints for healthcare and the 'double burden of disease simultaneously.

## Methodology

This research draws on quantitative methodology, based on the positivist paradigm. The study was conducted from June 2020 to November 2020. Data was collected from 405 elderly from 36 local self-government regions (*panchayats*) of Kerala using a structured questionnaire, adopting a multi-stage sampling technique.

The study area was divided into three geographical zones such as South, Central, and North. Three districts each were selected randomly from each zone. Four panchayaths from each district were selected by drawing lots, making a total of 36 panchayaths of Kerala in nine districts, under study. 11 households with elderly persons were selected randomly from each selected panchayaths. The respondents included any one of the resident members of the household who is above the age of 60, who could respond to the questionnaire. The data were analysed with SPSS 2.0 and used descriptive statistics to report the findings and correlation coefficient to test the hypothesis.

The questionnaire included two sections. The first section collected data on demographic variables such as age, gender, income, educational status, marital status, and source of income. It also included questions on healthcare-seeking behaviours and is measured using variables such as frequency of health check-ups and doctor consultation on a 5-point scale. The second section collected data on the source of healthcare financing, average healthcare expenditure per month, the most incurred expenses related to healthcare, the difficulty for finding money for treatment, and delay or denial of care due to the lack of money and insurance coverage, using a nominal variable. Source of Healthcare financing included 7 items including private and public insurance (see Table 2).

To test and eliminate errors and biased items in the initial stage of the survey, a pilot test was conducted on forty samples of the elderly. The feedback from the pilot test helped the researcher to get a better perspective of the rural elderly and the level of response.

Based on the previous studies, two hypotheses were developed for the study:

**H1:** Financial matters of the rural elderly influence their healthcare-seeking behaviour.

**H2:** Out-of-pocket healthcare expenditure leads to delayed healthcare access among the rural geriatric population in Kerala.

## Findings

### Socio-Demographic Variables

**Table 1**  
*Socio-Demographic Variables*

<i>Variable</i>	<i>Category</i>	<i>Frequency (n=405)</i>	<i>Per cent</i>
Gender	Female	181	44.7
	Male	224	55.3
Age	60–69	203	50.1
	70–79	128	31.6
	80–89	60	14.8
	Above 90	9	2.2
Marital Status	Married	314	77.5
	Not Married	11	2.7
	Partner Died	75	18.5
	Divorced	3	0.7
Education	No formal education	74	18.3
	School	267	65.9
	College/University	53	13.1
	No response	4	1
Monthly income	No income	125	25.9
	Less than INR 10,000	228	56.3
	INR 10,000–20,000	37	9.1
	INR 21,000–30,000	20	4.9
	Above INR 30,000	5	1.2
Source of Income	Job	18	4.4
	Pension	211	52.1
	Income from assets	29	7.2
	Business	35	8.6
	Income from agriculture	49	12.1
	Income from other sources	15	3.7

## Healthcare Financing

**Table 2**  
*Healthcare Financing*

<i>Category</i>	<i>Frequency (n=405)</i>	<i>Percentage</i>
self	124	30.6
Life Partner	43	10.6
Children	198	48.9
Relatives	26	6.4
Private Insurance	7	1.7
Govt. Insurance	7	1.7

Table 2 shows that, for a majority of the elderly, the healthcare expenditure is borne by their children (48.9%), and 30.6 per cent of elderly meet their healthcare expenditure. 10.6 per cent of them depend on their spouse, 6.4 per cent depend on their relatives for healthcare financing. Only 1.7 per cent of the elderly use government and private insurance for their healthcare financing.

## Monthly Healthcare Expenditure

**Table 3**  
*Monthly Healthcare Expenditure*

<i>Monthly Healthcare Expenditure</i>	<i>Frequency (n=405)</i>	<i>Percentage</i>
Less than INR 2,000	219	54.1
INR 2,000–5,000	90	22.2
INR 5001–10,000	24	5.9
Above INR 10,000	10	2.5
Not Aware	62	15.3

Table 3 shows that more than half of the geriatric population spends less than INR 2,000 per month. However, 22.2 per cent has to spend between INR 2,000 to 5,000 per month for their healthcare expenditure.



## Expenditure Category

**Table 4**  
*Healthcare Expenditure Category*

<i>Category</i>	<i>Frequency (n = 405)</i>	<i>Percentage</i>
Medicine	272	67.2
Doctor and Tests	56	13.8
Hospitalization	18	4.4
Medical Equipment	3	0.7
Other Expenses	56	13.8

As seen in Table 4, the major expenditure is for medicine (67.2%), and doctors and tests contribute more expenditure for 13.8 per cent of the elderly in Kerala.

## Hypothesis Testing

**H1:** Financial matters of the elderly influence their healthcare-seeking behaviour.

## Health Checkups

Healthcare-seeking behaviour of the geriatric population is measured using two variables as health check-ups and doctor consultation. Financial matters include variables such as Monthly Healthcare Expenditure and Income. 2 per cent conduct weekly check-ups whereas 6.2 per cent go for check-ups in every two weeks and 28.6 per cent conduct check-ups in less than 4 months period and a majority (58.3%) do check-ups when get diseased. It shows that 4.9 per cent of the elderly do not have the habit of having health check-ups.

**Table 5**  
*Healthcare seeking behaviour: Health check-ups*

	<i>Category</i>	<i>Frequency (n = 405)</i>	<i>Percentage</i>
<i>Health check-ups</i>	Weekly	8	2
	In two weeks	25	6.2
	In less than 4 months	116	28.6
	When getting diseased	236	58.3
	No check-ups	20	4.9

*Doctor Consultation*

**Table 6**  
*Healthcare Seeking Behaviour: Doctor Consultation*

	Category	Frequency (n=405)	Percentage
<i>Doctor Consultation</i>	Always	192	47.4
	Frequently	109	26.9
	Sometimes	80	19.8
	Rarely	23	5.7
	Never	1	0.2

As seen in Table 6, the habit of doctor consultation varies from Always (47.4%), frequently (26.9%), Sometimes (19.8%), rarely (5.7%), and never (0.2%).

*Healthcare Expenditure and Healthcare Seeking Behaviour*

**Table 7**  
*Healthcare Expenditure and Health Care Utilization (n=405)*

Variables	Health Checkup	Doctor Consultation
Monthly Healthcare expenditure	Spearman rho = -.119; p = .017	Spearman rho = -.245; p = .000
Income	Spearman rho = 0.001; p = .977	Spearman rho = -.214; p = .000

As in Table 7, the relationship between Monthly Healthcare Expenditure and Health Checkup (Spearman rho = -.119; p = .017) and the relationship between Monthly Healthcare Expenditure and Doctor Consultation (Spearman rho = -.245; p = .000) are significant. However, the Income has no significant relationship with Health Check-Up (Spearman rho = 0.001; p = .977) but has a significant relationship with Doctor Consultation (Spearman rho = -.214; p = .000). Therefore, it can be assumed that financial matters influence healthcare-seeking behaviour of the elderly, hence H1 is accepted.

**H2:** Out-of-pocket healthcare expenditure leads to delayed healthcare access.

As seen in Table 8, 42.5 per cent face difficulty in finding money for healthcare needs and 30.1 per cent have difficulty 'sometimes' and only 27.4 per cent have 'no difficulty' for healthcare financing. 48.8 per cent 'delays or denies' their healthcare need due to financial constraints.

**Table 8**  
*Delayed Care due to Financial Burden*

<i>The difficulty for money for treatment</i>	<i>Category</i>	<i>Frequency (n = 405)</i>	<i>Percentage</i>
	Yes	172	42.5
	No	111	27.4
	Sometimes	122	30.1
<i>Delayed/Denied care due to the lack of money</i>	Yes	198	48.8
	No	154	38
	Sometimes	53	13.1

**Table 9**  
*Healthcare Expenditure and Financial Burden (n=405)*

<i>Variables</i>	<i>Chi-square Value</i>	<i>df</i>	<i>Sig. (2-sided)</i>	
Source of Healthcare Financing	Delayed care	32.105	15	.006
Monthly Healthcare Expenditure	The difficulty for Finding Money for Treatment	19.296	8	.013

Table 9 shows that the relationship between Source of Healthcare Financing and Delay in accessing healthcare is significant at the 5 per cent level ( $\chi^2 = 32.105$ ,  $p = 0.006$ ,  $df = 15$ ). The results also show the relationship between Monthly Healthcare Expenditure and Difficulty for Finding Money for Treatment is significant at the 5 per cent level ( $\chi^2 = 19.296$ ,  $p = 0.013$ ,  $df = 8$ ). Hence H2 is accepted.

## Discussion

This study aimed to identify the impact of healthcare expenditure on the lives of the geriatric population in Kerala, particularly, in their healthcare-seeking behaviour. The present study confirmed the previous findings (Garg and Karan, 2009; Alam, *et al.*, 2012; State Planning Board, 2014) that healthcare expenditure in Kerala is very

high. It is evident that (Table 1), 25.9 per cent has no particular income whereas 56.3 per cent have a monthly income of less than INR 10,000. Only 3.1 per cent have health insurance coverage wherein 22.2 per cent has to spend between INR 2,000 to INR 5,000 per month for their treatment. 52.1 per cent responded that their only income is the old-age pension, which is just INR 1,500, which is insufficient to cover even the OP charges and check-ups. This situation requires urgent attention from the authorities that Kerala OOP expenditure remains highest in India for the last decade (Alam, *et al.*, 2012; State Planning Board, 2014), and the rural elderly are the most susceptible victims of this social situation. This necessitates the need for public healthcare financing as in other countries and the implementation of standardized and regulated healthcare costs in the dominating private healthcare industry of Kerala.

It is found that 58.3 per cent do check-ups when getting diseased. Nevertheless, 47.4 per cent of the geriatric population consult a doctor only when the need arises. It can be explained that, in Kerala, children are responsible for the healthcare expenditure of their parents and this social structure might be one of the possible reasons for the comparatively higher rates of healthcare-seeking behaviour among them. However, it equally challenges the social structure that 30.6 per cent of them have to struggle for their healthcare needs as they have nobody to depend for healthcare finance (Table 1). This is disturbing that, every year, 3.5 per cent to 6.2 per cent of the Indian population is pushed to below the poverty line due to OOP expenditure (Garg and Karan, 2009; Berman *et al.*, 2010). The study confirms the previous study finding of Philips and Ravindran (2017) that the financial burden of the elderly households with elderly are huge as the average OOP expenditure is INR 14,569 per episode of hospitalization and INR 1105 for drugs.

It is hypothetically proved that the monthly healthcare expenditure impacts the healthcare-seeking behaviour such as health check-ups and doctor consultation (Table 7).

However, their income is not influencing health check-ups but has an association with doctor consultation and this can be attributed to better literacy, higher health consciousness, and improved healthcare access due to the presence of both private and public sector

healthcare institutions (Dilip, 2003). Moreover, it is also tested and found significant that OOP expenditure leads to difficulty in meeting the healthcare finance, consequently leading to delayed or denied healthcare access. This is very distressing that, in India, about 70 per cent of the older population live in rural areas, and around half of them belong to poor socioeconomic status (SES). The rural elderly spent more amount on their treatment as compared to the urban elderly in Kerala (Alam, *et al.*, 2012).

Marais, *et al.*, (2013) in 2013, noted the possible convergence of infectious diseases with NCDs in the decades to come which will affect populations at a larger level. To support this, in Kerala, an average of 64 per cent of the elderly suffer from Hypertension, 51.4 per cent from Diabetes, 22.7 per cent from Heart Disease, 19.5 per cent from Respiratory Problems, and 6.7 per cent from Cancer (Joseph and Ulahannan, 2021). Many of them have two or more diseases (Comorbidities). According to the findings of the American Diabetes Association (2002), the healthcare expenditure of people with diabetes is two times or more than those without diabetes. This shows that diabetes causes a substantial healthcare expenditure burden on Kerala society as the incidence of type 2 diabetes (T2DM) is 21.9 per cent in Kerala (Vijayakumar *et al.*, 2019).

The health scenario is under a threat that, according to the 2011 census data, one in eight persons in Kerala belong to 60 years and above category, 11 per cent of the total population belong to the 'oldest-old category, 80 years and above (Rajan *et al.*, 2020) and is undergoing a demographic transition. It is consistent with the present study that around 17 per cent of them are coming in the 'oldest old' category of above 80 years of age (Table 1). In this social situation, investments in improving primary and secondary health care facilities under the public sector is necessary to ensure quality geriatric healthcare access (Levesque, 2006; Mukherjee and Levesque, 2012). This concept challenges the Buchanan theory (1965) which assumes that if the government provides public healthcare facilities to the public, it will create excess demand for healthcare, in turn, lead to unreasonable expenditure in the healthcare sector. The study disregards this theory as, if adhered, it will pave way for further commercialisation of the private healthcare sector in Kerala,

consequently leading to catastrophic healthcare expenditure leading to impoverishment and poverty.

Geriatric care must be transformed into innovative, evidence-based care, in the light of likely syndemic interactions of severe illnesses and their treatments (NASE, 2019). Preventive and curative elderly healthcare programmes are inevitable in the line of the present 'Vayomithram' project through which the elderly get free health check-ups and medicines and provides asylum for their mental rejuvenation by providing a space to open and share their problems. These interventions are significant where the inefficiency and unaccountability of the Indian healthcare system led to privatization of healthcare, in turn, paved the way for the mushrooming of commercialised healthcare facilities with lucrative aims pushing the vulnerable populations to pain, suffering, and poverty (Pal, 2009).

The Kerala healthcare industry with the highest number of private healthcare institutions and highest healthcare expenditure can be explained by using Wagnerian theory (1890) which states that the economy has got an impact on health expenditure. The economic development of the state increases the capability to purchase and build better health infrastructure, which is in line with previous findings (e.g. Subramanian, *et al.*, 2002). Nevertheless, the disease profile of the state demonstrates a challenging scenario, and the healthcare expenditure increase regardless of the purchasing power. It may push many households with a geriatric population to poverty which is incongruent with the health-led growth hypothesis of Keynes (1936) which states that an increase in healthcare infrastructure spending promotes the economy.

This study suggests that Innovative public financing mechanisms must be strengthened as Philip and Ravindran (2017) found that the Comprehensive Health Insurance Scheme (CHIS) and RSBY (Rashtriya Swasthya Bima Yojana) coverage among the geriatric population in Kerala did not translate into economical risk protection. Hence, being a vulnerable group with special needs, the geriatric population needs a more comprehensive healthcare package embedded with chronic disease care (Philip and Ravindran, 2017). Kerala is a state which has the largest number of out-migrants and consequently, a large number of older adults are left alone at their homes. This creates

embarrassment and suffering in making healthcare decisions, lack of physical, mental, and financial support, and the grave feeling of isolation. Social security and healthcare are their rights and therefore, free doctor consultation, generic medicines, counselling support, and check-ups must be made accessible to them while the elderly bedridden cases must be supported with preventive and curative care at their asylums.

This study is unique as it revealed the OOP expenditure and its impact on the healthcare-seeking behaviour of the geriatric population in Kerala. The study understandings will help to formulate policies on geriatric healthcare and has wider implications for the healthcare system where the geriatric population is projected to increase at a rate of 2.45 per cent (Rajan *et al.*, 2020). To its limitation, the data was collected while the pandemic COVID-19 is ongoing, causing limitations in accessing the elderly at their households as there were social restrictions due to their vulnerability to the pandemic. To truly assess the impact of huge OOP healthcare expenditure on the elderly, the study requires more data and, therefore, future research should further confirm the findings by including more samples in the study which may be further triangulated with qualitative data.

## **Conclusion**

It is found that the elderly in Kerala face a lot of healthcare difficulties particularly due to the lack of healthcare finance particularly when OOP expenditure remains higher in Kerala for several years. Due to the difficulty in finding healthcare finance, the geriatric population tends to delay or deny healthcare needs, who are more susceptible to epidemics and NCDs. Ageing is unavoidable, and therefore, the public healthcare system has to strengthen its facilities with a sufficient number of geriatricians. A more focused 'holistic quality ageing' approach is needed to develop the geriatric healthcare system in Kerala.

**Ethical approval:** The study was approved by the Institutional Ethics committee of the parent institution. Informed consent was obtained from every participant before the start of the study after briefing them about the study.

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## Impact of Positive Health Resources on Psychological Distress in Elderly with Chronic Illness: Revelations from Latent Profile Analysis

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### ABSTRACT

*This study aimed to identify homogenous positive health resources profiles among the elderly with chronic illnesses and examined their impact on psychological distress. A Purposive sample of 120 elderly participants (60 males and 60 females) of ages varying from 60 years and above, with chronic illness, was administered three measures – Spiritual Index of Well-Being, Interpersonal Support Evaluation List (shortened version–12 items), Depression Anxiety Stress Scales (DASS–21). The tidy LPA package in R version 4.0.5 for latent profile analysis – a model-based clustering was used in the analysis of data. A three-profile solution provided the best fit for the data. The emerged latent profiles were named as high, moderate, and low positive health resources sub-groups. The high positive health resources sub-group reported significantly lower psychological distress compared to the other two sub-groups. The emerged three latent profiles of the elderly with chronic illness were confounded by the level of education and illness condition.*

**Keywords:** Elderly with chronic illness, Spiritual well-being, Social support, Psychological distress,

Chronic disease is known for its prolonged course of illness or incurability. Chronic diseases are generally characterised by uncertain etiology, multiple risk factors, a long latency period, a prolonged course of illness, non-ontagious origin, functional impairment or disability, and incurability (McKenna and Collins, 2010). Existing evidence across the globe indicate that the elderly population suffers from chronic multiple health problems (World Health Organization, 2015). As the population ages, increasing numbers of people will live with at least one chronic condition (Stanton, *et al.*, 2007). Thus, the chronic illness of the elderly in the family is a growing concern.

Also, as age declines, physical and mental health deteriorates. Thus, elderly people are prone to physical and emotional health problems (Shin and Sok, 2012). Moreover, as living longer has its limitations, the dynamics of physical and mental health in the elderly are complex. Nevertheless, health is implied as a positive notion in terms of well-being and ability (Nordenfelt, 2017). Maintenance of health is reflected in terms of understanding the concept of positive health (Walmer, 1958). Positive health is an individual's ability to adapt and self-manage (Huber, *et al.*, 2011). Positive health comprises bodily functions, mental functions, perception, spiritual dimension, quality of life, social and societal participants, and daily functioning (Ibid.). Hence, it takes the positive health assets or resources as an approach to enhance health and longevity (Seligman, 2008).

The WHO (2021) suggests, "good general health and social care is important for promoting older people's health, preventing disease, and managing chronic illnesses." Over the last two decades, research has shed more light on the elements of living well despite chronic illness (Stanton, *et al.*, 2007). Moreover, self-perceived health is observed to be a significant predictor of mortality, physical morbidity, and disability among elderly people (Salman and Lee, 2019). Emphasising the healthy lifestyle of the elderly despite the presence of multidimensional challenges of chronic illness is therefore, desirable.

Spiritual well-being as a positive health resource is a significant factor that relates to an individual's meaning and purpose in life. Spiritual well-being is replicated in the value of relationships that an individual has with oneself, others, the environment, and God (King and Boyatzis, 2015; Linton, *et al.*, 2016).

Social support as a positive domain of health resources originates from social networks and relationships towards the well-being of individuals. It is believed that the quality of social support influences health differently (Windsor, *et al.*, 2016; Xing, *et al.*, 2017). Social support plays a pivotal role in various aspects of late life. Research findings suggest that social support is not only important for functional status in late life (Hajek, *et al.*, 2017), but also acts as a protective factor in decreasing both the vulnerability of older people and the risk of elder mistreatment (Melchiorre, *et al.*, 2013). The elderly with social support tend to have lower blood pressure (Birditt, *et al.*, 2012). Bennett and Shepherd (2013) have investigated that absence or lack of social support indicates major depressive symptoms in the elderly with chronic illnesses. Besides, low or no social support negatively impacts on elderly quality of life. Nevertheless, research findings suggest that a positive family environment facilitates positive growth among chronic illness patients (Rana and Nandinee, 2016).

### **Objectives of the Study**

The purpose of the study was to identify the homogenous latent profiles of positive health resources among the elderly with chronic illnesses and examine their impact on psychological distress. The study has addressed three specific research questions: (1) Despite having a chronic illness, how do different elderly experience the important aspects of positive health resources at the same time? (2) Do the elderly with chronic illness differ in their psychological distress depending on their latent profile of positive health resources? (3) What are the significant confounding variables that influence their positive health resources?

### **Material and Methods**

#### ***Participants***

The participants included 120 elderlies with atleast one chronic illness (equal number of men and women) selected through purposive sampling from twin-city of Hyderabad and Secunderabad in the Telangana State of India. The age of the participants varied from 60 to 79 years. The participants were divided into two age groups: 60 to

69-year (64.2%) and 70 to 79-year (35.8%). Thus, 35 per cent of the participants had one chronic illness and 65 per cent of participants had more than one chronic illness. The participants with known psychiatric conditions were excluded from the study.

### *Measures Used*

#### *Spiritual Index of Well-Being (SIWB)*

The Spiritual Index of Well-being (SIWB; Daaleman and Frey, 2004) measures spirituality in patient populations in health-related quality-of-life studies. The SIWB has 12 items with a 5-point Likert scale ranging from 1 = Not at all to 5 = Very true. The SIWB comprises two sub-scales – self-efficacy and life scheme. Each sub-scale has six items. Thus, the maximum score of a sub-scale was 30 and the minimum score was 6. A high score indicated a higher level of spirituality. With adequate psychometric properties, SIWB is observed to be a valid and reliable instrument (self-efficacy subscale:  $\alpha = .86$ , test-retest  $r = .77$ ; life scheme subscale:  $\alpha = .89$ , test-retest  $r = .86$ ; and whole scale:  $\alpha = .91$ , test-retest  $r = .79$ ; (Ibid.).

#### *Interpersonal Support Evaluation List (shortened version–12 items)*

Interpersonal Support Evaluation List (ISEL; shortened version–12 items; (Cohen, *et al.*, 1985) is a shortened version of the original ISEL (40 items; Cohen and Hoberman, 1983) that measures the perceived social support. The measure consists of 12 items and three subscales – appraisal support, belonging support, and tangible support. Each item uses a 4-point scale ranging from 1 = Definitely false to 4 = Definitely true. Half of the items are reverse scored. Each sub-scale has four items. A higher score indicates a higher level of social support. The reliability and validity of the ISEL shortened version–12 items are observed to be adequate (Merz, *et al.*, 2014).

#### *Depression Anxiety Stress Scales (DASS)*

Depression Anxiety Stress Scales – DASS–21 version (Lovibond and Lovibond, 1995; DASS web page, 2018) has 21 items, each measured on a 4-point scale ranging from 0 = Did not apply to me at all to 3 = Applied to me very much or most of the time. DASS–21 has

three self-report scales to measure the emotional states of depression, anxiety, and stress. Each scale has seven items. A higher score indicates a higher level of depression, anxiety, and stress. The DASS-21 is, however, based on a dimensional rather than a categorical conception of psychological disorder. This scale is widely used because of its adequate psychometric properties and relevance.

Important demographic data of the participants, such as their gender, age, level of education, and illness condition was also collected from the participants.

### *Procedure*

An informed consent form was specifically designed and used in this study as it involved assessment without having any potential risks. The participants were individually approached and the purpose of the study and proper instructions were explained to them. The participants were given assurance about the confidentiality of their responses. They were also informed that in the measures there would not be any 'right' or 'wrong' responses as there would be individual differences. The participants were informed that they had the right to withdraw from the study at any point in time. Further doubts about the assessment were clarified by the investigator. Participants were included only after understanding and signing their informed consent forms. The response for each item was recorded. The time to complete the measures ranged between 25–30 minutes. In case of any doubts regarding any item, clarification was given.

### *Statistical Analysis of Data*

R version 4.0.5, RStudio Version 1.4.1106 with appropriate packages, and Microsoft Excel 2019 for analysing the obtained data were used.

To examine the profile of positive health resources of elderly with chronic illness, latent profile analysis (LPA) was run primarily using *tidy lap* package (Rosenberg, *et al.*, 2018) along with other associated packages of R. The *tidy lap* package is a simple interface for conducting and evaluating LPA models (Rosenberg, *et al.*, 2018). LPA – a model-based clustering (Hennig, *et al.*, 2015; Scrucca, *et al.*, 2017) –

is one of the most commonly used and relevant applications of the general mixture model where all measured variables are continuous (Pastor, *et al.*, 2007; Harring and Hodis, 2016). LPA is a statistical method for identifying homogeneous subgroups (latent profiles) within heterogeneous samples based on a set of measures. According to Rosenberg, *et al.*, (2018), “the *tidy* lap package allows users to specify different models that determine whether and how different parameters (i.e. means, variances, and covariances) are estimated, and to specify and compare different solutions based on the number of profiles extracted”. In LPA, the researcher specifies the number of hypothesized profiles in the data. For each participant, the probability of being in a given profile is estimated, and classification into one of the profiles is determined by that individual’s highest-profile probability (Cohen, *et al.*, 2017).

LPA was used to detect homogeneous groups (latent profiles) using five aspects of positive health resources during old age – two domains of spiritual well-being (*self-efficacy* and *life-scheme*) and three domains of social support (*appraisal support*, *belonging support*, and *tangible support*). LPA was computed on the entire sample ( $N = 120$ ). One- to four-profile solutions using the above five aspects of positive health resources of elderly with chronic illness were also calculated. Out of six LPA models, the researchers specified Model 1, where variances = equal and covariances = 0.

## Results

Table 1 shows commonly used fit statistics, such as Aikake information criterion (AIC), Bayesian information criterion (BIC), entropy, minimum of the diagonal of the average latent class probabilities for most likely class membership by assigned class (Prob. Min), maximum of the diagonal of the average latent class probabilities for most likely class membership by assigned class (Prob. Max), the proportion of the sample assigned to the smallest class (N Min.), proportion of the sample assigned to the largest class (N Max.), and the p-value of bootstrapped likelihood ratio test (BLRT<sub>p</sub>) for one- through four-profile solutions for the sample.



**Table 1**  
*Parameters of fit for one- to four-profile solutions for positive health resource of elderly with chronic illness*

<i>Number of profiles</i>	<i>AIC</i>	<i>BIC</i>	<i>Entropy</i>	<i>Prob. Min</i>	<i>Prob. Max</i>	<i>N Min.</i>	<i>N Max.</i>	<i>BLRT<sub>p</sub></i>
1	3,012.74	3,040.62	–	–	–	–	–	–
2	2,832.09	2,876.69	.91	.97	.99	.46	.54	.009
3	2,772.20	2,833.52	.87	.92	.95	.22	.45	.009
4	2,768.02	2,846.07	.82	.83	.92	.18	.33	.089

*Note:* AIC: Aikake information criterion; BIC: Bayesian information criterion; Prob. Min.: Minimum of the diagonal of the average latent class probabilities for most likely class membership, by assigned class; Prob. Max.: Maximum of the diagonal of the average latent class probabilities for most likely class membership, by assigned class; N Min.: Proportion of the sample assigned to the smallest class; N Max.: Proportion of the sample assigned to the largest class; BLRT<sub>p</sub>: the p-value of bootstrapped likelihood ratio test.

As shown in Table 1, lower the value of the model information indicators, including AIC and BIC, better is the latent profile solution with increasing numbers of latent profiles. Compared to two-, three-profile solution had lower AIC and BIC. Entropy is a measure of classification uncertainty, where 1 reflects complete certainty of classification and 0 complete uncertainty (Celeux and Soromenho, 1996). Thus, entropy values close to one show good classification accuracy. The three-profile solution had an entropy of 0.87 which was greater than the four-profile solution. Though the AIC value of the four-profile solution was lower than the three-profile solution, the BLRT<sub>p</sub> was not significant (BLRT<sub>p</sub> = 0.08). Thus, based on the maximum number of fit statistics, the supremacy of the three-profile solution over alternative solutions was ascertained and the three-profile solution was considered the best-fitting model.

The elderly with chronic illness were divided into three profiles (sub-groups) by LPA. Profile 1 was the largest sub-group, which had 54 elderly participants, accounting for 45 per cent. This profile was characterised by the highest mean scores on all five aspects of positive health resources and was labelled the “*high positive health resources*” sub-group. Profile 2 consisted of 39 elderly participants accounting for 32.5 per cent. This profile was characterised by moderate scores on all

five aspects of positive health resources and was labelled the “*moderate positive health resources*” sub-group. Profile 3 was the smallest sub-group comprising 27 elderly participants (22.5%). This sub-group was characterised by the lowest mean scores on all five aspects of positive health resources and was labelled the “*low positive health resources*” sub-group. Table 2 reports the mean and standard deviation values on five aspects of positive health resources defining the latent profiles, total sample, and by profile.

**Table 2**

*Mean and standard deviation values on five aspects of positive health resource defining profiles, total sample, and by profile*

Variable	Total	Latent profiles		
		High	Moderate	Low
Spiritual well-being				
Self-efficacy	23.43 (4.59)	26.11 (2.55)	24.36 (2.29)	16.70 (3.49)
Life scheme	24.51 (4.75)	26.65 (2.38)	25.72 (4.33)	18.48 (3.86)
Social support				
Appraisal support	13.18 (2.22)	15.15 (0.79)	12.10 (1.45)	10.81 (1.62)
Belonging support	13.36 (1.94)	14.72 (1.37)	11.90 (1.43)	12.74 (1.74)
Tangible support	12.86 (2.34)	14.72 (1.29)	11.41 (1.70)	11.22 (2.10)
<i>n</i>	120	54	39	27
% of total sample	100	45	32.5	22.5

Note: Figures in parentheses are standard deviations

Figure 1 shows the profile plot for the three-profile solution using the standard scores (z-scores) of five aspects of positive health resources.

As the minimum and maximum scores of the five aspects of positive health resources varied, we calculated their z-scores ( $N = 120$ ) to compare across the three latent profiles in the profile plot in Figure 1. Though the high positive health resources sub-group was higher in all the five aspects of positive health resources than the other two sub-groups, it was closer to the moderate positive health resources sub-group in the life scheme. Nevertheless, the low positive health resources sub-group was higher in belonging support than the

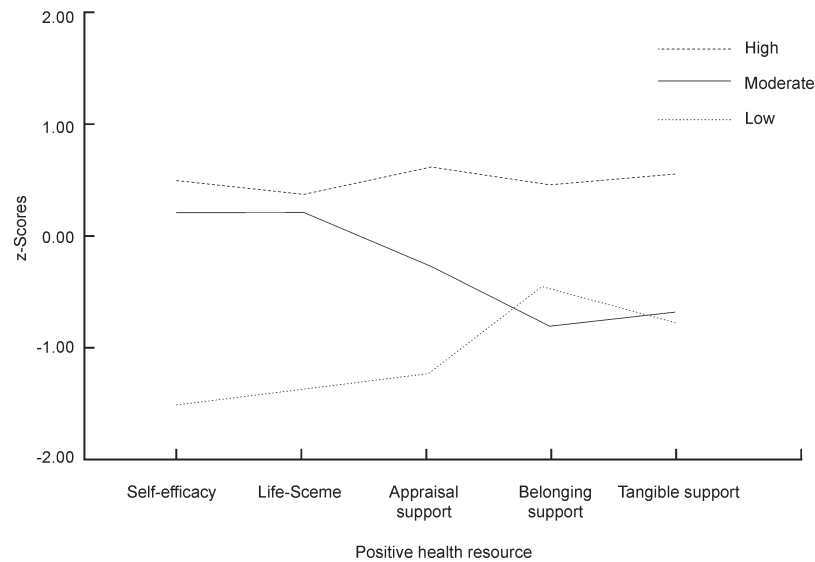
**Figure 1***Profile of five aspects of positive health resource of elderly with chronic illness*

Figure 1: z-Scores of the five aspects of positive health resource across three latent profiles (sub-groups) of elderly with chronic illness – elderly with high positive health resource, moderate positive health resource, and low positive health resource.

moderate positive health resources sub-group, whereas both the sub-groups were closer to each other intangible support.

#### *Impact of the profile of positive health resources on the psychological distress of elderly with chronic illness*

After exploring and interpreting each identified latent profile from the best-fitting solution, we computed One-way ANOVA to examine how the elderly with chronic illness varied in their psychological distress (depression, anxiety, and stress) depending on their latent profile of positive health resources. The means, standard deviations, 95 per cent confidence intervals, and the results of One-way ANOVA on depression, anxiety, and stress are reported in Table 3.

**Table 3**  
*Comparison of psychological distress across three latent profiles (sub-groups)*

	<i>High (n = 54)</i>		<i>Moderate (n = 39)</i>		<i>Low (n = 27)</i>			
	95% CI		95% CI		95% CI			
<i>Variables</i>	<i>M</i> <i>(SD)</i>	<i>Lower</i> <i>Upper</i>	<i>M</i> <i>(SD)</i>	<i>Lower</i> <i>Upper</i>	<i>M</i> <i>(SD)</i>	<i>Lower</i> <i>Upper</i>	<i>F</i> (2,117)	<i>Partial</i> $\eta^2$
Depressio n	4.89 (2.82)	3.64 <b>6.14</b>	9.64 (5.27)	8.17 11.11	17.70 (6.32)	15.94 19.47	68.93***	.54
Anxiety	4.41 (4.28)	3.01 5.80	10.26 (6.21)	8.62 11.90	19.85 (5.17)	17.88 21.82	80.44***	.58
Stress	5.96 (5.95)	4.45 7.48	8.97 (5.35)	7.19 10.76	18.44 (5.30)	16.30 20.59	44.96***	.43

Note: \*\*\* $p < .001$

From Table 3, it is observed that the One-way ANOVA conducted on the depression scores of the elderly with chronic illness revealed a statistically significant effect of the profile of positive health resources,  $F(2,117) = 68.93$ ,  $p < .001$ . The effect size was large (Partial  $f^2 = .54$ ) suggesting about 54 per cent of the variance of depression scores was due to the differences in the profile of positive resources of the elderly with chronic illness. Post-hoc comparisons using Tukey's HSD test were run for multiple comparisons between the latent profiles (sub-groups). From the results of the Tukey's HSD test, it is revealed that the elderly participants belonging to the low positive health resources sub-group ( $M = 17.70$ ,  $SD = 6.32$ ) were significantly more depressed compared to their counterparts in the moderate positive health resources sub-group ( $M = 9.64$ ,  $SD = 5.27$ ,  $p < .001$ ) and high positive health resources sub-group ( $M = 4.89$ ,  $SD = 2.82$ ,  $p < .001$ ). Moreover, the elderly participants belonging to the moderate positive health resources sub-group were significantly more depressed compared to their counterparts in the high positive health resources sub-group ( $p < .001$ ).

The One-way ANOVA conducted on the anxiety scores of the participants showed a statistically significant effect of the profile of positive health resources,  $F(2,117) = 80.44$ ,  $p < .001$ . The effect size was large (Partial  $f^2 = .58$ ) suggesting about 58 per cent of the variance of anxiety scores was due to the differences in the profile of positive

health resources of the elderly with chronic illness. From the results of Tukey's HSD test, it is revealed that the anxiety scores of the elderly participants belonging to the low positive health resources sub-group ( $M = 19.85$ ,  $SD = 5.17$ ) were significantly higher compared with their counterparts in the moderate positive health resources sub-group ( $M = 10.26$ ,  $SD = 6.21$ ,  $p < .001$ ) and high positive health resources sub-group ( $M = 4.41$ ,  $SD = 4.28$ ,  $p < .001$ ). Moreover, the elderly participants belonging to the moderate positive health resources sub-group had significantly higher anxiety scores compared to their counterparts in the high positive health resources sub-group ( $p < .001$ ).

The One-way ANOVA conducted on the stress scores of the participants showed a statistically significant effect of the profile of positive health resources,  $F(2,117) = 44.96$ ,  $p < .001$ . The effect size was large (Partial  $f^2 = .43$ ) suggesting about 43 per cent of the variance of stress scores was due to the differences in the profile of positive health resources of the elderly with chronic illness. From the results of Tukey's HSD test, it is revealed that the elderly participants belonging to the low positive health resources sub-group were observed to be significantly more stressful ( $M = 18.44$ ,  $SD = 5.30$ ) compared with their counterparts in the moderate positive health resources sub-group ( $M = 8.97$ ,  $SD = 5.35$ ,  $p < .001$ ) and high positive health resources sub-group ( $M = 5.96$ ,  $SD = 5.95$ ,  $p < .001$ ). Moreover, the elderly participants belonging to the moderate positive health resources sub-group were significantly more stressed compared with their counterparts in the high positive health resources sub-group ( $p = .032$ ).

#### *Confounding variables in understanding the positive health resources of the elderly with chronic illness*

After examining the impact of the profile of positive health resources on the psychological distress of elderly with chronic illness, we used the  $\chi^2$  test to examine the association between profile membership and the important demographic characteristics of the elderly with chronic illness to identify the confounding variables. The frequency and percentage of the cases under each important

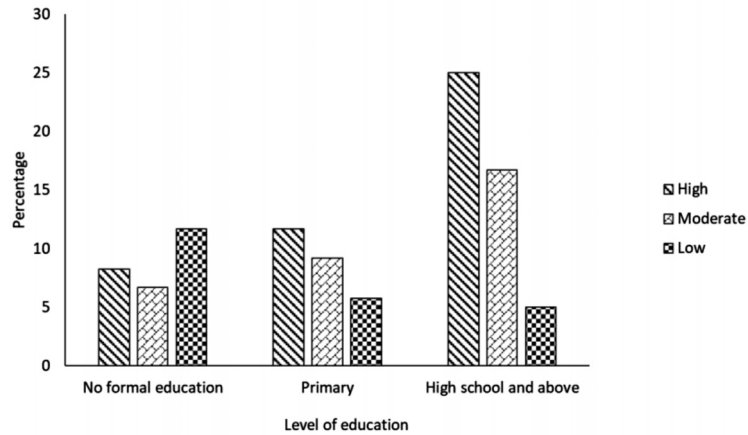
demographic characteristic and the results of the  $\chi^2$  are presented in Table 4.

**Table 4**  
*Association between the latent profiles and the important demographic characteristics of the elderly with chronic illness*

Demographic Characteristics	Latent profiles			$\chi^2$
	High (n = 54)	Moderate (n = 39)	Low (n = 27)	
	f(%)	f(%)	f(%)	
Gender				
Female	25 (20.8)	21 (17.5)	14 (11.7)	0.56, p = .754
Male	29 (24.2)	18 (15.0)	13 (10.8)	
Age				
60–69 years	32 (26.7)	27 (22.5)	18 (15.0)	1.07, p = .585
70–79 years	22 (18.3)	12 (10.0)	9 (7.5)	
Level of education				
No formal education	10 (8.3)	8 (6.7)	14 (11.7)	12.92, p = .012
Primary	14 (11.7)	11 (9.2)	7 (5.8)	
High school and above	30 (25.0)	20 (16.7)	6 (5.0)	
Illness condition				
One illness	13 (10.8)	21 (17.5)	8 (6.7)	9.26, p = .010
More than one illness	41 (34.2)	18 (15.0)	19 (15.8)	

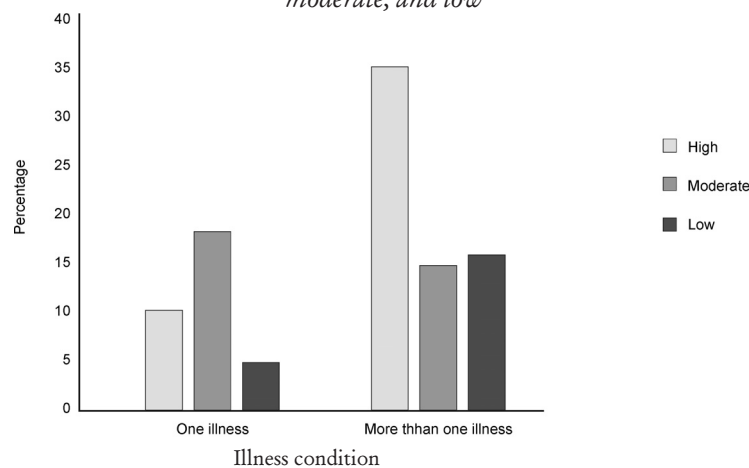
To determine whether the three profiles of elderly participants were confounded by gender, a Profile (3) X Gender (2)  $\chi^2$  test of association was computed. The results indicated that the number of male and female patients was not significantly different across the three clusters,  $\chi^2 = 0.56$ ,  $p = .754$ . Similarly, no significant association was observed between three latent profiles and two age groups,  $\chi^2 = 1.07$ ,  $p = .585$ . Nevertheless, the results of Profile (3) X Education (3)  $\chi^2$  test of association revealed that the levels of education of the elderly with chronic illness were significantly different across the three latent profiles,  $\chi^2 = 12.92$ ,  $p = .012$ . Out of the three profiles, the high positive health resources sub-group had a comparatively higher percentage of elderly with high school and above level of education (25%). The percentages of the levels of education across three profiles are presented in Figure 2.

**Figure 2**  
*Level of education of the elderly across three latent profiles (sub-groups) – high, moderate, and low*



Further, the results of the  $\chi^2$  test found a significant association between three latent profiles and two illness conditions,  $\chi^2 = 9.26$ ,  $p = .010$ . Among the three profiles, the high positive health resources sub-group had a comparatively higher percentage of elderly with more than one illness condition (34.2%). The percentages of the illness conditions across three profiles are presented in Figure 3.

**Figure 3**  
*Presence of one or more illnesses across three latent profiles (sub-groups)-high, moderate, and low*



## Discussion

The first question in this study has sought to determine how different elderly with chronic illness experience important aspects of positive health resources at the same time. Through LPA, we have identified three meaningful homogeneous latent profiles or sub-groups in the elderly participants with chronic illness based on their experience of five important aspects of positive health resources – two domains of spiritual well-being (*self-efficacy* and *life-scheme*) and three domains of social support (*appraisal support*, *belonging support*, and *tangible support*). Thus, the elderly with chronic illness, who initially formed a group, have been classified into three homogenous latent profiles or sub-groups – *high positive health resources sub-group*, *moderate positive health resources sub-group*, and *low positive health resources sub-group* – when their positive health resources are taken into consideration. The findings suggest that the aspects of positive health resources, specifically spiritual well-being and social support, are not uniformly experienced by the elderly with chronic illness. The disparity in degree and kind of positive health resources in terms of spiritual well-being and social support leads with the occurrence of different homogenous profiles or sub-groups.

The second question in this study focuses on how the elderly with chronic illness differ in their psychological distress depending on their latent profile of positive health resources. In this study, psychological distress is operationalised through three distinct constructs, such as depression, anxiety, and stress. The findings posit that there is a significant effect of the latent profile of positive health resources on the psychological distress of the elderly with chronic illness. The results reveal that the elderly with chronic illness falling under the high positive health resources sub-group have reported significantly low levels of depression, anxiety, and stress compared with the elderly in the moderate positive health resources sub-group and low positive health resources sub-group. The elderly with chronic illness falling under the low positive health resources sub-group has reported the highest level of depression, anxiety, and stress.



The present study contributes to the literature studies in various directions. The findings are consistent with recent studies stating that higher wellbeing and social support have been associated with lesser psychological distress in the elderly. There is a shred of evidence showing an association between low levels of spiritual beliefs with poor mental health. (Wilt, *et al.*, 2017). Another study showed that strong social support is a good predictor of improved mental health conditions in the elderly (Gyasi, *et al.*, 2018). Moreover, meaningful interpersonal relations help minimize psychological stress and enhances endocrine and immune functioning in the elderly (Yang, *et al.*, 2016). Psychological distress was associated with social dysfunction in the elderly (Matud and García, 2019). Self-efficacy which is effective through support from neighbours or friends further increases health-promoting behaviours and healthy ageing (Wu and Sheng, 2019). Also, self-efficacy in the presence of perceived social support mediates psychological wellbeing factors (Fatima, *et al.*, 2018).

The third question in this research is to explore the major confounding variables affecting the positive health resources of the elderly with chronic illness. The results show that the identified three latent profiles or sub-groups of the elderly are not confounded by gender and age group. This suggests that experiencing positive health resources in terms of spiritual well-being and social support is not dependent on the gender or age group of the elderly. For this, the elderly participants of both the gender and age groups are distributed across the three latent profiles.

On the contrary, a longitudinal study revealed that older women reported higher levels of spirituality than men, and those who had a religion reported higher scores of spirituality than their counterparts who had no religion, and also older adults who reported higher levels of social support and flexibility also reported higher levels of spirituality (Bailly, *et al.*, 2018). In a community-dwelling, elderly women with at least one chronic illness were considered in the study, results show that social support has been associated with high sociability and lower depression (Warner, *et al.*, 2019). Among elderly men, tangible support, affectionate support, overall support, and positive social interactions contribute to slow down cognitive decline (Pillemer, *et al.*, 2018). Age

and gender have many inclinations in outcome measures and subjective measures like spiritual well-being, mental health, health-related quality of life, post-traumatic growth, and positive self-regard. Also, Age and gender have curvilinear effects on spiritual well-being and health-related quality of life (Roberts, *et al.*, 2019).

Nevertheless, significant associations are observed between the identified three latent profiles and the levels of education and illness condition of the elderly with chronic illness. This indicates that the identified three latent profiles of the elderly with chronic illness are confounded by levels of education and illness condition. One interesting finding is that out of the three latent profiles, the high positive health resources sub-group has a comparatively higher percentage of elderly with high school and above level of education. This signifies that the elderly participants with a higher level of education are more resourceful in terms of their spiritual well-being and social support. Education appears to foster positive health despite the challenges of chronic illness in elderly participants. Similarly, it is somewhat surprising that the high positive health resources sub-group has a comparatively higher percentage of elderly with more than one illness condition. This finding suggests that when there is a presence of more than one chronic illness condition the elderly participants seek more positive health resources in terms of spiritual well-being and social support. When the complexities increase, the orientation towards positive health resources also enhances in the elderly population.

In agreement with the present study, education plays a significant role in the social well-being of the elderly (Singh and Kiran, 2015). Elderly men having at least one chronic comorbid condition perceived better quality of life than elderly women (Deshmukh, *et al.*, 2015). Moreover, systematic reviews in Asia and across 13 countries reported a strong association between social support and depression (Schwarzbach, *et al.*, 2014). 85.20 per cent of elderly Chinese had at least one chronic disease (Wu and Sheng, 2019).

During our review, we have never come across any studies using LPA on the positive health resources of the elderly with chronic illness regarding their spiritual well-being and social support. This

study appears to be the first study to use the *tidy LPA* package to identify latent profiles of positive health resources of elderly with chronic illness. Thus, the findings of our study have brought new dimensions of research in the area of positive living despite the challenges of chronic illness during old age. The yields in this study are unique compared to those of others as the study has adopted a new technique to examine the impact of spiritual well-being and social support, two important aspects of positive health, on three distinct dimensions of psychological distress (depression, anxiety, and stress) of the elderly population. It is also understood that LPA could be a parsimonious method to model positive health resources heterogeneity in any participants with chronic illness.

Consistent with the existing literature, this study has observed that the elderly having high positive health resources are less vulnerable to depression, anxiety, and stress. The level of education and illness condition as confounding variables is one of the striking findings of the study. What is curious about the findings is that the latent profile having a high level of positive health resources has a comparatively higher percentage of elderly having higher education level and more than one chronic illness condition.

### **Limitations**

Nevertheless, the most important limitation lies in the fact that the participants are chosen from one region. Therefore, the role of culture has not been studied. More research needs to be carried out by adopting a mixed-method research design for further exploration in this area involving elderly participants from various regions. The study has practical implications as well. It supports the formulation of integrated psychosocial interventions towards minimising the psychological distress factors – depression, anxiety, and stress. The study suggests the need for health psychologists under geriatric care at the individual and community levels.

### **Conclusion and Suggestions**

The findings of the study posit that there is a significant impact of positive health resources on psychological distress in the elderly with

chronic illness. The emerged three latent profiles or sub-groups of elderly with chronic illness are confounded by the level of education and illness condition. The findings of the study are suggestive of an interaction between spiritual well-being, social support, psychological distress, and demographic characteristics of the elderly with chronic illness. More research, however, is required to develop a deeper understanding of the area by involving a mixed-method design with elderly participants from various regions.

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## Psychological States, Self-esteem, Leisure Motivation and Quality of Life among Institutionalized and Non-institutionalized Older Adults

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### ABSTRACT

*This research aims to find out the difference in psychological states, self-esteem, leisure motivation, and QoL in 200 hundred institutionalized (N=100) and non-institutionalized (N=100) older adults age varying from 60 years and above. The subjects were administered to assess their psychological states (4DSQ-Terluin, et al., 2006), self-esteem (Rosenberg Self-esteem Scale), leisure motivation (Leisure Motivation Scale-LMS), and QoL (Older People QoL Questionnaire (OPQOL). Results revealed that the level of leisure motivation and QoL were higher in non-institutionalized older adults. The study also found that depression and self-esteem were significant predictors of QoL. Based on present findings it may be concluded that the institutionalized older adults experience a low level of leisure motivation and QoL compared to non-institutionalized older adults. Psychological states were found to have an association with self-esteem, leisure motivation, and QoL*

**Keywords:** Institutionalized, Non-institutionalized, Older adults, QoL Self-esteem, Psychological states, Leisure Motivation.

Studies have shown that the institutionalized older adults were more depressed (Rasquinha, 2014; Sridevi and Swathi, 2014; Azeem and Naz, 2015; Kumar, *et al.*, 2016), demonstrated stress and suicidal ideation (Sridevi and Swathi, 2014), had a higher level of death anxiety and showed lower self-esteem and QoL (Rasquinha, 2014; Sangeeth and Solomon, 2015; Shrestha, *et al.*, 2019), when compared with non-institutionalized older adults. Studies (Lyons and Dionigi, 2007; Beggs, *et al.*, 2014) have also revealed that social components of leisure motivation are important among the older population. Studies (Lui, *et al.*, 2014; Tavares, *et al.*, 2016) have also shown that a higher level of self-esteem and participation in leisure activities contribute to better QoL (Rajendran, *et al.*, 2011; Hammed, *et al.*, 2014).

The objective of the present study was to find out the difference in psychological states, self-esteem, leisure motivation, and QoL in institutionalized and non-institutionalized older adults and to see whether psychological states, self-esteem, and leisure motivation predict QoL among the older adults population.

## **Method**

### ***Sample***

The study was conducted on 100 institutionalized and 100 non-institutionalized older adults, selected through convenient sampling techniques from Telangana and Kerala. The age range of the participants was 60 to 99. The elderly having psychiatric disorders and serious illnesses were not included in this study.

### ***Tools Used***

The scales used in the study were the Four-Dimensional Symptom Questionnaire (4DSQ), Rosenberg Self-esteem Scale, Leisure Motivation Scale (LMS), and Older People QoL Questionnaire (OPQOL). The instrument 4DSQ (Terluin, *et al.*, 2006) was used to assess the psychological states of depression, distress, somatization, and anxiety. The Cronbach's alpha of 4DSQ varied between 0.84 and 0.92, and criterion validity was also established.

Rosenberg Self-esteem Scale (Rosenberg, 2006) is a short Likert 4 point scale and reflects an individual's overall subjective emotional

evaluation of their worth that includes beliefs about oneself and emotional states. Internal consistency and test-retest validity for RSE range from 0.77 to 0.88 and 0.82 to 0.85, respectively whereas criterion validity is 0.55 (Rosenberg, 2006).

The leisure Motivation Scale (Beard and Ragheb, 1983) was used to determine and understand the factors that motivated leisure choices. It has four dimensions such as intellectual, social, competence-mastery, and stimulus-avoidance. The dimension with the highest total score indicates the primary motivating factor for engaging in a leisure activity. The internal consistency of LMS range from 0.90–0.9 (Ibid.).

Older People QoL Questionnaire (Bowling, 2009) is a 35-item questionnaire and has 5-point Likert scales. The items have been divided into eight dimensions: life overall, health, social relationships and participation, independence, control over life, freedom, home, neighborhood, psychological and emotional well-being, financial circumstances, religion, or culture. The Cronbach's alpha of OPQOL ranges from 0.70 to 0.90, and it also has acceptable validity (Ibid.).

### ***Procedure***

Ethical clearance was obtained from the Institutional Ethics Committee of the University of Hyderabad. Then, participants were approached and assured about the confidentiality of their details and responses, and any doubts raised by the participants were clarified. Individuals who agreed to participate in the study were asked to sign an informed consent form. Responses to the questions on the questionnaire were obtained from the participants by the investigator.

The questionnaires were then scored, and SPSS version 20.0 was used for data analysis.

### ***Results***

Table 1 shows the demographic details, including the living situation, gender, marital status, and pension status of the participants. There were 100 older adults from each group, 50 per cent older adults from the institutionalized setting, and 50 per cent from the non-institutionalized setting. Total 143 females and 57 males participated; out of them, 100 were married (50%), six were unmarried (3%),

and 94 were widowed (47%). Out of 200 participants, 140 were pensioners (70%), and 60 were non-pensioners (30%).

**Table 1**  
*Demographic details of the participants (N = 200)*

<i>Demographic details</i>	<i>Frequency</i>	<i>Percentage</i>
Institutionalized	100	50%
Non-institutionalized	100	50%
Male	57	28%
Female	143	72%
Married	100	50%
Unmarried	6	3%
Widowed	94	47%
Pensioner	140	70%
Non-pensioner	60	30%

Analysis of t-test results (Table 2) shows no significant difference in terms of Psychological states of distress, depression, anxiety, and somatization and also self-esteem between institutionalized and non-institutionalized older adults. Significant difference was found between these two groups in terms of Intellectual leisure motivation  $t(198) = -3.16, p = 0.002$ , social leisure motivation  $t(198) = -5.06, p < 0.00$  and Competency/Mastery leisure motivation  $t(198) = -3.57, p < 0.001$ . The level of Intellectual, social and competency/Mastery leisure motivation among institutionalized older adults ( $M = 27.66, SD = 10.16$ ;  $M = 21.89, SD = 10.29$ ;  $M = 21.55, SD = 9.87$ ) were less than that of non-institutionalized ( $M = 32.43, SD = 11.16$ ;  $M = 30.59, SD = 13.78$ ;  $M = 26.61, SD = 10.17$ ). No significant difference was found between two groups in terms of Stimulus avoidance leisure motivation. A significant difference was seen between two groups in terms of QoL  $t(198) = -3.08, p = 0.002$ . The level of QoL among institutionalized older adults ( $M = 112.12, SD = 14.02$ ) is less than to the level of QoL among non-institutionalized ( $M = 117.68, SD = 11.21$ ). On dimensions of QoL, such as Life overall,  $t(198) = -2.89, p = 0.004$ , Health,  $t(198) = -2.02, p = 0.045$ , social relationships, leisure/social activities,  $t(198) = 4.11, p < 0.001$ , Independence, Control over life and freedom,  $t(198) = -5.35, p < 0.001$ , psychological and emotional wellbeing,  $t(198) = -3.56, p < 0.001$  and financial circumstances,  $t(198) = -3.46, p = 0.001$  scores were found to be higher among

institutionalized older adults than noninstitutionalized older adults. There was no significant differences between institutionalized and non-institutionalized older adults in terms of dimension of home and neighbourhood,  $t(198) = -1.44$ ,  $p = 0.151$  and religion and culture,  $t(198) = 1.28$ ,  $p = 0.200$ . Thus, data in Table 2 partially support the first hypothesis.

**Table 2**

*Difference between the two groups in terms of psychological states, self-esteem, leisure motivation and QoL.*

Variables	Institutionalized elderly people (N1=100)		Non-institutionalized elderly people (N2=100)		<i>t</i>	<i>p</i>	95% CI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			<i>L</i>	<i>U</i>
Psychological states	33	18.94	33.2	19.87	-.073	.94	-5.64	5.24
Distress	14.4	8.05	13.68	8.32	.621	.535	-1.57	3.005
Depression	4.61	3.9	3.83	4.05	1.37	.17	-.33	1.89
Anxiety	4.01	4.09	4.52	3.84	-.912	.363	-1.63	.59
Somatization	10.13	6.63	11.13	6.47	-1.08	.28	-2.83	.83
Self esteem	18.16	3.81	18.29	3.66	-.25	.81	-1.17	.91
Leisure motivation	107.41	31.51	126.25	36.57	-3.9	.000	-28.36	-9.32
Intellectual	27.66	10.16	32.43	11.16	-3.16	.002	-7.75	-1.79
Social	21.89	10.29	30.59	13.78	-5.06	.000	-12.1	-5.32
Competency/mastery	21.55	9.87	26.61	10.17	-3.57	.000	07.85	-2.26
Stimulus avoidance	36.32	10.19	36.62	7.54	-2.24	.813	-2.8	2.20
Quality of life	112.12	14.02	117.68	11.21	-3.08	.002	-9.13	-1.99
Life overall	13.18	3.51	14.52	3.00	-2.89	.004	-2.25	-.43
Health	10.56	3.51	11.43	2.50	-2.02	.045	-1.72	-.02
Social relationship/leisure and social activities	25.07	3.97	23.18	2.23	4.11	.000	.98	2.79
Independence, control over life and freedom	15.16	3.33	17.32	2.27	-5.35	.000	-2.96	-1.36
Home and neighbourhood	15.59	2.18	16.02	2.03	-1.44	.151	-1.02	.159
Psychological and emotional wellbeing	13.46	3.4	14.85	1.9	-3.56	.000	-2.96	-.63
Financial circumstances	10.38	3.09	11.86	2.96	-3.46	.001	-2.32	6.35
Religion and culture	8.72	1.74	8.42	1.55	1.28	.200	-.159	.768

*Note:* CI-Confidence Interval, L-Lower value, U-Upper value

**Table 3**  
*Inter-correlation for psychological states, self-esteem, leisure motivation and QoL among the entire sample.*

Variables	Dis- tress	Depre- ssion	Anx- iety	Somati- zation	Self- esteem	Leisure Moti- vation Intelle- ctual	Leisure Moti- vation Social	Leisure Moti- vation Com- petence/ Mastery	Leisure Motiv- ation Stimu- lus Avoi- dance
QoL	-.39* *	-.53**	-.33**	-.15*	.51**	.28**	.21**	.32**	.27**
Life overall	-.4**	-.51**	-.29**	-.18	.43**	.24**	.19**	.27**	.2**
Health	-.28* *	-.34**	-.22**	-.20**	.31**	.07	.06	.14	-.04
Social Relationship, Leisure/Social Activities	-.24* *	-.28**	-.30**	-.22**	.33**	-.03	.09	.02	-.02
Independence, control over life and freedom	-.25* *	-.32**	-.15**	-.05	.26**	.35**	.28**	.38**	.13
Home and Neighbor- hood	-.22* *	-.36**	-.18**	-.06	.34**	.26**	.19**	.29**	.29**
Psychological and emotional wellbeing	-.19* *	-.29**	.18**	-.01	.41**	.35**	.22**	.29**	.28**
Financial Circumstances	-.14	.20**	-.04	.02	.18	.06	-.06	.08	.12
Religion and Control	.05	-.03	-.07	.03	.11	-.06	-.07	-.02	-.17*

Note: \*\*p < 0.01, \*p < 0.05;

**Table 4**  
*Summary of hierarchical multiple regression analysis for psychological states, self-esteem, and leisure motivation predicting QoL among the entire sample (N=200)*

Model	B	SE	$\beta$	t	R <sup>2</sup>	$\beta$ R <sup>2</sup>
Model 1 (C = 119.56, F = 20.55***)					.30	
Distress	.17	.19	.10	.87		

Cont'd...

Cont'd...

Depression	-2.13	.37	-.66***	-2.13		
Anxiety	-.11	.29	-.03	-.11		
Somatization	.24	.15	.12	.24		
<b>Model 2 (C= 97.13, F= 22.37***)</b>					.37	.07***
Distress	.16	.18	.10	.88		
Depression	-1.65	.36	-.51***	-4.53		
Anxiety	.19	.28	.05	.64		
Somatization	.124	.15	.06	.06		
Self esteem	1.12	.25	.32***	.32		
<b>Model 3 (C= 93.87, F= 14.11***)</b>					.41	.03*
Distress	.19	.18	.12	.64		
Depression	-1.64	.36	-.51***	-3.9		
Anxiety	.15	.28	.05	.34		
Somatization	.14	.14	.07	.82		
Self esteem	1.03	.25	.38***	4.25		
Leisure Motivation Intellectual	.15	.09	.13	-.3		
Leisure Motivation Social	.01	.08	.01	-.42		
Leisure Motivation Competency/Mastery	.23	.12	.18	1.95		

Note: \*\*\* $p < .001$ , \*\* $p < 0.01$ , \* $p < 0.0$

Before running hierarchical regression analysis, QoL correlation was run with psychological states, self-esteem, and leisure motivation which is shown in Table 3. Then, hierarchical regression analysis was conducted where QoL was taken as the criterion, and its predictor includes psychological states, self-esteem, and leisure motivation (Table 4). Model 1 with psychological states such as distress, depression, anxiety, and somatization as predictors explained 30 per cent variance and was significant ( $F(4, 195) = 20.55, p < .001$ ). Depression was found to be a significant predictor of QoL. In Model 2, when self-esteem was added, the Model was found to be significant  $F(5, 194) = 22.37, p < .001$ . In Model 2,  $R^2$  change was significant, and the Model predicted 37 per cent of the variance. In Model 2, depression and self-esteem were found to be the significant predictor of QoL. In Model 3, when leisure motivation intellectual, leisure motivation social, leisure motivation competency/mastery, and leisure motivation stimulus avoidance were added to the model, it predicted



39 per cent of the variance  $F(9, 190) = 14.11, p < .001$ . In Model 3,  $R^2$  change was found to be significant. In this Model depression and self-esteem were again found to be the significant predictors of QoL. Based on the result, it can be said that the data in Table 4 partially supported Hypothesis 2 of the study.

### **Discussion**

The current study first examined the differences between the older adults from both settings in terms of psychological states, self-esteem, leisure motivation, and QoL. The result revealed no significant difference between the two groups in terms of psychological states of distress, depression, anxiety, and somatization. Previous studies also showed that the prevalence of anxiety (Kumar, *et al.*, 2016) and depression (Wang, 2004) is more or less the same in institutionalized and non-institutionalized older adults. Some studies reported that the level of depression (Wang, 2004; Rasquinha, 2014; Sridevi and Swathi, 2014; Kumar, *et al.*, 2016), death anxiety (Sridevi and Swathi, 2014) and somatic symptoms (Christopher, *et al.*, 2013) are higher in institutionalized older adults compared to non-institutionalized older adults and one study (Moreno, *et al.*, 2009) showed a contrasting result that the institutionalized older people experience a lower level of death anxiety and depression than non-institutionalized older people.

The current study found no significant difference between institutionalized and non-institutionalized older adults in terms of self-esteem. This finding is in contrast with the findings in the earlier literature that institutionalized older adults have lower self-esteem (Wang, 2004; Rasquinha, 2014) compared to non-institutionalized older adults.

The present study showed a significant difference between the two groups in terms of leisure motivation. It was found that non-institutionalized older adults scored high in an intellectual dimension of leisure motivation. The social milieu, networks of relationships, and available facilities may facilitate non-institutionalized older adults to explore and satisfy the intellectual dimension in leisure motivation. In terms of the social dimension of leisure motivation, non-institutionalized older adults scored higher than institutionalized older adults. Non-institutionalized older adults

have possible access to several resources like the freedom to watch favorite television programs, smartphones, approach to social media, friends, relations, and travelling than institutionalized older adults. Whereas on the other side institutionalized older adults have limited social relationships, lack support from their family and relatives, interact only with people who are available to them and to people who come to visit them in institutions. A high level of competency/mastery dimension was found in non-institutionalized older adults. Again, compared to institutionalized older adults, non-institutionalized older adults have enough resources to engage in physical activities such as farming, gardening, and household chores, perhaps giving them enough scope for this finding. There was no significant difference between these two groups in terms of stimulus avoidance of leisure motivation. It shows that older adults from both settings engage in leisure activities, or feel relaxed physically and mentally, etc. Almost all the participants reported that regardless of where they live, they engage in various leisure activities for relieving stress and forgetting unpleasant past events.

Non-institutionalized older adults scored higher in all six dimensions of QoL, including Life overall, Health, Social relationships, Leisure/Social activities, Independence, Control over Life and Freedom, Psychological and Emotional Wellbeing, and Financial Circumstances, and the overall QoL. It indicates that the participants from non-institutionalized settings enjoy their life overall; they tend to be happy most of the time, they look forward to things. In terms of health, they feel that they have enough physical energy to take care of themselves and others at home, and their wellbeing is not affected by physical health issues and pain. This may be because, compared to participants from Institutionalized settings, Non-institutionalized participants receive help from family, friends, and neighbors, they like more companionship and contact with others, they have someone to give them love and affection, they like more people around and the most importantly they have their children around. Earlier studies support these findings that non-institutionalized older adults have better QoL in terms of social participation, activities, and autonomy (Nogueira, *et al.*, 2016).

In the present study, depression was a significant predictor of QoL. The study suggested that when the level of depression increased, the QoL of older adults decreased. Previous research (Rogger, 1999; Soosova, 2010; Lin, *et al.*, 2014; Sivertsen, 2015), also reported similar results. Apart from depression, self-esteem was also a significant predictor of QoL; when the self-esteem of the older adults increased, their QoL also improved. Another study (Tavares, *et al.*, 2016; Ingrand, *et al.*, 2018) showed that self-esteem indirectly impacts QoL of the older adults.

The study's findings indicate the need to understand the psychological states of older adults and design need-based psychosocial interventions for the overall enhancement of the psychological states of older adults. The self-esteem of older adults needs to be addressed to enhance their quality of life. The Leisure time, which is popularly believed to be available in abundance to older adults, also has to be explored further so that it is constructively utilized, especially in terms of intellectual leisure motivation. It is also pertinent to point out the need for support and care from family members owing to the belief and practice of collective culture. In spite of the satisfaction for the care provided by institutions at large, the findings indicate a greater need for care from near and dear of the older adults which makes a difference. Interventions encouraging greater support from available and close family members may contribute to better psychological states, self-esteem, and QoL of the older adults in institutional settings.

### **Conclusion**

There was no significant difference between institutionalized and non-institutionalized older adults on components of psychological states. Leisure motivation and self-esteem were significant predictors of the quality of life of older adults.

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## Mobility Pattern of Elderly Population in Kolkata

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### ABSTRACT

*This study has tried to find out the mode preference of the elderly in daily transport needs. The study focused on randomly selected 400 elderly (208 male and 192 were female), age varying from 60 years to 80 years and above from different religious and socio-economic backgrounds from various parts of Kolkata city (West Bengal). These subjects were administered a questionnaire containing the names of various modes of transport. For the preference in transport, the options of various transport available were listed, they were asked to choose one mode which they would choose for different travelling purposes. The results show that for short distances the majority of the elderly prefer walking and for long-distance – taxi and bus. Among the elderly many have used the app-based cab service as well. The selection of mode and the frequency of taking a trip are found to vary according to the age and sex of the elderly. Social and leisure activities are the major purpose for the elderly taking the trip.*

**Keywords:** Elderly mobility, public transport, mode of transport, travel dependency.

In the case of Indian cities, public transport is very essential mode as the majority depend on them due to low vehicular ownership.

Badami and Haider (2007) state that in Indian cities the public transit is of major importance wherein the cities like Mumbai, almost ninety per cent of the household is dependent on public transit. Many scholars have vouched on the aspect that the availability of transport facilities allows the elderly to engage in various forms of activities and thus can improve their quality of life and well-being and also impact their independence (Titheridge, *et al.*, 2009; He, *et al.*, 2020).

The transport design, particularly of buses is sometimes unsuitable for the elderly to access (Ryan, *et al.*, 2015; Bocker, *et al.*, 2017; Luiu, *et al.*, 2018). Within the broad elderly age group, the demand and need changes with health, gender, and increasing age (Broome, *et al.*, 2010; Bocker, *et al.*, 2017). As observed in much of the literature, the elderly preferred their own transport or even walking wherever possible instead of using public transport, for their day-to-day mobility (Wong, *et al.*, 2017). The reliance of elderly women on public transport is more compared to the male elderly who preferred driving their car (Ryan, *et al.*, 2015; Truong and Somenahalli, 2015; Bocker, *et al.*, 2017). If the mobility rate is considered the male elderly travelled more than the female elderly (Hu, *et al.*, 2013; Liu, *et al.*, 2017; Saidatulakmal, *et al.*, 2019). Hahn, *et al.*, (2016) found a contrary picture where they found the female elderly were travelling more for attending the mandatory or basic needs trip. Government policies of cheap public transport availability, a bus pass for the elderly, cost of transport (Help age India, 2008), Seat availability (Musselwhite and Haddad, 2010; Hjorthol, 2012), fear of crime (Patterson, 1985) are the few other factors which impacted the elderly's preference to avail public transport. The education level of the elderly and owning of mobile phones is seen to have some positive relationship with public transport usage (Ryan, *et al.*, 2015; Truong and Somenahalli; 2015).

Studies show that predominantly the elderly travel for shopping, entertainment, meeting up with friends and families, health trips, religious and social participation (Hu, *et al.*, 2013; Krishnaswamy, *et al.*, 2013; Liu, *et al.*, 2017; Saidatulakmal, *et al.*, 2019). The number of trips taken by the elderly decreases with age though the complexity of the trips taken increases (Rahman, *et al.*, 2016). In most Asian countries Walking and cycling for smaller distances and any form of



public transit for longer distances is the dominant mode (Liu, 2017; Wong, *et al.*, 2017; Saidatulakmal, *et al.*, 2019; Yang and Cui, 2020; Jamal, *et al.*, 2020).

A large portion of the literature dealing with the elderly and transport is focused on the developed countries; very few studies are focused on the developing countries (Ahmad, *et al.*, 2019). In the case of India as well there exists, limited literature addressing this question of the elderly and their transport choices. Though various studies are being conducted in the field of ageing, this particular area lacks considerable attention. As the percentage of elderly expands in near future, it is necessary to probe into this. The main focus of this study is to determine the mobility and transport mode preference of the elderly in Kolkata to get an understanding of their various needs and limitations related to mobility preferences.

## **Material and Methods**

### *Study Area*

Kolkata is a dominant urban centre in Eastern India. Currently, Kolkata houses about 11.8 per cent of the population who are above the age of sixty years (highest among Indian cities). The decadal growth rate for the elderly cohort has been 16.88 per cent (Census, 2011). The survey covered the area under the jurisdiction of the Kolkata Municipal Corporation.

### *Sample Design and Survey*

For the survey, a structured questionnaire was prepared to consist of mostly open-ended and some close-ended questions. The survey was conducted by random sampling method, by visiting the households, covering a sample size of 400 elderly. For the transport preferences, the options of various transport available were listed and the respondents were asked to choose their most preferred mode for any daily purpose of travelling.

### *Data Analyses*

The data was entered in SPSS 20 and further analysis was done in the programme. Simple percentages and crosstab analysis were used to understand the picture of transport preference by the elderly of

Kolkata. To understand the association of the different demographic and social factors with the choice of the elderly, a chi-square test was done. The result is concluded based on the p-value of the chi-square statistics, i.e. if  $p < 0.05$  then the relationship is significant and are not independent of each other; if  $p > 0.05$ , then there is no significant relationship between the variable. The hypothesis is made at a 95 per cent confidence interval. The result of this analysis is presented in Table 5.

## Results

### *Characteristics of the Sample Elderly Population*

Among the total 400 samples surveyed, 208 were male elderly (52%) and 192 (48%) were female elderly. Out of the total sample size, 86.5 per cent belonged to the above poverty level and 13.5 per cent belonged to the below poverty level.

**Table 1**  
*Showing the general characteristics of the elderly population*

<i>Characteristics</i>		<i>Percentage of the elderly population</i>	
<i>Age Group (years)</i>		<i>Religion</i>	
60–79	85.5	Hinduism	83.5
80 and above	14.5	Islam	7.2
<i>Marital Status</i>		Christianity	7.8
Never Married	5.0	Sikhism	1.3
Currently Married	68.8	Buddhism	0.3
Widow/Widower	25.3	<i>Education Level</i>	
Separated	0.8	Illiterate	8.5
Divorced	0.3	Primary	10.8
<i>Mother Tongue</i>		Secondary or school final	23.8
Bengali	85.5	Graduate	44.3
Hindi	8.8	Postgraduate	10.3
others	5.7	Above Post-Graduation	2.5

Source: Primary field data

Among the elderly, about 11.5 per cent were living alone, 35.5 per cent lived with a spouse, 50.7 per cent lived with children and 2.3 per cent lived with relative or friends. The majority of the elderly (75%) were able to walk without any problem, 12.5 per cent reported

problems in their knees but were able to walk independently without any aid. 7.5 per cent of the elderly used walking aid and 5 per cent required both walking aids and someone to assist them. Among the elderly population, 35 per cent were retired, 10 per cent were still in service, 29.2 reported themselves, housewives, 8.4 per cent were employed 5.8 per cent had business and the rest 11.7 per cent reported various self-employment such as a music teacher, clothes designer, boutique owner, private tutor, etc.

### ***Preferred Mode of Transportation***

Walking is the most preferred mode of transport for short-distance travel that ranges between 0.5 to 1 km. For short-distance travel about 56.8 per cent preferred walking, 31.8 per cent used rickshaw, 10.9 per cent travelled by auto, and 0.6 did cycling. 63.3 per cent male elderly and 43.8 per cent female elderly preferred walking reflecting a gender gap. Elderly females preferred travelling by rickshaw over other modes. Similarly, age harms preference for walking. The age-wise analysis for short-distance travel showed that 60.7 per cent of young elderly (60–79 years) preferred walking, while for older elderly (80 years and above) it is almost half, i.e. 31.1 per cent. About 28.8 per cent of the young elderly used rickshaw, while the rest depended on auto or cycling. The majority of older old preferred rickshaw (51.1) for short-distance travel and about 17.8 per cent depended on auto.

**Table 2**  
*Showing the preferred mode in short distance according to age and sex*

<i>Mode</i>	<i>Young old</i>	<i>Older old</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
Walk	60.7	31.1	68.3	43.8	56.8
Rickshaw	28.8	51.1	20.6	44.4	31.8
Auto	9.8	17.8	10.0	11.9	10.9
Cycling	0.7	0	1.1	0	0.6

*Source:* Primary field data

In the long-distance travel category, 15.5 per cent of the elderly used their cars to travel for long distances within the city. The percentage of older elderly is 24 per cent as compared to 14 per cent of younger elderly using personal cars. Among the mode of public

transport used in long-distance travel, some elderly preferred a single transport mode, while some reported a combination of two modes. Cab or taxi form the most preferred mode of public transport, with 38 per cent using a taxi or app-based cab as their first preference. 45.6 per cent of female elderly preferred cabs which is comparatively higher than male elderly. The older elderly group has a much higher preference (51.7 %) for cabs or taxis than the younger ones (28.9) (Table 3). Among the elderly who owned and travelled only by personal car, 50 per cent used the cab service and preferred it as the only mode of public transport. Compared to the above-mentioned mode, the percentage of elderly preferring auto and metro as the single preferred mode is quite low; only 7.8 and 8.2 per cent respectively. Among the elderly who use the metro the percentage of female and older elderly is lower. The combination of the modes shows an even lower percentage (Table 3).

**Table 3**  
*Showing the preferred mode in long-distance according to age and sex*

<i>Mode</i>	<i>Young old</i>	<i>Older old</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
Taxi/Cab	28.9	51.7	26.9	38.0	32.2
Bus	27.8	8.6	29.8	19.8	25.0
Car	14.0	24.1	14.4	16.7	15.5
Metro	9.1	3.4	10.1	6.3	8.2
Auto	7.9	6.9	9.6	5.7	7.8
Bus+ auto	6.7	0.0	4.3	7.3	5.8
Auto+ taxi/cab	2.3	0.0	1.0	3.1	2.0
Auto+ metro	2.0	3.4	2.9	1.6	2.2
Bus+ metro	1.2	1.7	1.0	1.6	1.2

*Source:* Primary field data

#### ***Reasons for preferring the particular mode:***

The elderly had a few reasons for which they chose a particular mode. 29.8 per cent of the elderly stated comfort as their primary reason, while 34.2 per cent stated affordability and easy access. Easy access as a sole reason was reported by 12.4 per cent. 15.3 per cent answered that the choice is influenced by their health conditions. Two other reasons stated were time-saving (6.5%) and never considered

other mode due to habit of using it (1.8%). Most of the elderly who preferred buses noted affordability and easy availability as the major reason while for the elderly who preferred cab and a combination of cab and auto, comfort and suitability for their health were the major reasons.

**Table 4**  
*Reasons for preferring a mode according to individual modes*

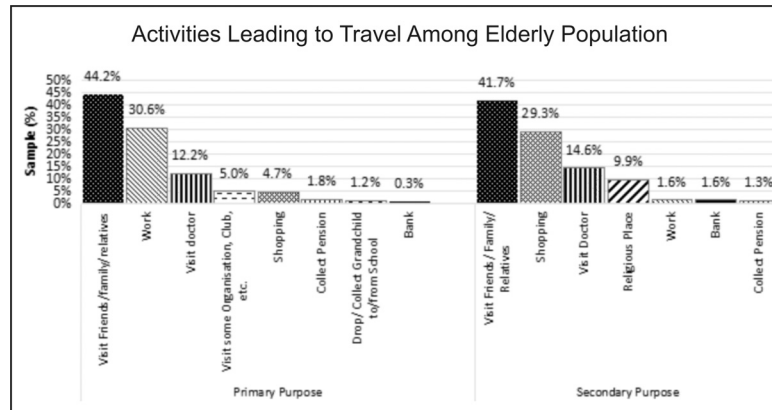
<i>Modes</i>	<i>Comfort</i>	<i>Affordable and easy availability</i>	<i>Easy Availability</i>	<i>Suitable for health</i>	<i>Time-saving</i>	<i>Always used</i>	<i>Total</i>
Bus	1.0	77.0	19.0	0	0	3.0	100
Auto	35.5	41.9	16.1	3.2	3.2	0	100
Metro	3	21.3	15.2	0	57.6	3.0	100
Taxi/cab	60.5	0	1.6	73.2	0	0.8	100
Auto + metro	0	22.2	44.4	0	22.2	11.1	100
Bus+ auto	17.4	56.5	21.7	0	0	4.3	100
Auto +taxi	50	25.5	12.5	12.5	0	0	100
Bus+ metro	20	40	20	0	0	20	100

*Source:* Primary field data

### ***Travel Behaviour concerning Activities***

The activities that induce travel are seen to answer the underlying travel behaviour of the elderly population. The single most important activity among the elderly, regardless of sex and age, is to visit friends, family, and relatives (44.2% of primary purpose and 41.7% of secondary purposes), followed by work-related trips, shopping, visiting the doctor, and religious places. Social and leisure activities accounted for 49.2 per cent of the primary and 51.6 per cent of secondary purposes of travel. Whereas family and personal activities accounted for 47.5 per cent of primary and 45.5 of secondary purposes. This reflects the lifestyle of the elderly population in the cities towards having more time for leisure activities. Work-related travel is mostly among the young elderly population who continue to work.

**Figure 1**  
*Activities leading to travel among elderly*



Source: Primary field data

The difference between the young and old elderly, using public transport is statistically significant. This can be attributed to an increase in physical constraints with an advancing age. The low rate of car ownership among the elderly and the inevitability that at some point they have to give up driving due to various reasons, make public transport an important part of elderly mobility.

The use of public transport is higher among the elderly who are economically dependent like housewives and retired people and the difference is statistically significant. With a higher educational level, access to a private mode of transport increases. Public transport used by the elderly is constraint based rather than by choice.

**Table 5**  
*Chi-Square test for Use of Public transport and different socio-demographic characteristics.*

Attributes	Sig. (p)
Age	0.042
Sex	0.632
Car Ownership	0.000
Level of Education	0.000
Occupation	0.029

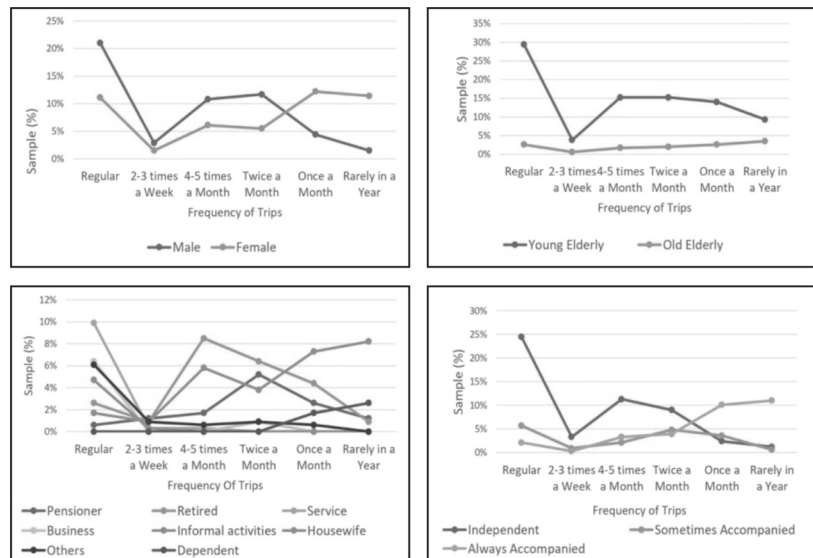
Source: Primary field data

### Trip Characteristics of the Respondents

Figure 2 shows the distribution of trip frequency for different socio-demographic characteristics of the elderly population using public transport. It is evident from the graph that young elderly are more mobile and make a higher number of trips across all categories. Physical mobility restrictions and high dependency on public transport lead to mobility constraints for the old elderly.

From a gender perspective, it is seen that elderly women travel less on an everyday basis, with 12.2 per cent of the trips being made just once a month. Elderly women face mobility restrictions with limited out-of-home activities. Even among the elderly population, the sphere of daily mobilities is dominated by men with 21 per cent of male respondents making regular trips as compared to only 11.1 per cent of women. Respondents who travel independently, i.e. not being

**Figure 2**  
*Distribution of Trip Frequency concerning different socio-demographic characteristics*



Source: Primary field data

accompanied by others, often travel regularly, accounting for 24.5 per cent of the trips made. There exists an inverse relationship between the frequency of trips and whether they are accompanied. It's mostly the female respondents that are dependent on others to travel and hence make a lesser number of trips.

On looking at the occupation and trip generation, it is seen that respondents who are engaged in economic activities travel more frequently. Trips among housewives are mostly clustered towards travelling once in a month or rarely, whereas the retired respondents, who are assumed to be less mobile, have higher trips in comparison to housewives. From the graphs, it is evident that gender, occupation, age, and travel dependency affect the trip frequency in public transport.

### *Travel Dependency*

The elderly population is dependent on 'others' for their mobility choices and is affected by socio-demographic factors. Around 31 per cent of the elderly always need someone to accompany them for the trips. 48 per cent of the young elderly travel independently, of which 34 per cent are male. Elderly women are highly dependent on others for travel with 22 per cent of them always being accompanied.

Everyday mobility, i.e. the physical mobility of the elderly plays a significant role in their independence. 48 per cent of the elderly who are completely mobile, travel independently while ones with difficulty in walking need company to travel. 26 per cent of the elderly, who are completely mobile still need someone to accompany them.

Children and spouses are the two most important groups that accompany the elderly in their out-of-home activities. It is important to note that 21 per cent of elderly are accompanied by their spouse in the 'sometimes accompanied' category whereby in the always accompanied category, 26 per cent are accompanied by their children. The marital status and living arrangement of the elderly affect their travel patterns in terms of who accompanies them.



**Table 6**  
*Travel Dependency by Age, Sex, Everyday Mobility and Accompanied With.*

<i>Attributes</i>		<i>Independent</i>	<i>Sometimes Accompanied</i>	<i>Always Accompanied</i>	<i>Total Percentage</i>
Age	Young Elderly	47%	16%	23%	100%
	Older Elderly	4%	2%	8%	
Gender	Male	34%	10%	9%	100%
	Female	18%	7%	22%	
Everyday Mobility	Completely Mobile	48%	14%	12%	100%
	Slight Walking Problem but Without Support	3%	3%	8%	
	Use Aid for Walking	0%	1%	9%	
	Aids and Someone Assists	0%	0%	2%	
Accompanied By Whom	Children	0%	8%	26%	100%
	Spouse	1%	21%	22%	
	Spouse/ Children	0%	4%	11%	
	Friends/ Relatives	0%	2%	4%	
	Others	0%	1%	0%	

Source: Primary field data

### *Use of Uber/Ola*

Ride-sharing apps can provide an alternative to an individual mode of transport as the waiting time is usually lower compared to summoning a taxi and also provides last-mile connectivity. The use of these app-based services is often found to be intimidating to the elderly. 52.6 per cent of the elderly who use public transport, use app-based cab services. The use of these services is dependent on the age and level of education, as penetration of technology is lower among the elderly. The gender gap in mobile phone ownership in India is 33-percentage point (Sanghera, 2018), thus making the elderly women less accessible to app-based services.

With higher levels of education, the use of app-based cab services increases, leaving the illiterate disadvantaged. Even the cost of a trip is higher in Uber/Ola as compared to the other public modes of transport. The elderly prefer using the cab services for long distance travel as it is more comfortable and reliable. Around 13 per cent of the app-based cab services are availed by housewives due to their mobility constraints in terms of safety and being dependent on others to travel. The elderly usually take help of their children for booking cab services. There still needs to be innovation keeping the needs of the elderly in mind.

**Table 7**  
*Use of Uber and Ola among the Elderly by  
Socio-Demographic Characteristics.*

	<i>Use Uber/Ola</i>	<i>52.60%</i>
Age	Young Elderly	46.60%
	Old Elderly	6.00%
Sex	Male	30.50%
	Female	22.10%
Level of Education	Illiterate	0.90%
	Primary Education	1.70%
	Secondary Education or Final School	12.10%
	Graduate	29.60%
	Post Graduate	6.90%
	Above Post Graduation	1.40%
Occupation	Pensioner	8.60%
	Retired	14.90%
	Service	8.30%
	Business	3.40%
	Informal Activities	0.90%
	Housewife	12.60%
	Others	3.40%

*Source:* Primary field data

## Discussion and Conclusion

This study identified the statistical significance of different socio-demographic and economic parameters on the mode choice behaviour of the elderly and several dimensions of trip and activity

purpose. Mode-choice among the elderly is inclined towards public modes of transport, which is determined by economic well-being. The widespread presence of mobility limitations among the elderly makes walking difficult. Even driving among the elderly is very low. These limitations hamper their access to services and increase their dependency on others for out-of-home activities. Cycling is highly gendered, and the lack of proper infrastructure makes it highly inconducive for the elderly. Cost of travel can affect the mode choice, as most of the elderly are economically dependent, with a major part of their expenditure being diverted towards maintenance activities. Last-mile connectivity is at the core of elderly mobility as functional limitations eliminate travel by walking. Public modes of transport with fixed routes like bus and metro are always paired with an intermediate mode of transport that is affordable to achieve last-mile connectivity for travelling long distances. The majority of the elderly find travelling by bus uncomfortable, but still, a higher percentage uses it because of affordability and extensive bus network. Intermediate Public Transport lies at the intersection of affordability, comfort, last-mile connectivity, and availability, thus meeting the elderly transport challenges by providing an alternative to private and public modes of transport.

Out-of-home mobility is characterized by leisure and maintenance activities among the elderly. This is necessary for accessing everyday basic needs as well as leads to participation in meaningful social and cultural activities. Travel to avail healthcare facilities form an integral part of elderly travel patterns and lack of private transport mode leads to barriers especially the ones living in poverty. Living arrangements affect daily mobilities as elderly living with their family find their activities like grocery shopping being substituted by other family members. The family serves as the traditional social institution that is supposed to take care of and provide support to the elderly. This is reflected through the degree of assistance that the elderly require in their mobility. The elderly depend on their children and spouse for the majority of the trips. In the absence of an institutional support system, the younger generation helps in providing economic, social, and emotional support.

The Elderly's travel frequency is negatively affected by gender. Women are more inclined towards caring activities and restricted to the familial domain (Menon, 1999). Trip frequency is low among housewives and pensioners. The traditional relation of men dominating the public sphere and women restricted to the familial domain transcends to the older population (Mathur, 2008). Elderly men travel frequently in comparison to women who hardly travel once a month. Technology holds great potential in providing alternative transportation to the elderly (Cirella, *et al.*, 2019). Ride-sharing apps serve as a substitute for a private mode of transport characterized by comfort, reliability, and last-mile connectivity.

This study found that the elderly population is highly dependent on public modes of transportation, even though they are uncomfortable and unreliable. Access to private mode is a product of the income and functional mobility of individuals. Walking is important to achieve active mobility among older people but is often restricted due to a lack of infrastructure and planning in terms of people with functional limitations (Rantanen, 2013). Travelling to fulfill medical needs forms one of the primary activities among the older population and public transportation forms a major barrier in accessing it, which impacts health care access (Goins, *et al.*, 2005)

From the discussion, it can be inferred that public transport form an important part in meeting the travel needs of the elderly in Kolkata. Access to privatised modes of transport is limited for the elderly due to physical and economical constraints. Travel dependency of the elderly on other members reflects the failure of the state in providing adequate mobility needs for elderly with functional restrictions. Elderly mobility lies at the intersection of functional, socio-economic, health, and design parameters. The finding suggests that transport policies must go beyond providing private automobiles, to adequate public transport infrastructure along with pedestrian infrastructure to meet the mobility needs of the elderly. Elderly-friendly mobility plans should be at the core of mobility and transport plans so that mass mobility can be inclusive of the elderly.

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## Healthy Space for Ageing: Embedding Smart Home Technology

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### ABSTRACT

*In this paper, a comprehensive theoretical overview has been presented on the areas, the technological devices, and designs that can be used for offering a comfortable home to the elderly in India where they can stay with dignity and age gracefully.*

**Keywords:** Smart Home, Technology, Ageing, Elderly, Wellbeing, Devices.

Never before have had so many people lived to be old. In the 20th century, the proportion of the population in the age group of 60 years and above has increased in all the countries of the world. In 2019 the share of the elderly population increased to 8.6 per cent (Census 2011: Population Projections for India and States 2011–2036). The projection proportion of aged people in the total population will further rise to 12.5 per cent in 2026 (India Human Development Report, 2011). The share of India's population aged 60 and older is projected to climb from 8 per cent in 2010 to 19 per cent in 2050, according to the United Nations Population Division, 2011. It took more than 100 years for the aged population to double in most of the countries in the world, but in India, it has doubled in just 20 years. The increasing elderly population is the result of some very positive



development such as lower infant mortality and a parallel trend of decline in fertility and increasing life expectancy due to medical progress, greater access to educational and economic opportunities, and better public health facilities. Ageing now needs to be understood as a universal phenomenon of growth and development and not as a period of disease and disability.

The Department of Science and Technology (DST) under the Ministry of Science and Technology launched a new programme on Technological Interventions for Disabled and Elderly (TIDE, 2019) to promote applied research and development of assistive technologies for empowerment of the elderly population and Divyangjan (Disabled) in the country. Earlier it was called Technological Intervention for Elderly (TIE). The areas identified for the design and technological solutions are: (a) activities of daily living (b) Cognition (c) Communication and Social connectivity (d) Personal mobility (e) Rehabilitation (f) Built Environment/Smart Homes (g) Transportation (h) Games and Entertainment. It provides technological solutions with a multidisciplinary approach to resolve the problems and improve the quality of life of the elderly population. It also aims at providing individual autonomy and independence to persons with disabilities through holistic development by creating enabling environment for their empowerment through the application of Science and Technology.

To sustain proper physical and mental health in the absence of family members adopting smart home technologies and the various housing options can help seniors to remain independent. Keeping in mind the needs mostly related to health, comfort, psychological well-being, and security aspects the smart homes can be designed specifically for tackling the barrier encountered in day-to-day activities. The smart home is designed to provide safety, health care and to remain in touch with the family and society at large. The core part of a smart home is its artificial intelligence technology, sensor technology. Sensor technology is in rampant use as the sensor and the actuator communicates to provide a comfortable life. This concept of a smart house is being recently developed in our country slowly and steadily and above all, a healthy space is required for the elderly to age gracefully and happily.

### Objective of the Study

This paper presents a theoretical overview of the types of technology in building a smart home keeping in mind the needs of the elderly in India. The study also assesses the factors where the technological devices and designs can help older people physically, cognitively, and emotionally. The user-friendly smart home reacts to the specific needs and health care of the elderly thereby improving the pleasantness of the home.

### Smart Home Concept

The world is getting smarter so the living space or home is expected to get smart. The smart home concept is a revolution in the field of technology where the home environment is embedded with modern devices and designs. Smart home technology is *“using basic and assistive devices to build an environment in which many features in the home are automated and where devices can communicate with each other”* (Cheek *et al.*, 2005). Developments in ICT technology have resulted in the evolution of traditional homes to smart homes which according to Robles and Kim (2010) is defined as *“an amalgamation of technology and services through home networking that ensures a better quality of life for its inhabitants”*. In the era of ICT smart home has emerged as a leading innovation in the field of technologies making the living space more intelligent, remotely controllable, and interconnected. Many global companies like Amazon, Google, Samsung, LG, Xiaomi have entered the innovative race to provide billions with the ‘smart concept’. This concept was popularized with invent of smartphones and high-speed internet. The diffusion of high-speed internet opened up the opportunity for the smart home concept business to grow.

Smart homes facilitate the easy movement and self-care of the elderly staying at home with disabilities and cognitive impairment. The devices used in smart homes are referred to as assistive devices as they require the services that of a healthy person including cognitive, sensory, and other activities. It includes artificial intelligence technology, sensor technology, and radio frequency identification (RFID). Artificial intelligence technology includes drones, robots surgical systems, self-driving cars, and more. Recently, smart home

services are evolving as they approach AI. The intelligent personal assistant “Alexa,” developed by Amazon Lab 126, has been installed in a wide range of products. LG Electronics has adopted Alexa throughout its smart home product line. For example, if a user calls “Alexa” from a smart refrigerator, the user can access services such as searching news, online shopping, and checking schedules. In addition, China smart home manufacturer Xiaomi launched an air purifier that can be remotely controlled by a smartphone and developed a smart module that can be inserted into all appliances such as refrigerators, air conditioners, and washing machines (Yang *et al.*, 2018)

Sensor technology is a device that converts physical quantities into digital quantities. Through a combination of hardware, such as sensors and actuators, and software, the elderly can conduct their daily activities with minimal assistance (Kon *et al.*, 2017). It is with the help of the internet that the sensor and actuator are connected. RFID (Radio Frequency Identification) tracks objects with the help of electromagnetic fields to which the tag has been attached.

Therefore smart home is a pleasant home providing comfort, convenience, safety, security which enables an independent lifestyle that is treated as the basic criteria of a smart home environment. If compared with ordinary homes, smart homes have automated devices and designs which are cost-effectively providing an aesthetically artistic environment. Most of the devices run through the internet which is an embodiment of the technology.

#### *Areas of Adoption of Technological Devices and Designs in the Evolution of Smart Home*

To improve the quality of life of the elderly, the adoption and use of technology are imperative. The characteristics of the residential environment – its design, organization, and amenities can have a profound effect on the ability of older persons to function independently daily, by either fostering or limiting their safety and convenience. This is especially true for the elderly with functional disabilities and for the growing number of older persons who live alone (Huth, 1986). Chakraborti (2004) stresses that the elderly are deprived of the most basic facilities of life and subject to more diseases, a hazardous physical environment could lead to incapacitating and

painful injuries among the aged. Improving the housing environment by implementing elderly-friendly features could prevent them from injuries like falls, accidents which could otherwise risk the life of the aged. Safety, social connectedness, and health are the three prime areas that have mobilized the concept of a smart home. These first two are connected with health as safety is connected with physical health and social connectedness improves the mental health of a person. Technology can cater to the needs of the elderly in a variety of ways like overcoming loneliness and boredom, eliminating barriers within the home for easy movement within, without causing injury, providing safety and security. But the grasping technology is not an easy task as it requires time, skill, and investment. Higher-income households are better able to risk trying a new product, higher educational attainment will facilitate understanding the technology and its potential benefits; higher occupation holders may have more experience with new technology in the workplace (Meeks, 1994). Here we will focus on the designs as well as devices to cater to the special needs of the elderly based on the three prime areas of safety, social connectedness, and health.

### **Safety**

The topic of safety is of vital importance especially with the elderly diagnosed with disabilities or staying independently. Declining physical and cognitive abilities of the elderly and their ageing at home requires home modifications in terms of installation of technology and design features for their convenience and safety. The subject of safety, in regards to a smart home, is about detecting hazards to prevent impairment due to declining faculties of the elderly, environmental hazards, or other personnel (Kon *et al.*, 2017). The frail elderly need support daily with their movement, domestic chores, personal care for which technology is needed creating a difference in their lives. Starting from simple safety devices in the kitchen (example, finger protectors, gas leakage detectors, tin openers), the use of technology in safety devices can be noticed in, for example, shock prevention in electrical/electronic gadgets, fire alarms, door security intercoms, skid-free floors, ramps, unobtrusive entrances and exits, fall protection devices, diapers for elders with health problems (Dixit and Goyal, 2015) etc.

For promoting the safety of the elderly at home more attention should be placed on the sites where the elderly tend to hurt themselves like bathrooms, staircases. Getting injured in old age requires a long recovery process and can interrupt the healthy aging process. A slippery bathroom is a major cause of falls resulting in severe injuries. The bathroom floor should be carpeted with non-skid rugs, rubbers, and mats and the floor should be a little slid so that water drains out easily from the floor. It should be slip-proof to avoid falls and minimize the risk of slipping. In case of slipping in the bathroom or in the staircase fall detection sensor can send alert signals to the actuators attached in several places of the home so that the family members can respond immediately. Smart digital sensors (motion sensors) and gadgets can track the activity of the elderly either in the kitchen, bathroom, or bedroom and send an alert signal to the family members or the caregiver via phone if something abnormal or accidental occurs. The artificial intelligence technology like the cleaning robots where the system host sends them to eliminate dirt, water, grease on the floor. In the detection of a fall, human robots can immediately give first aid to the ailing which only a smart home can deliver with advanced sensors and networks. Visutsak and Daoudi (2017) discuss the smartwatch which is a wearable device for fall detection and medical monitoring. The bathrooms should be well illuminated if they have a visual impairment. Tub chairs with adjustable heights, secure backs, and nonslip leg tips are available for the elderly who find it difficult to remain standing for a shower or to rise after a bath (Huth, 1986). Another featured design is the adjustable toilet-seat, because many older persons also have difficulty in sitting down or rising from the average toilet-seat height of sixteen inches, various types of adapters are available to increase the height from two to five inches, and, to help prevent falls, assist rails can be installed on either side (Ibid.). If a device system is installed in the bathroom in the form of ringing alarms or speakerphones it can be helpful to the elderly especially the ones suffering from vision impairment (glaucoma or cataract), cardiovascular disease that make people prone to falls and dizziness in the bathroom.

Kitchen design should also be such that it minimizes the risk of accidents like fires and injuries. Oven and stoves should be located at a

convenient height of the elderly which minimizes the need to bend or stoop and should be placed at a safe distance so that the elderly don't come into contact with flames or heating elements. Modern-day technology has brought touch-sensitive electronic appliances with touch systems, dials, and push pads which can easily be used by the elderly. Safety of the elderly is also based on the kitchen design such as adjustable height storage racks, counters and cupboards, finger protector, utensils with finger bump grips or hand straps, jar opener (Dixit and Goyal, 2015), roll-out shelves in base cabinets, shelves that are a minimum of seventy inches above the floor and that are approximately two feet deep for ease of access to items stored on them, turntables in corner cabinets and rounded edges on all corner and cabinet edges (Huth, 1986)

In the bedrooms of the elderly, the bed should be designed such that they can easily get in and out of bed. Persons with joint pain should have a lower bed height so that they can easily move out of the bed. In addition to this, the other furniture designs of the bedroom should be emphasized upon so that the things or the goods kept are within their easy reach. Next to the bed, a telephone or an emergency/safety alarm should be there which can be used by them in case of emergency at night. The table lamp should also be there beside their bed.

The doors should be wide enough for the easy movement of the elderly with or without a wheelchair; doors should be of magnetic seals. Staircases are another area where the elderly tend to fall and hurt themselves. Instead of stairways, ramps can provide free and easy passage for the mobility of the elderly. If a staircase is available at all, it should be non-slip, non-high gloss flooring material, which can reduce the chance of slipping. Stairs themselves are a major source of falls among the elderly, due to more tripping than to slipping (Ibid.). Elderly persons with restricted agility or arthritic patients should restrict their movement by stairways and instead use the passenger lift. The handrails of the stairways should not be slippery and should be in the grip of the elderly being not too large in circumference. The house of the elderly should always be well-illuminated which can avoid them from an unforgiving fall or accident.

To ensure safety from burglary intercom system, CCTV cameras can identify and monitor the activities of strangers enhancing the security and safety of the elders. Elderly people who have difficulty in controlling and using equipment may be provided by a home automation system. It will enhance the security, safety of the home which is a part of the smart home. Home automation systems can provide voice control, remote control, or control of equipment through timers (Meeks, 1994). For example, devices and sensors control lighting, smoke detectors, door entry systems, locks, water outlets as well as visual and tactile signaling devices (Dixit and Goyal, 2015).

### **Health Care**

The process of aging and health has to be studied in its totality encompassing body and mind. Technology has focused on the cognitive ability and physical ability of elderly patients. There are various health benefits under technology which can be termed telecare or telehealth. With age, the functional capacity in an elderly person decreases with physiological or structural changes in the body system. These changes can be met with technological interventions. A growing range of technology monitors the state of health so that the elderly can maintain their autonomy allowing them to live independently. The elderly with a physical disability can be benefitted from technology. At the physical level decline in mobility and encountering musculoskeletal disorders interrupts the independence to remain mobile indoor and outdoor and also to maintain daily activities. Elderly patients suffering from low vision, arthritis, paralysis, or accidents creating lifetime disability. Injuries due to falling also create a hindrance to an individual's ability to remain mobile. Multiple technologies could improve mobility. Power wheelchairs, manual wheelchairs, and scooters are in common use now, and there are growing capabilities in prosthetic devices and robotic assistants (President's Council of Advisors on Science and Technology – PCAST, 2016). The age-related changes like loss of motor function, visual and auditory impairment can be improved if the home is rehabilitated with improved designs and devices. For older people experiencing mobility difficulties, it may no longer be practical to have to climb stairs to use the bathroom, for example. Depending on the specific context, a chair

lift may remove the barrier the stairs pose to the accessibility of the home (Guihen, 2016). Aged care focuses on daily monitoring of health through a sphygmomanometer, pulse oximeter, electrocardiograms, and nebulizer. Courtney *et al.*, (2008) mention passive-intervention devices such as an electrode-slipping device that can be inserted under-mattress pads for detecting heart rate, respiration, and restlessness. Wearable sensors have a strong presence in health, fitness, and well-being technology, with products (e.g. Apple Health, Google Fit, and AppleWatch) and systems that track various body measurements including steps, sleep, heart rate, burned calories, distance traveled, and individual exercises (Bice *et al.*, 2016). The GPS and blue tooth beacon detect the location of the elderly through these medical wearable sensors. The smart home technology also includes the automatic lighting system. It is automatically activated when a person enters the room and gets switched off when he leaves the room. All the above activities are maintained through sensor technology and wireless charging technology.

With advances in ICT, telehealth technology approaches the elderly who have limited physical mobility through their wide range of technology. Information and communication technology (ICT) based care technologies include real-time audio and visual contacts between patients and caregivers (Fitzgerald and Adam, 2016) which the telehealth technology promises. Other than these the physical fitness machine like treadmills, exercise bikes promote physical activity and helps in sustaining mobility. These universal fitness machines help in improving the disabilities such as musculoskeletal disorder and fine-grained mobility which is crucial to the maintenance of good health. Broekens *et al.*, (2009) discusses about health care technologies that imply communication and that can be considered social robots or social entities that communicate with the user. They are termed assistive social robots. Robotic assistants follow older adults to guide them to specific locations in the home and connect electronically to health care professionals, improve orientation by playing recordings of the date and time and of daily activities, and offer social and mental stimulation (Smith, 2008). Chris and Gavan (2000) mentioned 'Robot Nurses' in Japan and 'Flo-robot' in Pittsburgh being used to assist in activities such as cleaning, assisting patients from



wheelchairs, and onto the bed. Human form android robots have been introduced by Aldebaran Robotics (France) named 'Nao' that is responsive to voice, eye gaze, and gesticulation (Normie, 2011). Service type robots support the basic activities (e.g. eating, bathing, using the toilet, getting dressed), enhance the mobility level, provide household maintenance and monitor individuals that need permanent attention. Examples of this type of robot are the nursebot Pearl, the Dutch iCat, and the German Care-obot (Broeken *et al.*, 2009).

Memory is an integral part of cognitive ability. With age the elderly tend to forget things, they are not good at storing new information as to their cognitive ability declines. The changes in cognition are due to cognitive aging, a process inherent in humans as they age, or due to a specific disease like Alzheimer's disease or dementia which are prevalent, costly, and cause notable suffering (PCAST, 2016). It decreases attention, memory capacity and makes the elderly forgetful which can increase error and threaten the wellbeing of the elderly as well as the family. Some promising technologies can overcome to some extent the cognitive impairment. The assistive devices in combination with the ICT can maintain the elderly's cognitive health. Wearable sensors or remote monitoring technology can track the activity pattern of patients with cognitive decline and act immediately for his/her safety. Pollack (2005) explains that several projects have attempted to do more general activity recognition, using radio frequency identification (RFID) tags attached to household objects. The Elderly often forget where they have kept the item so an RFID tag to the items helps locate the approximate range of the item.

Tamamori *et al.*, (2017) tried to promote the participation and activities of the elderly by developing and utilizing a daily activity surveillance system to increase such opportunities in an online manner. The system utilizes a smartphone to collect environmental sound signals and the user's triaxial acceleration signals continuously. Those signals are sent to a server and the system sends the recognition results, user's activity to their smartphone. The history of the user's activity can be viewed through a graphical user interface installed on the smartphone as an application. The system will interact with a user through the interface based on the activity history; if a user's recent exercise activities are decreasing within a term, e.g. a week, then the

system will notify the decrease of exercise activities and promote the user to go out by sending a message, like, "Today is sunny, then let's jogging in the nearby park". This is a kind of surveillance on the activities of the elderly. For the elderly who are on the onset of dementia and Alzheimer's disease, their daily activities can be targeted and messages for every activity are given as a reminder right from brushing teeth, taking breakfast, having medicines (medication reminder), sleeping. Signals are obtained through sensors that are attached to the user's body to recognize their activities. Many times Alzheimer's patients forget their names, address and get lost, so it is easy to trace them or their location if the sensors are attached to their bodies. Huth (1986) discusses 'Lifeline' an electronic emergency alarm system which is a personal transmitter that is either hand-held or worn on the body usually on a belt or as a pendant which sends signals to the central control centre monitored by a computer which can receive several calls simultaneously and automatically decode each one to determine the time and date it was made and to identify the home from which it came. The uses of these technologies can help the elderly to lead a qualitative independent life. Japan, Sweden, France have taken active steps in promoting the healthy active life of the elderly by embedding these assistive technologies.

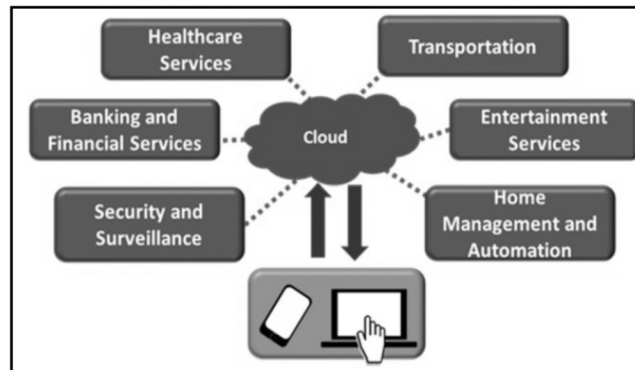
Video games can help in enhancing the memory of the elderly through, specially designed memory games for those who have cognitive impairment. For example, 'Brain Age' (known in Japan as brain training), a new brain-training game for the elderly from Nintendo Co., played on the company's hand-held DS console is a package of cerebral workout aimed at the over-45s that claimed to improve mental agility and even slow the onset of dementia and Alzheimer's diseases (Mc Curry, 2006). Iancu and Iancu (2017) studies mention that internet search activates the prefrontal cortex more intensively, an area responsible for quick decisions and complex information assessment.

### **Social Connectedness**

Technology helps to maintain the social connectivity between the elderly and their family. The migration of the youth has disturbed their emotional relationship. To maintain the cordial relationship

technology facilitates social interaction which helps ameliorate social isolation, maintain social support, establish a new social connection. The key technologies used in a smart home to maintain social connectivity are a) internet (computer-based through e-mail, skype or video conferencing, Facebook); b) smartphones (whats app, google duo, messenger); c) GPS. Computers, the internet, mobile phones have benefited the elderly as these make the elderly stay connected with their family or so-called on-line family with the aid of technology devices such as web-cameras which supports conference, video chatting and calls online. Usage of the internet is an easy way to remove isolation, depression and maintain a greater involvement with distant family members and relatives. Social interaction can enhance cognitive and motor performance through the usage of the internet. Other than making calls and conferences, accessibility to services, knowledge about the world, recently developed clinical trials, online education is all done through the internet. Online bill payment, online shopping, banking transactions, clinical trials have all become easy for the elderly especially those detected with physical agility.

**Figure 1**  
*Application of Internet of Things*



Source: Majumder *et al.*, 2017

## Conclusion

For offering a dignified and comfortable life to the elderly the technological solutions have paved up new possibilities. The outdoor

and indoor environments of the elderly can be secured by adopting technological devices. This paper is a theoretical overview of the types of technology which can be used in building an elderly-friendly smart home. The work underlined the areas why a smart home with the use of assistive technology can create an independent lifestyle. It presents that technology can be used in an assistive manner especially concerning health issues. It also focuses on the various spaces and living units which are developed with special features for the elderly. A lot of development for designing smart homes has taken place in developed countries but it has more to offer to the developing nations. Concerning India, it can play a lead role in revolutionizing the care services to the elderly at home and can reduce the burden of the caregivers. But the rate of adoption on the aspects of technological fronts is low partly due to the high costs and lack of availability on a commercial scale. With age, the cognitive and physical power declines so the assistive devices must be simple and easy in their function otherwise the elderly may discard their use. The elderly's behaviour, motivation, and social background in our country seem that they are quite reluctant to adopt the concept of smart home and this remains a challenge in the way of successful ageing.

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## Retirement Transitions and Social Support among Teachers

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### ABSTRACT

*The purpose of the present study was to assess the level of social support among Pre-Retiree and Retiree Teachers at different stages of retirement among 200 teachers (100 Pre-Retiree and 100 Retired) from government educational institutions. The Social Support Inventory for the Elderly (SSI) by Ramamurti and Jamuna (1991) was administered to assess 'social support' among these teachers. The analysis showed no significant difference between Pre-Retiree and Retired teachers in the perception of social support. There was no significant difference in the perception of social support among the two groups of Pre-Retiree (6 months and 3 years) and Retired (6 months and 3 years) teachers. Implications were discussed.*

**Keywords:** Social support, Retirement, Teachers

“Like many of the world’s nations, India’s aged population is growing both in absolute numbers as well as in proportion to the general population” (Kalavar and Jamuna, 2008). The proportion of India’s elderly population aged 60 and above is expected to nearly triple from 2015 to 2050, increasing to 317 million (Biswas, 2018). The forecast of the above figures along with the growing number of

Indians currently retired raise serious questions about the nation's capacity to assist the elderly. Also, urbanization has had an impact on the traditional social structure across the country. In such a scenario, several concerns arise on the care of this population. Against this backdrop, the present study has attempted to understand the interpersonal relationships and support systems among teachers at different stages of retirement.

### Review of Literature

Retirement is a phenomenon of recent origin, which took place around the 19th century due to the industrial revolution, labour reforms, and changes in social structure. Since then, the event of retirement has transformed in many ways moving from a kind of state provision into a social right and later a legal structure. Along with the changes in the conditions of retirement, the portrayal of the event has been redefined.

Retirement has been defined in various ways by different researchers. According to Atchley, 1999, retirement refers to an exit from formal occupation and dependency on social security benefits. França (2012) highlighted that retirement can be seen as a time of losses and gains positively and negatively. It is seen as an employee's departure from the workforce, accompanied by a reduced commitment to and withdrawal from work (Shultz and Wang, 2011). Retirement is a flowing notion as it signifies different things and varied experiences to different people (Ononuju, 2018).

Retirement concerns can also be addressed by understanding the theories of gerontology that revolve around the issues of retirement. *The Disengagement theory* (Cummings and Henry 1961), suggests that older adults tend to get less involved in the social system around them and disengage themselves from the formerly central roles. Unlike the abrupt transition associated with the former theory, *the Continuity theory* (Atchley, 1989), suggests that older adults maintain similar activities, lifestyle and relationships in their retirement as they did in their earlier years of life by using strategies tied to their past experiences of themselves and their social world. *The role theory* (Mead, 1913; Linton, 1936) explains the changing role of an individual with age. It suggests that individuals enter and exit various roles as they move from



one life stage to the next. The level of satisfaction and psychological well-being depends on the experience from the role they are leaving versus the expected gains from the roles they will be entering (Wang, *et al.*, 2011). The above theories allow for in-depth analysis on retirement as a significant milestone and its influence on older workers' engagement and social structure.

Social networks are essential to successful aging as they provide a strong system of control, trust, access to information, and social support to the elderly (Antonucci and Akiyama, 1995; Coleman, 1988). "Social support consists of social relationships that provide *material* and *inter-personal resources* that are of value to the recipient, such as counseling, access to information and services, sharing of tasks and responsibilities, and skill acquisition" (Thompson, 1995). It is a multi-dimensional construct, that has been categorized into 3 broad categories:

- (i) Social connectedness; refers to feeling connected and belonging to a social group that includes both formal and informal relations. It also includes the quality and quantity of social ties (Kaul and Lakey, 2003; Sarason, *et al.*, 1987).
- (ii) Perceived social support; refers to an individual's subjective interpretation and perception of support. Measurement of perceived social support includes assessment of both availability and adequacy of support, also the perceptions of support may be more important than the actual support received (Lyyra and Heikkinen, 2006).
- (iii) Actual social support; refers to an individual's report of support they have received. However, other researchers have argued that the positive influence of actual or enacted social support may be mediated by perceived social support (Wethington and Kessler, 1986).

Achieving and maintaining social engagement is considered a key component of successful aging (Rowe and Kahn, 1998; Menec, 2003). A few studies have assessed changes in social engagement before and after retirement and the evidence is mixed as to whether retirement might strengthen or weaken engagement (Pillemer, *et al.*, 2000; Szinovacz, *et al.*, 2003, Wang 2007). *Some researchers* have suggested that the effects of retirement on social engagement may differ by

factors such as one's main occupation during working life, gender, health, and earlier-life levels of engagement (Moen 2000; Kim and Moen 2002).

Most research studies suggest that age is positively associated with the presence of good social relations and older adults tend to interact more with support contacts and have more kid-centered networks (Marsden, 1987; Shaw, *et al.*, 2007). Most work shows that older adults are more involved in the community than younger adults, especially concerning volunteering and religious participation (Miller and Nakamura 1996; Chatters, *et al.*, 1999). Some assert that this has to do with generational differences in values, customs, and traditions (Putnam, 2000; Rotolo and Wilson, 2004;). A few other researchers point to older adults' greater involvement as an adaptive response to narrowing role sets (Cavan, *et al.*, 1949; Lemon, *et al.*, 1972). Major life transitions like bereavement and retirement may extend active involvement in community social work, however, there is mixed evidence for this (Ferraro, 1984; Mutchler, *et al.*, 2003; Li, 2007).

In general, the literature suggests that the association between age and social connectedness is complex, and depends on several life course factors. There is a lot of research on individuals' network connectedness in general, but most of this work considers adults of all ages. Work that does focus on older adults usually treats employment status merely as a control variable and is based on cross-sectional data. This provides information on differences between retirees and workers, not necessarily the transition effect (Bosse, *et al.*, 1990; Cornwell, 2008). A few studies investigate the support given (De Jong Gierveld and Dykstra, 2008; Kahn, *et al.*, 2011), and these are not focused on the transition of retirement. Only a limited number of present-day studies focus on retirement as an important life transition and investigate its consequences for people's social life.

Thus, social support being an important aspect of retirement transition, is what is being attempted to be explored in the present study by way of studying the perception of support at different stages of retirement among teachers, which may further assist in understanding the well-being and the social structure during the work-to-retirement transition.

The present study seeks to answer the following research questions.

**Research questions**

- Do Pre-Retiree and Retired teachers differ on their Social Support?
- Do Pre-retiree teachers who are going to retire in less than 6 months differ in Social Support from those who are going to retire in 3 years?
- Do Retired teachers who have retired from service in less than 6 months differ in Social Support from those who have retired from service during 3 past years?

**Objectives**

- To study the differences in Social Support of Pre-Retiree and Retired teachers.
- To study the differences in Social Support of Pre-Retiree teachers who are going to retire in less than 6 months and those who are going to retire in 3 years.
- To study the differences in Social Support of Retired teachers who have retired from service in less than 6 months and those who have retired from service during the past 3 years.

**Hypotheses**

**H1:** There is no significant difference between Pre-Retiree and Retired teachers in their Social Support.

**H2:** There is no significant difference in Social Support between Pre-Retiree teachers who are going to retire in less than 6 months and those who are going to retire in 3 years.

**H3:** There is no significant difference in Social Support between Retired teachers who have retired from service in less than 6 months and those who have retired from service during the past 3 years.

**Methodology**

The study used a descriptive survey method for data collection to assess the Social Support of Pre-retiree and Retired teachers. The sample consisted of 200 teachers (50 teachers who are going to retire in less than 6 months and 50 teachers who are going to retire in 3 years; 50 teachers who have retired from service in less than 6 months and 50

teachers who have retired from service during past 3 years) selected using a disproportionate stratified random sampling technique. Social Support was measured using The Perception of Social Support Inventory for the Elderly (SSI) by Ramamurti and Jamuna (1991). It has 35 items. Each item has a 6-point rating scale ranging from no support (0) to good support (5). The inventory covers 4 areas of Social Support namely: Emotional Support, Financial Support, Traditions, Customs and Community Support, and Physical Care and Disability Support.

### Results and Discussion

The results are discussed hypothesis-wise as follows.

Hypothesis 1: There is no significant difference between Pre-Retiree and Retired teachers in their Social Support.

**Table 1**  
*Significance of difference between Pre-Retiree and Retired teachers on Social Support*

<i>Teachers</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>SEm</i>	<i>df</i>	<i>t</i>	<i>p-value</i>
Pre-Retiree	100	104.85	14.35	1.43	198	.18	.31
Retired	100	105.25	16.80	1.68			

An analysis of Table 1 indicates that the mean score of Pre-retiree teachers is 104.85 and Retirees is 105.25. In terms of standard deviation, Pre-retirees have 14.35 and Retired have 16.80. It means the spread of scores away from the mean is more among Retired suggesting that the variation is relatively more among the Retired as compared to Pre-retirees. To see whether the obtained mean difference is true of the population, the scores were subjected to the “*t*” test, which yielded .18, which is statistically not found to differ significantly. Therefore, the null hypothesis is accepted. This indicates that the Pre-retirees and Retired do not differ significantly in their Social Support. It means whether the teachers are going to retire or already retired, their Social Support remains more or less the same.

The Social Support dimensions that have been tested in the present study include Emotional Support (ES), Financial Support (FS), Traditions, Customs and Community Support (TCCS), and Physical

Care and Disability Support (PCDS). An attempt is made to compare both the groups on all the above dimensions as follows.

**Table 2**  
*Significance of difference between Pre-Retiree and Retired teachers  
on the 4 dimensions of Social Security Inventory*

<i>S. No</i>	<i>Dimensions</i>	<i>Groups</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p-value</i>
1	ES	Pre-retirees	100	31.16	5.79	198	.53	.69
2		Retired	100	30.72	5.94			
1	FS	Pre-retirees	100	23.58	5.97	198	1.70	.39
2		Retired	100	22.08	6.44			
1	TCCS	Pre-retirees	100	25.66	4.56	198	.95	.74
2		Retired	100	26.29	4.72			
1	PCDS	Pre-retirees	100	24.45	3.71	198	2.93	.05
2		Retired	100	26.16	4.48			

An analysis of Table 2 indicates the significance of the difference between Pre-Retiree and Retired teachers on the 4 components of SSI. High scores on 'ES' indicate high emotional support, 'FS' indicates high financial support, 'TCCS' indicates high support from traditions, customs, and community and 'PCDS' indicates high physical care and disability support respectively. The above table shows that the mean score of Pre-retiree teachers does not differ much from the mean score of Retired teachers on most of the dimensions. Also, in terms of standard deviation, the scores of Pre-retirees and Retired do not differ much except for the component of PCDS. It means the spread of scores away from the mean is more or less similar for Pre-retirees and Retired teachers. To see whether the obtained mean difference is true of the population, the scores were subjected to the "*t*" test, which is not found to be statistically significant on most of the components of SSI except for PCDS. It means on these dimensions, on the whole, the Pre-retirees and Retired do not differ in their perception of Social Support. ES refers to a feeling of security and concern from spouse, children, relatives, and friends. This indicates whether the teachers are yet to retire or already retired has no relation to the affection and care that they receive from significant others like family and friends. This could be due to the nature of emotional competence in teachers which

enables them to maintain former social relationships that are important to them and also acquire new ones. FS refers to the availability of financial resources for the elderly for various needs. This indicates support from social security benefits and also a good financial plan among teachers. This could be due to sufficient financial literacy among pre-retired and retired teachers. TCCS refers to the extent of support from the society and the cultural context to the elderly. This indicates invariable support from the society and the socio-cultural customs to teachers irrespective of their work status. This could be due to the cultural ethos of respecting elders and the community-centric nature of Indian society. PCDS refers to concern and support at times of disability or when in need of physical care. The result indicates statistical significance at 0.05 level in favour of the retired teachers indicating higher health care support to the retired from the family circle and public institutions at times of ailments. It means the retired teachers who become disabled get much better care and support than the pre-retiree teachers. This indicates that the retired teachers get better attention and care after retirement compared to pre-retirees who will have less time to get cared for due to no availability of time or their commitment to work.

This could be because as a category the teachers are a more cohesive group, they are more socialized human beings and would have formed their own social life in a way that their values are consistent throughout, and retirement or no retirement is not going to make any big change in terms of their family environment. Therefore, the perceived social support will not be varied.

**Hypothesis 2:** There is no significant difference in Social Support between Pre-Retiree teachers who are going to retire in less than 6 months and those who are going to retire in 3 years.

**Table 3**  
*Significance of difference between Pre-Retiree teachers  
(6 months and 3 years) on Social Support*

<i>Teachers</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>SEm</i>	<i>df</i>	<i>t</i>	<i>p-value</i>
Pre-Retiree 6 months	50	105.42	14.10	1.99	98	.39	.50
Pre-Retiree 3 years	50	104.28	14.72	2.08			

An analysis of Table 3 indicates that the mean score of Pre-retiree (6 months) is 105.42 and Pre-retiree (3 years) is 104.28. In terms of standard deviation, Pre-retiree (6 months) have 14.10 and Pre-retiree (3 years) have 14.72. It means the spread of scores away from the mean is almost the same in Pre-retiree (6 months) as compared to Pre-retirees (3 years). To see whether the obtained mean difference is true of the population, the scores were subjected to the “*t*” test, which yielded .39, which is statistically not found to differ significantly. Therefore, the null hypothesis is accepted. This indicates that the Pre-retiree (6 months) and Pre-retiree (3 years) do not differ significantly in their Social Support. It means, whether the teachers are going to retire in 6 months or 3 years, their Social Support remain the same more or less. This further shows that Pre-retirees are one as a group in their perception of social support.

The unchanged nature of social support at different stages of pre-retirement could be due to various job characteristics and family attributes of pre-retirees. As the profession demands, teachers, in general, have excellent communicability and interpersonal skills. The support, care, and sense of belongingness from co-workers and the significant others in the family have little to do with the work status of an individual.

**Hypothesis 3:** There is no significant difference in Social Support between the teachers who have retired from service in less than 6 months and those who have retired from service during the past 3 years.

**Table 4**  
*Significance of difference between Retired teachers  
(6 months and 3 years) on Social Support*

<i>Teachers</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>SEm</i>	<i>df</i>	<i>t</i>	<i>p-value</i>
Retired 6 months	50	105.40	16.45	2.32	98	.08	.68
Retired during 3 years	50	105.10	17.31	2.44			

An analysis of Table 4 indicates that the mean score of Retired (6 months) is 105.40 and Retired (3 years) is 105.10. In terms of standard deviation, the Retired (6 months) score is 16.45, and the Retired (3 years) score is 17.31. It means the spread of scores away from the mean

is slightly more among Retired (3 years) suggesting that the variation is more among the Retired (3 years) teachers as compared to Retired (6 months). To see whether the obtained mean difference is true of the population, the scores were subjected to the “*t*” test, which yielded .08, which is statistically not found to be significant. Therefore, the null hypothesis is accepted. This indicates that Retired (6 months) and Retired (3 years) do not differ significantly in their Social Support. The results also indicate that no matter whether the teachers have retired 6 months back or 3 years back, their perception of Social Support remains the same more or less.

The present finding is consistent with the research literature. The invariability in the perception of social support in different stages of retirement could be due to the natural occurrence of social engagements and retirement being a co-occurrence. While retirement may cause people to lose touch with former colleagues and the workforce, it may also cause them to strengthen other ties – like those with family and friends. Retirement transition itself may not be a determining factor for social engagement and socialization aspects may differ based on one’s occupation, gender, health, and personality (Kim and Meon, 2002). According to van Tilburg (2003), retirement is not the reason for the decrease in social relations, as there is a change in network composition, wherein the coworker links are replaced by family relationships. Also, at the retirement age, relationships with parents, children, and friends are often well established and have crystallized into a certain form, wherein there is a particular amount of contact and support (Kahn and Antonucci, 1980).

Contrary to the above findings, some studies show that retirement lowers the volume of and intensity of social networks (Supan and Schuth, 2016; Patacchini and Engelhardt, 2016). Research analysing the effect of retirement on social relations holds up the notion that retirement is associated with the lessening or closing of work-related relationships (Bacharach, *et al.*, 2007; Bosse, *et al.*, 1990; Bosse, *et al.*, 1993) and a decline in interpersonal relations with an increased sense of isolation (Stevens and van Tilburg, 2000; Alpass and Neville, 2003; Barnes and Parry, 2004).



## **Conclusions**

- The following conclusions are drawn based on the research questions raised.
- Pre-retiree and Retired teachers do not differ significantly in their emotional, financial, traditional, and customs support. In terms of physical care and disability support, the retired teachers receive slightly higher support in comparison to the pre-retiree teachers.
- Pre-retiree (6 months) and Pre-retiree (3 years) do not differ significantly in their Social Support. It means teachers are alike no matter whether they are going to retire in 6 months or 3 years. The duration before retirement of 3 years or less than 6 months is all the same among teachers in their perception of Social Support.

Retired (6 months) and Retired (3 years) do not differ significantly in their Social Support. It means teachers are alike no matter whether they have retired 6 months back or 3 years back. The duration after the retirement of 3 years or less than 6 months is all the same among teachers in their perception of Social Support.

## **Implications**

On the whole, whether somebody is going to retire or already retired their emotional, financial, traditional, and customs support remain the same because they would have already formed a certain predictable social way of life. Thus, their social life after retirement is not going to make any drastic change. On the other hand, in terms of their physical care and disability, support would be extended much more after retirement. This shows that teachers will have fixed and predictable life circumstances and support systems which they would have established over a period that is likely to continue even after their retirement.

The above implication holds good even for Pre-retirees (6 months and 3 years) and Retirees (6 months and 3 years). The particular issue had to be studied because there was a need to see if there would be any difference in social support in terms of the approaching of retirement, during retirement, and post-retirement. Whether the teachers are going to retire or already retired, the social support network and the social security is consistent. The teaching community has the greatest

advantage that their social support will continue to be very stable irrespective of whether they are about to retire or retired. Retirement transitions do not make any alterations in their social support.

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## **‘Ageing and Alone’: Analysing Health Implications of being a Left Behind Elderly Parents in Kashmir**

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### **ABSTRACT**

*The paper analyses the impact of migration on the parents living in Kashmir valley who have been left behind by their children with a special focus on their health. The qualitative method was employed involving in-depth unstructured interviews with 12 parents aged 65 > having the only one male child living and working in other countries for more than 5 years. It uses the existing literature, supported by respondent narratives to present the findings. Several themes emerged from the study most notably around the social and psychological aspects of the lives of the elderly.*

**Keywords:** Migration, Elderly, Parents, Health, Kashmir.

Migration in pursuit of new-fangled prospects and safer places in which to live is a socio-political and economic process that affects both the individuals who move, who stay behind, and the places where they go. (IOM, 2013). It is an accepted notion that overseas migration is also known as international migration along with different causes has certain consequences on both sending as well as receiving countries. (Antman, 2010). Much of the international migration is known as economic or labour migration and occurs as people move from

countries with lower wage levels to countries with higher wage levels in search of work. This labour migration has become one of the most promising ways for poor families in developing and emerging countries to leave poverty (Clemens, 2011).

Different pull and push factors exist that force individuals to migrate to different regions of the world for earning their livelihood and subsistence. Many studies have revealed that migration increases household income, and the findings are very consistent across many countries (Liang and Ma, 2004; Van Wey, *et al.*, 2005; Semyonov and Gorodzeisky, 2008).

Accelerated by globalization, urbanization, employment opportunities, this type of migration is conventionally viewed as economically productive for the family members who are left behind through remittances. It has been found that over the past decade, there has been a widespread increase in both international and internal migration rates with the increase in the rate of unemployment in Jammu and Kashmir. This has changed the living patterns of society including family relations (Kahanec and Zimmermann, 2008).

### **Elderly Heath and Migration**

There is a dramatic increase in ageing globally. With the improvements in living situations and technological advancements in medical science, globally people are living longer. Presently, for the first time in history, most people can expect to live up to the sixties and beyond. By the year 2050, 2 billion people are expected to be between the ages of 60 years and beyond as compared to 900 million in 2015. Today, 125 million people are aged 80 years or older. By 2050, there will be almost this many (120 million) living in China alone, and 434 million people in this age group worldwide. By 2050, 80 per cent of all older people will live in low- and middle-income countries. (IOM, 2018).

However, research has also shown that migration puts the family systems in a strain that could sometimes offset the benefits brought by remittance. (Lu, 2012; Antman, 2013). The splitting up of families due to migration may also have several adverse implications for family members especially the elderly who do not migrate. (Demurger, 2015). therefore, identifying the underlying influence of migration on those who are left behind remains a challenging research question.

Many factors and developments are impelling the lives of elderly people directly or indirectly like globalization, technological developments, urbanisation, and migration to name a few. Although a few of these variations in older people's health are genetic based, much is due to people's physical and social environments – including their homes, neighbourhoods, and communities, as well as their characteristics – such as their sex, ethnicity, or socioeconomic status (Ratha, *et al.*, 2011). The migrant children usually suppose that they are ensuring every kind of amenities to their left-behind parents but they overlook the desolations of their parents who are forced to shoulder the additional and heavier responsibilities of their households in the absence of their children which ultimately affect their health and wellbeing. (Démurger, 2015)

The interaction between health and migration is complex and dynamic. Migration can have an impact on the physical, mental, and emotional health and well-being of migrants themselves, on those left behind in the place of origin, and on those at the destination. (Carballo, *et al.*, 1998). The impact of young adults' migration on their elderly parents' health could be adverse and uncertain. Having a migrant child might improve the economic status of households and thus benefit the elderly's well-being, but at the same time, having migrant children might also increase the burden on the elderly as they often have to shoulder some of their migrant children's responsibilities such as taking care of their grandchildren and helping with rural labour work. (Liu, *et al.*, 2015). It is generally found that the elderly who need care, love, support, and time from their children at this stage of life have to suffer adversely due to the prevailing trend of migration and eventually suffer from several social, psychological, and health problems (Adhikari, *et al.*, 2011). Those who migrate may call their families to decrease their loneliness while the elderly who are generally left behind; suffer and their agonistic life starts here. This paper analyses the impact of migration on the parents who have been left behind by their children with a special focus on their health.

### *Theoretical Perspective*

The family systems theory (FST) of Bowen, M. (1950) proposes that individuals cannot be understood in isolation from one another,



but rather as a part of their family, as the family is an emotional unit. According to Bowen, a family is a system in which each member has a role to play and rules to respect. Members of the system are expected to respond to each other in a certain way according to their role, which is determined by relationship agreements. This theory is simply a concept of looking at the family as a cohesive emotional unit.

In the FS theory, even when people may feel they are disconnected from members of their family, the family still has a profound impact on their emotions and actions – whether positive or negative. The same is witnessed in cases of migration on those who migrate as well as who stay behind. And, a change in one person sparks a change in other members of the family unit act and feel as well. Though the degree of interdependence can vary between different families and also among the members. This interdependence between and within families acts as a glue to keep them intact and together. The family members live together and are dependent on each other for the fulfillment of different needs. (Minuchin, 1974).

This theory has great relevance for the present study given the fact that the migration of a family member creates a vacuum that is very hard to overcome for the family. The left-behind family members are affected by the physical and emotional absence of their migrated members. An emotional, as well as physical distance from the loved ones, harms the physical and psychological health of left-behind elderly parents. Parents share a strong bond with their children right and migration leads to a disconnection in this bond which in turn hampers the balanced relationships of the family. The elderly parents who make this emotional unit (family) are subjected to several challenges due to the migration of their children. The study strived to unravel the experiences of the left-behind elderly parents.

### *Review of Literature*

The main methodological problem in studies of the impact of migration on family members left behind is typically the endogeneity of migration itself. Since migration is generally not random and migrants self-select, it is generally acknowledged that migration is likely to be correlated with the same factors that influence outcomes for family members left behind. Thus, it becomes difficult to

determine whether migration is causing the outcome of interest or whether it is some other lurking variable that is correlated with both migration and the outcome of interest. In short, there is a classic omitted variable problem.

The existing literature evidences the fact that the majority of studies on international migration particularly concerning left-behind elderly have been undertaken in the context of developed countries. But not much research has been carried out on this phenomenon in developing countries. There is no doubt in the fact that a plethora of research is done on the impact of international migration on left-behind families particularly wives (Farooq and Javed, 2009) and children. (Battistella and Cecilia, 1998). The out-migration of young adults from the household results in children and older family members being 'left behind' which has resulted in drastic consequences for these left-behind families. (Toyota, 2007). But, the issue of migration of children and sufferings of left-behind elderly in developing countries is under-researched. There has been massive migration since the advent of globalization that severely impacted the lives of families and the elderly left behind. Significant efforts have been devoted to understanding the health consequences of the left-behind children and elderly and spouses (Tong, *et al.*, 2015; Xu and Xie 2015; Huang, and Tao, R., 2015; Ren and Treiman, 2016). One of the studies has found that older adults with migrant sons are more likely to report lifestyle-related chronic diseases such as hypertension, diabetes, and heart disease. (Falkhingam, 2017). In another study of migration, lower utilization of healthcare services among the left-behind elderly has been observed which aggravates the health problems (Zhou, *et al.*, 2015). Despite having ill health and suffering from varied ailments, elderly parents are found unable to take the required healthcare services needed. (Liu, *et al.*, 2007). In addition to this, Indian parents when compared to British parents were found to experience more difficulties due to their expectations that sons stay with the parents or what we call joint family living arrangements extensively prevalent in India. (Mitchell, 2009). Most studies in India showed that living in multigenerational households had protective health benefits. (Samanta, 2015). In most Asian countries, the elderly are seen as dependent

on their children for personal care and financial support. (Knodel, 2005). There is a need to understand the diverse phenomenon of migration and how it negatively influences the life of elderly parents who have to shoulder the additional burden of family responsibilities. There is no doubt in the fact that migration has an adverse impact not only on those left behind but also on those who migrate. However, the major concern in this study is on the experiences of those people who are left behind i.e (left behind elderly parents). It is a fact that aging demands time from children, but migration deprives this demand of elderly people who are supposed to live only with the memories of their children.

### **Methodology**

The qualitative methodology approach was employed in the study, as it aimed to be exploratory, examining the impact of migration on the health of left-behind elderly people from the perspective of research participants. Purposive sampling has been used to select participants for the study. The target population of the present study comprised of those elderly people who were living without their male adult children. In-depth interviews have been employed to collect data from participants. The interviews lasted for 30–45 minutes. These interviews have been then transcribed carefully and analysed thematically. Moreover, the major purpose behind this research was to explore the impact of migration on left-behind elderly only and not to generalize the results on the whole population.

### **Sample Selection**

This study has been specifically carried out in an attempt to explore the impact of migration on the left-behind elderly population. The sample for the study has been chosen from Kashmir valley, where in-depth interviews of left-behind parents were conducted and themes of these interviews were explored and henceforth concluded. Purposive sampling was used in choosing the research participants. The purposive sampling is based on the assumption that with good judgment one can select the participants that are satisfactory about one's requirements. A total of twelve participants aged more than 65 were selected for the study. So, only those participants were interviewed whose children have migrated.

### **Data Collection and Analysis**

In-depth interviews were conducted with the selected research participants in their homes for around 30–40 minutes. The purpose of the research study was explained to the participants in the local language, i.e. Kashmiri. Besides, consent was also granted from participants for audio-recording of interviews. The interview records were analysed and transcribed later on. However, before starting the interview, the informed consent was verbally explained by the interviewer and signed by the participants, and the right to participate in or withdraw from the study at any time was also explained.

The purpose of the research study was clearly explained and interviews started with open-ended clarifying questions. Data analysis was started immediately after the interviews. It is a fact that aging demands time from children, but migration deprives this demand of elderly people who are supposed to live only with the memories of their children. The study strived to reveal the experiences of the left-behind elderly parents.

For the analysis of data, narrative analysis has been done to make sense of the data. The data was transcribed. The transcriptions were then read line by line to gain a deeper understanding of the whole. Data analysis was started immediately after the interviews.

For the analysis of data, procedures and techniques of grounded theory (Strauss and Corbin, 1990) were followed.

The names of the respondents as well as the address had been kept off the record to maintain the principle of confidentiality.

### **Field Narratives and Discussion**

After the analysis of the data, the key themes generated included deep emotional challenges suffered by elderly people owing to the separation of their children. The elderly people feel lonely and desperate in the absence of their children which have eventually deteriorated their health. As a result, elderly people need help and treatment to resolve their health challenges. But, the migration of their children deprives them of this privilege and they are not in a position to seek proper health care services. The themes that emerged are:

- Emotional Distress

- Adverse impact on Health
- Passive health care-seeking behaviour Emotional Distress:

The participants shared their experiences of emotional distress like loneliness, sadness, and depression resulting from the migration of their loved ones. The following narratives of respondents reflect upon their experiences and issues confronted:

“... After the migration of my son, I used to play with my grandchildren. Now, they also migrated. There is no fun in this life. I feel alienated. It seems that I will die in their wait. I miss my family very much and wish them to be back.” (E4)

“... Children are busy with their jobs and don’t find time for us now. They have learned to live without us but forgot to make us learn how to live without them.” (E1, E3)

“... I miss my children very much and want to live the last moments of my life with them.” (E12)

“... Life is of no interest without children. Parents need their children more than anything else in the world.” (E7)

“... There is not a single moment in my life when I don’t remember my children. I wish them to be back as early as possible.” (E2)

“... I spent my lifetime earnings on my children. I gave them everything which they needed. But now it was my turn and they have grown indifferent. Still, I miss them very much.” (E5, E11)

“... My children went abroad in search of good jobs. They are earning large sums of money. Initially, they visited their home once a year but later they took their families along. They now visit after five years. We don’t need their money. We just need their time, love, and care.” (E6)

Respondents’ money is not the only thing, they need. They can manage poverty but to manage life in the last phase of life in the absence of loved ones becomes much more challenging. They further added that they had not lived luxurious lives nor would they want to live. They only wanted to live a life with their children and grandchildren around. (E5, E1, E12, E4, E11)

The participants were very much emotionally disturbed in the absence of their children. The sharing of their experiences of loneliness and the pain to live without their children was very

difficult for the respondents to reveal. It was found that most of them feel that the financial aspect of migration does not necessarily compensate for the psychological impact of living alone after the migration of a child.

### **Adverse Impact on Health**

Traditionally, elderly people are reliant on their children for support. Increasing age is usually accompanied by multiple illnesses and sensory impairments. (Government of India, 2016). The rapidly growing migration has added to the sufferings of elderly people who face innumerable challenges in the absence of their children. These elderly parents are facing multiple problems such as taking care of their failing health, taking over the responsibilities of their children, and managing other household affairs viz agriculture farms particularly in rural areas, etc. The narratives indicate that most of the respondents experience an impact on their health because of living alone.

“... My only son is working in Dubai for the last six years. The daughter used to take care of me but now she can't move out without the permission of her in-laws. I have multiple ailments and there is no one to take care of my health.” (E8)

“... I used to manage every household affair. But, my health problems have made me paralyzed now. I need someone to take care of my failing health.” (E10)

“... Years passed since I have seen my son. I am yearning for his single glimpse. His separation has made me sick. I sometimes feel that I will die of a heart attack in his memory. I miss him very much.” (E1)

These inferences are inconsistent with the studies of Antman (2010b) who looks at international migration from Mexico to the US and finds that parents with at least one child in the US on average have worse self-reported physical and mental health and are more likely to

suffer from a heart attack or stroke. In this context, it has been suggested that poor mental health due to social isolation may be responsible for deteriorating physical health. (Antman, 2010a) offers some suggestive evidence that the negative impact of children's migration on mental health may be responsible for deteriorating physical health, raising the possibility that resulting social isolation of elderly parents when their children migrate may be an important mediating factor.

### **Passive Health-care Seeking Behaviour**

Given the role of the family in supporting elderly individuals as they age, the migration of children may be expected to affect the health-care-seeking behaviour of an elderly individual.

In developing countries, adult children are mainly responsible for the care of their elderly parents. However, the migration of children is common in these countries. As a result, elderly parents are likely to care for themselves. The impact on the healthcare-seeking behaviour on the elderly can be understood from the following narratives:

"... My children used to take care of my health and other needs. Now, they are away. I have to manage things on my own. I hate going to the hospital alone, its difficult for me" (E7)

"... Health is wealth. As children moved to other countries. The entire burden of taking care of my health has fallen on my shoulders."(E3)

"... Nobody is there to take care of my health. I feel alienated due to the deteriorating health conditions. I badly need someone to take care of my health."(E10)

"... Healthcare needs are multiplying day by day. We miss our children and want them to be with us. Children are the assets for their parents. We have a lot of expectations from them." (E2. E5)

"... Old age makes one dependent. I need the company and support of my children more than anything else I have enough money but no one to get me medicines at times." (E4)

"... As they were around they used to manage our needs and everything on their own. Now i have to call my neighbour's son to

accompany me to doctor. My daughter has been married off so she cannot be always with us" (E12)

Migration has heightened the already existing eldercare crisis. The elderly parents are left to take care of themselves. Many studies have evidenced the fact that migration has adversely affected the health-care-seeking behaviour of elderly parents left behind in their place of origin.

### **Conclusion**

The issue of how the migration of children affects elderly people is very much significant as current trends towards globalization and populations ageing throughout the developing world are rising. The left behind elderly think that they should not have been deprived of their basic rights of love and care in the last phase of their lives. The present study found that migration has diverse effects on elderly parents who are mostly found yearning for the return of their children. The study found that elderly people due to advancing age are suffering from chronic illnesses and other age-related disabilities. They are not in a position to get the required health services which subsequently resulted in poor health conditions. Moreover, these elderly people are generally observed facing a double burden of taking care of themselves and their families in the absence of children which further aggravates their problems. The moving out of the children has no doubt benefitted the parents economically but these benefits don't compensate the emotional distress and other health problems faced by elderly people.

Since the concept of migration is complex and dynamic, the relationship between migration and its impact on the overall well-being and health of the elderly population needs serious attention and urgent intervention. Keeping in view the finding, there is a need to research the negative impacts of migration on elderly people to come up with measures to tackle and resolve the challenges arising due to migration.

The separation of the elderly parents and their migrant children has led to several problems among elderly parents. The elderly who are usually vulnerable due to frailty and other problems are left alone to bear the brunt of migration and to take care of themselves in the absence of their children has added to their vulnerabilities. The



scholars should exhibit a keen interest in these under-researched areas keeping in view the growing vulnerabilities of elderly people. Besides, Government should also come up with concrete steps to combat the ill effects of the migration process on left-behind parents. The elderly people are the assets of every society and every effort should be made to ensure their well-being.

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## Impact of Covid-19 Pandemic on Mental Health of Community-Dwelling Older Adults

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### ABSTRACT

*This cross-sectional online survey aimed to evaluate the impact of the covid-19 pandemic on the mental health of 200 community-dwelling older adults of both genders, ages varying from 60–80 years, belonging to rural and urban areas of Maharashtra. Participants were selected by using the snowball sampling method. The outcome measure for assessing anxiety due to covid-19 among them was Coronavirus Anxiety Scale (CAS). It was found that the overall prevalence of anxiety was 22 per cent on the coronavirus anxiety scale. While comparing the age, 70–79 years elderly were having a high level of anxiety during the lockdown. It was also noticed that in comparison to males females were more affected by anxiety during the lockdown. Based on the present findings, it may be concluded that the coronavirus pandemic harmed the mental health of community-dwelling older adults aged 60–80 years.*

**Keywords:** Covid-19 outbreak, lockdown, quarantine, community-dwelling older adults, mental health, anxiety.

The ongoing pandemic of covid-19 also known as the coronavirus pandemic, the severe acute respiratory syndrome 2 (SARA-CoV-2) viruses are the causative virus of the coronavirus pandemic which is spreading in the world at an accelerated rate

(Mon-Lopez D., *et al.*, 2020). In January 2020, WHO (2005) declared the covid-19 as a 'public health emergency of international concern. According to the previous study, health emergencies like pandemics can lead to harmful and long-lasting psychological consequences because of disease-related fear and anxiety, overloaded information on social media, and social isolation (Joseph J., *et al.*, 2020).

In most countries, the government applied several anticipation measures to reduce the transmission of coronavirus spread (Ibid.). The Researcher put forward that restrictive measures such as quarantine, isolation, and social distancing have a negative psychological impact such as maladaptive behaviour, emotional distress, and defensive responses (anxiety, fear, frustration, loneliness, anger, depression, stress) on people's well being (Taylor S., 2019). Anxiety and panic lead to stress which can affect the pattern of eating, can aggravate health problems in the chronic phase, and increase the symptoms of mental health and psychological distress. Social isolation and unpredictability of disease can lead to sleeping and concentration difficulty (Sahoo, and Biswal, 2020).

In India, a Covid-19 infection has spread to a larger number of the younger individuals but the mortality rate and risk of transmission are higher in older individuals more than 60 years and individuals having at least 1 comorbidity like diabetes, cancer, cardiovascular disease and in smokers (Roy A., *et al.*, 2020; Mohile S., *et al.*, 2020). Among the elderly reduced immunity makes them more vulnerable to covid-19 disease (Roy A., *et al.*, 2020).

"Headline stress disorder" is a peculiar syndrome identified by high emotional response, as stress and anxiety, to unending reports from news media which are harmful for physical and mental function of some people. The instant-messaging technology and mobile phones spread news faster and magnify the anxiety and panic of the public. Social media blog or news about the death of an older individual, rumours and misinformation about coronavirus have contributed to the increased level of anxiety and fear of being at risk of death (Dong, and Zheng 2020; Kumar, and Nayar, 2020). The negative valuation of older adults (e.g. media messages that older adult's lives are less valuable such as #BoomerRemover) can damage their pride and

cognitive functioning, aggravate their day to day stress, and place them at greater risk of poor health outcomes (Monahan C., *et al.*, 2020).

Similar impacts of mental health due to covid-19 are also seen in Japan, Singapore, and Iran. There is also an increased rate of covid-19 related cases in Maharashtra, Uttar Pradesh, Assam, and Kerala. Mainly, for children, geriatric, and quarantined individuals sudden and drastic changes in daily routine can be difficult to handle as well as confusing (Roy A., *et al.*, 2020).

To reduce the risk of transmission among the most vulnerable, older adults are instructed to isolate themselves from others by public health officials with no specific end date of relaxation from this measure (Gorenko, J. A., *et al.*, 2020). Available information suggests that in this lockdown period, due to social isolation older people are at greater risk of deterioration in mental health and developing depression and anxiety (Sahoo, and Biswal, 2020; Joseph J., *et al.*, 2020). As older adults are confined to their homes only, they miss their walks and talking to other people therefore they are psychologically vulnerable. In some older adults struggle with a new level of loneliness and helplessness can elevate their pre-existing conditions like anxiety, depression, and OCD (obsessive-compulsive disorder), while in some older people who are already facing cognitive decline, dementia, loneliness and social isolation in that mental health impact can be particularly difficult (Sahoo, and Biswal, 2020; Roy, A., *et al.*, 2020). Compared with younger adults older adults are at higher risk of being socially isolated even under normal circumstances (Gorenko, J. A., *et al.*, 2020). Those elderly who have social contact out of homes like day-care venues, community centres, and places of worship will be disproportionately affected by self-isolation (Armitage, R., and Nellums, L. B., 2020). Maintaining physical distance even from their grandchildren can worsen their psychological condition (Sahoo, H., and Biswal, R.K., 2020). Besides lonely and isolated older adults, some other older adults are at additional risk – those who do not have close family and friends, and those who rely on others for support and care (Armitage, and Nellums, 2020).

The Mental health of older persons and geriatrics is going to be a big challenge because of the social outcome of the disease. Therefore for the prevention of mental health problems and early intervention

plan of action, there should be a periodic assessment of the magnitude of mental health outcomes that should be done urgently (Joseph J., *et al.*, 2020).

The study aimed to evaluate the prevalence of anxiety in community-dwelling older adults during a covid-19 pandemic.

### **Materials and Method**

In this cross-sectional study of community-dwelling 200 older adults, of both genders of age varying from 60 years and above, from rural and urban areas of Maharashtra, were selected by using the snowball sampling method.

From the available samples, only those participants were selected who were familiar with the operations of smartphones and were able to read. Participants who were diagnosed with mental health problems (dementia, Alzheimer's, etc.), participants with severe physical deterioration due to neurological disorders like stroke, Parkinson's, etc. and participants with severe cognitive impairment were not included in the study.

The willing participants were briefed about the nature and aim of the study in a language best understood by the participants on a phone call or a video call and their informed consent was taken before the study. Also, the confidentiality of information was explained and assured.

For this study, the coronavirus anxiety scale (CAS) was used which was developed by Lee S. A., (2020). The Coronavirus Anxiety Scale is a 5 question mental health scale designed to efficiently and effectively aid healthcare workers and researchers to identify people with dysfunctional anxiety associated with the covid-19 pandemic. The CAS scale is used in clinical assessment and for research of the level of anxiety in an individual due to social isolation during the covid-19 pandemic. The question in this scale (Table 1) is measured on a numeric rating scale from 0 (not at all) to 4 (nearly every day over the last 2 weeks). The optimized cut score of CAS is =9, which has been able to distinguish between persons with and without dysfunctional anxiety accurately (90% sensitivity and 85% specificity).

**Table 1**  
*Coronavirus Anxiety Scale.*

How often have you experienced the following activities over the last 2 weeks?	Not at all	Rare less than a day or two	Several days	More than 7 days	Nearly every day over the last 2 weeks
I felt dizzy, lightheaded, or faint when I read or listened to news about the coronavirus.	0	1	2	3	4
I had trouble falling or staying asleep because I was thinking about the coronavirus.	0	1	2	3	4
I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.	0	1	2	3	4
I lost interest in eating when I thought about or was exposed to information about the coronavirus.	0	1	2	3	4
I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus.	0	1	2	3	4
Column totals=	+	+	+	+	+
Total score=					

(Lee S. A., 2020).

Then the Google form of the scale was created and was open for the participants to reduce the risk of transmission.

The data of Google form was collected in tabular format in Google sheet and was statistically analysed. The mean and standard deviation method of statistical analysis was used to obtain the result.

The present study received approval from the ethics committee of Dr APJ Abdul Kalam College of Physiotherapy, Pravara institute of medical sciences, Loni (registration no-BPT/INT/2020/30).

The study was done between December 2020 to April 2021.

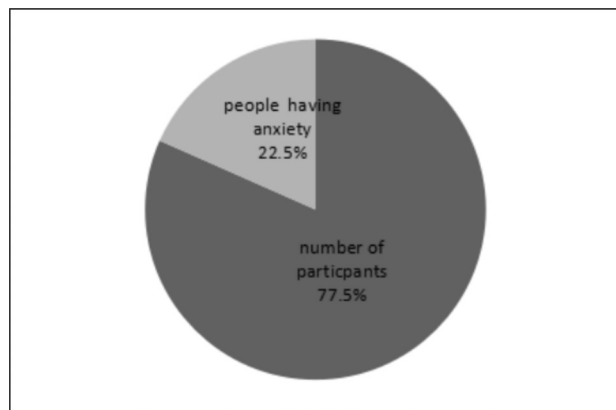
## Result

The mean age of participants was 68.97 among them 50 per cent were males and 50 per cent were females. The overall prevalence of anxiety in community-dwelling older adults (60–80 years) was 22.5 per



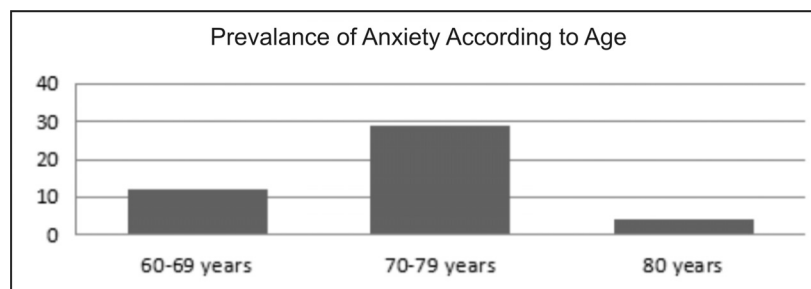
cent on the coronavirus anxiety scale (CAS). The mean score of the coronavirus anxiety scale was 4.665 and the standard deviation was 4.075021966.

**Graph 1**  
*Prevalence of Anxiety*



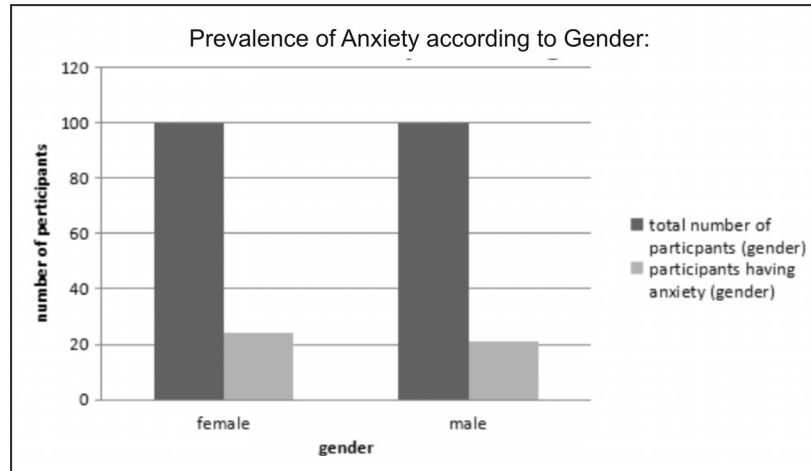
According to the CAS scale, 29 people aged 70–79 years showed higher scores for the coronavirus anxiety scale. Stating that, 70–79 age groups were more affected by anxiety.

**Graph 2**  
*Prevalence of Anxiety according to Age Group*



According to the CAS scale, 21 males and 24 females showed a higher score for coronavirus-related anxiety. According to the CAS scale, the study suggests that females are at higher risk for coronavirus-related anxiety than males.

**Graph 3**  
*Prevalence of Anxiety according to Gender*



However, there was a negative impact on the mental health of community-dwelling older adults during the covid-19 pandemic.

### Discussion

The present study investigated the mental health concerns among older adults associated with the covid-19 pandemic. In this study, we used the coronavirus anxiety scale for the evaluation of generalized anxiety associated with the covid-19 outbreak. The results of the present study showed an overall prevalence of 22.5 per cent of anxiety in participants as per the coronavirus anxiety scale (CAS). Similar studies done on the impact on mental health during the covid-19 pandemic suggested that the prevalence of stress, anxiety, and depression in the general population were 29.6 per cent, 31.9 per cent, and 33.7 per cent respectively (Salari N., *et al.*, 2020). Similarly, another research on the association of social isolation with anxiety and depression during the early covid-19 pandemic reported that most of the people did not report a change in a component like anxiety and depression using the HADS scale, but people who were affected showed worsened symptoms (Robb C. E., *et al.*, 2020). In another recent study, one in china reported 16.5 per cent moderate to severe depressive symptoms, 28.8 per cent moderate to severe anxiety

symptoms, and 8.1 per cent moderate to severe stress symptoms were seen due to covid-19 (Roy A., *et al.*, 2020). A similar study conducted in china on covid-19 psychological impact reported an overall prevalence of 20.1 per cent and 35.1 per cent of depressive and anxiety symptoms using the Centre for Epidemiology Scale (CES) for depression and GAD-7 for anxiety (Joseph J., *et al.*, 2020).

In the present study, the result showed that older people aged 70-79 years showed a higher rate of coronavirus-related anxiety on CAS. A similar study conducted in the middle-aged and elderly population during the covid-19 pandemic suggests that the prevalence of anxiety and depression were 19.7 per cent and 21.5 per cent using GAD-7 and PHQ-9 respectively (Ibid.). A study suggests that a predisposing factor for physical and mental health illness is advancing age itself. Also, the presence of co-morbid conditions in older adults makes them more prone to infection. Even under normal life older adults are prone to social isolation because they only interact with their family and close friends. But, during this pandemic, the interaction was disturbed hence the mental health problems were elevated. Also, the anticipation measures to reduce transmission of virus worsen the mood of an older individual and there is a development of fear and anxiety about the coronavirus in them. Before the covid-19 pandemic, some older individuals have a routine of going out of the home to buy grocery products, medicine, or for a morning walk but, during this pandemic, these older adults were restricted to come out of the home to avoid the spread of transmission which affected their mental health and also started deterioration of their mental health (Philip J., Cherian V., 2020).

In the present study, females showed a higher rate of coronavirus-related anxiety on CAS than males. Similar research stated that women, younger age, living alone, poverty, and loneliness were risk factors for developing anxiety and depression (Robb C.E., *et al.*, 2020). Another research showed that compared to men women are more vulnerable to stress and post-traumatic stress disorder which may lead to anxiety (Salari N., *et al.*, 2020). Also, a study done by Robb *et al.*, 2020 showed women compared to men were more likely to report worsened anxiety and depression components. Some factors that can worsen their anxiety and depression symptoms are like living alone, single, widowed, divorced, remote contact with family and friends with help of technology, etc. (Robb C. E., *et al.*, 2020).

During this lockdown, there was an increase in screen time in older adults as they were not allowed to come out of the home. To know about the virus and the current pandemic situation they started to watch news reports on TV. Near constant information about the coronavirus and pandemic became the source of anxiety and stress in older adults. The highlight on most of the media news was about the increasing rate of covid-19 patients, increasing rate of mortality, and risk of transmission of the virus in vulnerable and older adults which again triggered the episodes of anxiety and depression. This anxiety and depression affected the sleep of older adults. There was an increased rate of disturbed sleep, reduced sleep, insomnia, and loss of interest in eating (Philip J., Cherian V., 2020).

To build and maintain a social support network and a sense of belonging online technologies can be used. During the social isolation period health care workers, voluntary organizations, and community outreach projects to provide peer support have an important role to provide support to older adults (Armitage R. and Nellums L. B., 2020; Mukhtar S., 2020; Girdhar R., *et al.*, 2020). Mental well being, perceived loneliness, and social affiliation can be enhanced by online delivered therapies like cognitive, behavioural, social, and positive therapies (Mukhtar S., 2020). During covid-19 pandemic to reduce loneliness and improve the mental and physical health of older adults some interventions can be applied such as interaction with family and friends, helping them with essential products, engaging in activity, practicing yoga and meditation, and avoiding exposure to stressful information from media (Armitage R., Nellums L. B., 2020; Girdhar R., *et al.*, 2020; Kar N., 2020).

## Conclusion

The result concluded that 22 per cent of older individuals aged 60–80 showed a higher score for coronavirus-related anxiety during the covid-19 pandemic. According to the result, among these older adults aged 70–79 were more affected and gender-wise comparison showed that females were more affected than males for coronavirus-related anxiety. Hence, from the present study, it can be concluded that the covid-19 pandemic showed a negative impact on the mental health of community-dwelling older adults aged between 60–80 years using the coronavirus anxiety scale (CAS).

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