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Contents

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Age-Associated Variations in the Hematologic Values of *HDLC* and *LDLC* in Relation To Waist Circumference

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ABSTRACT

In view of probable risk of age-induced pathophysiologic pertur-bations in association with disproportionate increase in adiposity, hematologic values of High Density Lipoprotein Cholesterol (HDLC) and Low Density Lipoprotein Cholesterol (LDLC) were estimated among randomly sampled Waist Circumference (WC) linked obesity groups of older adults from Darbhanga and its suburbs between 50 to 86 years (n=130) with successive increase in age with a view to assess inter-relationship amongst the chosen parameters. Observed variations in HDLC and LDLC concentra-tions as a function of advancing age and central obesity could be attributed to variable dietary patterns, inadequate physical activity and cardio-protective ageing medication for curbing common obesity-associated dysfunctions viz. hypertension, hyper-cholesterolemia and dyslipidaemia. Relatively more pronounced variations in the terminal age interval of both the sexes invariably with obese conditions might be thought suggestive of possible age-obesity nexus in late age.

Key words: Hematologic, Obese, WC, HDLC, LDLC, Hypercholesterolemia, Dyslipidaemia.

Ageing in association with the diseases of old age raises co-morbidities and mortality manifold. Late age coupled with disproportionate rise in adiposity is believed to arise a number of physiological discrepancies and metabolic disturbances. It has been observed that obesity is associated with different types of co-morbid conditions viz; dyslipidaemia, hypertension, hyperglycaemia, hypercholesterolemia (Goff *et al.,* 2006 and Smith 2007). There is a wide variation in the prevalence of obesity in India. It varies according to the age, gender, habitat, socio-economic status and lifestyle practices (Misra *et al.,* 2004). High prevalence of abdominal obesity in South Asians based on studies on different study groups has been observed (Misra and Shrivastava, 2013). Abdominal obesity is essentially an important risk factor for Type 2 Diabetes Mellitus, Metabolic Syndrome and Cardiovascular Diseases in South Asians (Misra and Khurana, 2008 and Misra *et al.,* 2011). It has been shown that South Asians develop obesity related co-morbidities at lower levels of BMI and waist circumference as compared to other ethnic groups (Deurenberg-Yap, *et al.,* 2001; Vikram, *et al.,* 2003). Health Ministry of India has reduced the cut-offs for BMI and WC with a view to achieve optimal health and to prevent obesity and metabolic syndrome. Waist circumference indicative of Abdominal Obesity in Indian population has been taken into consideration as = 90 and = 80 cm for men and women respectively in contrast to respective global mark of 102 and 88 cm (WHO, 2000 and Patil, *et al.,* 2012).

The present study was primarily aimed at assessing age-associated variations in the haematologic values of HDLC and LDLC in relation to WC-linked obesity with successive increase in age.

Materials and Methods

Haematologic values of HDLC and LDLC of randomly sampled older adults (n = 130) residing in Darbhanga, a commissionary town of Bihar (India) and its suburbs were estimated in relation to WC using semi-automated analyser and Friedewald's formula. The study group comprised of 78 men and 52 women in 52–86 years age range were classified into 50–59, 60–69, 70–79 and 80+ years age intervals; further

subdivided into Obese and Non-Obese groups according to= 90cm and = 80cm cut off values of WC for men and women respectively indicative of Abdominal Obesity in Indian population as suggested by Patil *et al.,* (2012). Standardized values of HDLC (normal >43mg/dl, pathologic<43mg/dl) and LDLC (normal < 101mg/dl, pathologic > 101mg/dl) as suggested by Das and Mishra (2005) were followed.

Statistical significance of the recorded data was done using ANOVA and Pearson's correlation at 5 per cent probability level.

Results and Discussion

Table 1 shows mean values of WC, Age, HDLC and LDLC in chosen age and obesity groups of both the sexes. Table 2 presents ANOVA in respect of observed values of HDLC and LDLC in relation to WC and Age.

Table 1

Mean WC, Mean Age, Mean HDLC and Mean LDLC in Chosen Obesity Groups of Older Adults

S. No.	Age Range	Obesity Group (% population)	Mean WC±SD	Mean Age±SD	Mean HDLC±SD (mg/dl)	Mean LDLC±SD (mg/dl)
1.	50–59	N-Ob M (13.84)	79.8689±5.09	53.7222±3.01	45.8889±7.85	86.5667±29.29
		N-Ob W (4.61)	74.93±2.83	52.5±2.56	47.6666±3.94	69.3±18.09
		Ob M (10.76)	98.3343±8.87	54.5714±2.74	45±7.94	89.2857±18.03
		Ob W (15.38)	93.8575±5.53	52.65±2.57	46.44±7.81	88.705±24.76
2.	60–69	N-Ob M (10.76)	81.6428±5.15	62.5714±2.87	46.9286±9.91	78.8±16.04
		N-Ob W (3.84)	74.168±2.48	64.4±1.20	45.16±6.61	77.42±18.93
		Ob M (7.69)	99.306±9.17	63.4±2.69	38.1±3.47	86.17±14.07
		Ob W (7.69)	91.184±8.14	62.4±2.28	48.69±6.41	107.07±30.52
3.	70–79	N-Ob M (7.69)	78.586±6.36	72.9±2.50	40.37±4.84	76.3±20.40
		N-Ob W (1.53)	73.66±2.54	70±0.00	39±2.00	65±1.00
		Ob M (2.30)	98.22±6.34	72±2.16	47.6666±9.84	110.4666±9.82
		Ob W (6.92)	88.3377±7.92	70.5555±1.57	46.3333±5.16	88.1333±12.95
4.	80+	N-Ob M (6.92)	78.1755±5.048	83.2222±2.29	43.2222±8.71	83.3777±22.83

N.B.: N-Ob=Non Obese, Ob=Obese, M=Men, W=Women.

Table 2

F Value and Significance Level in Chosen Obesity Groups of Older Adults

Age Range	Group Type	WC & HDLC	WC & LDLC	Age & HDLC	Age & LDLC
50–59	N-Ob M	223.73914**	0.8623562	14.722177**	21.14058**
	N-Ob W	157.34285**	0.4721562	5.2760353*	4.2228737
	Ob M	**260.63882****	2.6356	**16.851574****	**47.094063****
	Ob W	**466.359****	0.78348196	**10.831668****	**39.846767****
60–69	N-Ob M	125.52373**	0.3698884	29.882242**	12.886285**
	N-Ob W	67.34954**	0.115966104	32.74285**	1.8834261
	Ob M	**350.25058****	5.4997373*	**298.02432****	22.71302**
	Ob W	151.17879**	2.2757483	**36.42331****	**19.166473****
70–79	N-Ob M	205.57098**	0.10297232	320.21304**	0.24622054
	N-Ob W	114.940834**	10.064362	240.25**	25*
	Ob M	**37.26912****	2.1922994	11.660831*	29.232506**
	Ob W	**157.6883****	0.00144950	**161.09831****	**14.5137615****
80+	N-Ob M	**96.35288****	0.3956993	**157.5684****	0.0004

* Significant at 0.05 and **Significant at 0.01 level of P

Highly significant and positive correlation between WC and LDLC for obese women in 50–59 years age interval (r=0.589160014) and Non-obese men in 80+age bracket (r=0.799752034) at 0.01 per cent level of P might be attributed to remenopausal surge in cardiac risk and obesity independent perturbations in terminal age group respectively. Variable dietary patterns, inadequate physical activity and cardio-protective ageing medication taken in prescribed doses for curbing common obesity-associated dysfunctions viz. hypertension, hypercholesterolemia and dyslipidaemia could be thought to be responsible for observed variations in HDLC and LDLC concentrations as a function of advancing age and central obesity.

This paper summarily suggests possible age-obesity nexus in late age in consideration of relatively more pronounced variations invariably in obese groups of the terminal age segment in both the sexes and recommends calorie restriction and moderate to high physical activity with successive increase in age for reducing risk of obesity-induced cardiovascular disabilities.

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Occurrence of Growth Marks in the Phalanges of the Indian Black Rat, *Rattus Rattus* (Lannaeus, 1758)

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ABSTRACT

Generally vertebrate age was determined by growth layers found in the cementum in the dentine. Age was determined for the first time by enumerating the number of growth marks present in the cross sections of phalanges of the Indian black rat (Rattusrattus) inhabiting southern India. Mid-diaphyseal sections of phalanges exhibited growth rings, each ring consisting of a broader growth zone and a chromophilic line of arrested growth (LAG). One to five growth marks were observed in specimens with different body sizes. There is a strong positive correlation between body size and LAGs, indicating that larger individuals have experienced greater number of growth cycles and hence may be older.

Key words: Rat, age, Skeletochronology, Tropics

Age composition study is one of the life history parameters needed to assess the dynamics of wild mammalian species populations (Klevezal, 1996). Different criteria have been practiced to estimate physiological age in some mammalian species such as, eye lens weight, degree of closure of cranial sutures; tooth wear and the number of corpora albicantia (Scheffer and Myrick, 1980). Majority of marine mammals' age has been determined on the basis of presence of growth

zones in the whole teeth or sections (Van Beneden and Gervais, 1880). Further, age of a few terrestrial and aquatic temperate mammals like, rodents, lagomorpha, carnivores, marsupials, edentata, chiroptera and primates has been estimated by counting the lines of arrested growths (LAGs) in the jaw bones and the diaphysis of long bones (Klevezal and Fedyk, 1978; Puzachenko, 1991; Garlich-Miller, 1993; Burke and Castanet, 1995; Castanet *et al.*, 2004) and the results compared with those obtained from tooth cementum (Petersen and Born, 1982; Quere and Pascal, 1983). Moreover, age determination of rodents by measuring the weight of their eye lenses is a widely used method in wildlife biology (Burlet *et al.*, 2010). On the other hand, counting of growth marks present in the cross sections of long bones (skeletochronology) has proved that it is an accurate and reliable age determination technique in both temperate and tropical her pet faunal species (Smirina, 1994; Castanet *et al.*, 1993). Skeletochronological technique studies are totally lacking in mammalian species in comparison to amphibians and reptilian species (Smirina, 1994; Esteban *et al.*, 1996; Castanet, 2002; Kumbar and Pancharatna, 2001a; Kumbar, 2010; Kumbar and Lad, 2017). Presently, there is no age estimation study on tropical mammals by using skeletochronological technique. Hence, the present study is attempted to detect the occurrence of growth marks in the phalangeal bones of the Indian black rat, *Rattus rattus* inhabiting southern India by skeletocronology.

Materials and Methods

Specimens of black rat, *Rattu srattus* (SVL = 5.5–30.2 cm; N = 21) were collected from the houses of Palus (16' 75º N and 73' 70º E), Maharashtra, India between June 2013 – June 2016. Subsequently, the animals were transported to the laboratory where their body mass (g) and body size (cm) were recorded. The animals were anaesthetized using light diethyl ether. The fourth (longest) toe was clipped from the right hind limb and fixed in 10 per cent formal in. The wound was washed, cleaned with dettol and nebasulph was applied. The rats were kept under observation until their recovery and then allowed to release. Digits were washed in water for 1–2 h and demineralized in 5 per cent nitric acid. They were washed overnight in water to remove traces of formal in and nitric acid and then preserved in 70 per cent alcohol before processing for paraffin embedding. The transverse sections (10 Fm thick) of the distal phalanx were cut on a rotary

microtome (Model GE–70) and stained with Harris haematoxylin. The sections were observed under a compound microscope (Olympus CX–41) for the presence of growth rings, which were enumerated when present.

Results

The hematoxyl in stained sections of the phalanges showed central bone marrow cavity surrounded by an inner narrow end steal layer and outer relatively broad periosteal bone layer (Fig. 1A-D). In the periosteal layer a series of thin darkly stained chromophilic lines separated by wider light purple rings with sparsely distributed osteocytes were seen; the former were interpreted as lines of arrested growth (LAGs) and the latter as growth rings in the phalanges of *R. rattus*. One to four LAGs were equally distributed in the periosteal layer (Fig. 1B-D). Correlation coefficient analysis showed a positive correlation between body mass and body size (r = 0.87) as well as body size and the number of LAGs (r = 0.70).

Explanations to Figure

PLATE 1
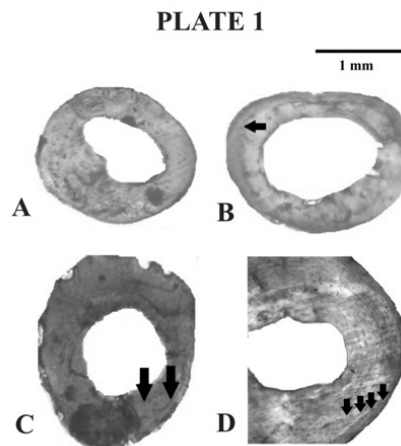
Fig. 1A - D: Mid-diaphyseal cross sections of right phalanges of *Rattusrattus* (Hematoxylin). *A*, Showing the absence of LAG in the rat with SVL 7.5 cm; *B*, one LAG in the phalange of rat with SVL 14 cm; *C*, two LAGs in the phalanges of rat with SVL 28.2 cm; *D*, four LAGs (arrows) in the rat with SVL 30.2 cm; Scale line = 100 Fm.

Abbreviations: MC = Marrow Cavity; PL = Periosteal Layer; Arrows = Lines of Arrested Growth (LAGs).

Discussion

Studies on age, longevity and reproduction of the wild mammals are most essential for knowing the population dynamics and their proper management in the field. Among the various techniques, the use of lines of arrested growth (LAGs), periodically laid down in teeth and skeletal tissues (long tubular bones) is one of the best ways to obtain the age of individuals. Experimental evidence indicates that the formation of growth marks in the teeth and skeletal tissues in the different regions is controlled by different physiological factors such as nutrition, breeding activity, intrinsic rhythms and photoperiod (Castanet *et al*., 2004; Klevezal and Kleinenberg, 1969). In many tropical and temperate amphibians and reptiles, cyclical pattern of bone growth has been well established (Smirina, 1994; Pancharatna, 2002; Kumbar and Pancharatna, 2001b). Although, formation of bone growth marks in temperate species is a result of annual temperature fluctuations (Castanet and Smirina, 1990; Esteban *et al*., 1996; Smirina, 1994), in tropics LAGs are laid down during rainy months that coincide with the breeding activity (Castanet and Smirina, 1990; Kumbar and Pancharatna, 2001a; Kumbar and Pancharatna, 2001b; Kumbar and Pancharatna, 2004). However, both male and female of this species are strictly seasonal breeders and show breeding activity for a greater part of the year from March to October with peaks during June to September (Chauhan and Saxena, 1985a & b). The results of the present study demonstrate that growth marks comparable to those found in amphibians and reptiles, are also detectable in the phalanges of Indian black rat, *R. rattus*. Although, environmental factors are believed to favour continuous growth, many rodents inhabiting the Indian peninsula exhibit marked seasonality in the gametogenetic, reproductive and breeding activity (Chauhan and Saxena, 1985a; Chauhan and Saxena 1985b; Vadell *et al*., 2010), suggesting that the bone growth is a cyclical phenomenon leading to the formation of LAGs even in tropical species. Further, the positive correlation between body sizevs LAGs in *R. rattus* indicate that larger individuals have experienced greater number of growth cycles and hence, may be older. Further, detailed study is essential to confirm whether the growth marks are formed annually or not and hence can

be used as 'year rings' for estimating age and longevity in tropical mammalian species.

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Gender and Income Differences in Economic Dependency among Urban Aged Persons in Assam

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ABSTRACT

The paper seeks to associate the different levels of economic dependencies with gender and income levels, to learn whether there exist any differences in terms of gender and income levels among those urban elderly persons who contribute to household expenses and also to know about the economic support providers of the urban elderly population of the study area. Data collected randomly from 657 elderly male (N=362) and female (295) persons of six district headquarters of Assam have been used for this purpose. Secondary data have been gleaned from various reports and other published and unpublished sources. Both descriptive and inferential bivariate analyses were carried out for gender and income comparisons. The association between the different income levels and levels of economic dependencies was confirmed from this study. At lesser income levels, the number of fully dependent elderly respondents is more. However, lesser number of economically independent elderly respondents was also found as the income level increases. This is true for both the genders. Differential management with

respect to gender and income levels of the elderly has to be adopted
mainly at the initiative of the government.

Key words: Aged, Elderly Population, Economic Dependency,
Reverse Dependency.

The world population is rapidly ageing and this rate is faster for
the developing countries like India. As people grow older, their
capacity to work diminishes, thereby making most of them dependent
on others. With the changes in the socio-economic situation, majority
of the elderly population falls into a trap of varying levels of social,
physical and economic dependencies, some of them even being thrown
to the depths of chronic poverty.

Old age dependency ratio is the ratio of the population in the age
group 60 years and above to that between 15 to 59 years (working
population). The ratio basically indicates the pressure on the working
population because of the elderly population. Thus, essentially the old
age dependency ratio is a demographic measure of the extent of
population ageing. This ratio has been increasing over time as per the
Census and National Sample Survey (NSS) estimates.

There has been a rising old age dependency on children (both
rural and urban areas) and decreased dependency on spouses over the
years. The elderly females, particularly in rural areas are the worst
sufferers. More than 80 per cent women in both rural and urban areas
are partially dependent. The female aged dependency is higher and the
gap between male and female aged dependency is rising over the years.
The rural aged dependency ratio is also greater than the urban one.
The old age dependency burden has been increasing in the period
1994–2011. Kerala has the highest aged dependency both for urban and
rural, male and female. In case of Assam, which has about 6.5 per cent
elderly population (2011, Census), over 81 per cent aged women in
rural areas are fully dependent on others. This is the picture when
compared to all India level, the rural aged dependency is the lowest in
case of Assam. Overall, the aged dependency ratio varied from 84 in
Delhi to more than 150 in Himachal Pradesh and Punjab and 165 in
Kerala. Assam's aged dependency ratio is equal (100) for both urban
and rural areas. In India reverse dependency is higher in rural areas. A
very high proportion of elderly people have one or more dependents.

Assam has the highest rural male dependency (CSO, 2011 and Prasad, 2011).

In the backdrop of the findings of authors like Bose (2000) who have marked one of the issues in the Indian ageing population scenario to be that of pauperisation of the elderly, the CSO (2011) comparative analysis of the estimates of NSS Round (1995–96) and NSS Round (2000) gave a ray of hope that the economic condition of the elderly across the different sub-groups, mainly the urban female elderly had improved. However, the same increased to 119 in the NSS 60th Round (January-June 2004) Report. The figure in the 2011 Census stood at 133. The old age dependency ratios calculated for Assam reveals that the ratio has increased from 5.56 in 1971 to 6.27 in 2001 and to 10.05 in 2011 (Neog, 2017). Hence this paper attempts to find out the gender and income differentials in connection with the economic dependency of the aged persons of the study area.

Objectives of the Study

The objectives of this study were:

1. to associate the different levels of economic dependencies with gender and income levels of the elderly sample respondents;

2. to learn whether there exists any differences in terms of gender and income levels among the elderly sample respondents who contribute to household expenses;

3. to know about the economic support providers of the elderly sample respondents.

Hypotheses

The following hypotheses were formulated:

i.   **H–1:** Significant difference exists between the male and female urban elderly persons with respect to economic dependency levels.

   H?: There is no significant difference between the male and female urban elderly persons with respect to economic dependency levels.

ii.   **H–2:** There is significant association between income levels and economic dependency.

H?: Income levels and economic dependency are not associated.

Methodology

As a part of an ongoing research, data was randomly collected with the help of an interview schedule from 657 male (N=362) and female (N=295) persons aged 60 years and above, residing in the following six district headquarters of Upper Assam: Dibrugarh, Golaghat, Jorhat, North Lakhimpur, Sivasagar and Tinsukia. Secondary sources viz. available literature and reports were referred to in order to understand the chalked out specific situation among the elderly population of India with special reference to Assam. Both descriptive and inferential bivariate analyses were carried out for gender and income comparisons.

Results and Discussion

The results obtained are presented inferentially and descriptively with the help of Pearson's Chi square tests and percentages respectively.

Economic Dependency of the Elderly Persons

The demographic measure of the extent of ageing of population, i.e. old age dependency ratio no doubt indicates the pressure on the working population because of the elderly population. However, the ratio conceals the fact that not all elderly persons are dependent. They are faced with varying levels of dependencies ranging from Fully Dependent to Partially Dependent to being Fully Independent. Moreover, a section of the elderly also supports their children economically, i.e. the case of Reverse Dependents. Thus, for the purpose of the present study, the different levels of economic dependencies were framed as: *Independent, Partially Dependent, Fully Dependent and Reverse Dependent.* The elderly persons under different levels of dependencies were divided on the basis of their gender (Table 1a).

In case of gender and economic dependency, as observed from Table 1 (a), out of the total independent elderly persons, more than three-fourths were males. However, more females, i.e. 71.83 per cent were fully dependent than males. In case of partial dependence, the

male-female ratio is 46:54. Thus, the female elderly respondents were found to be more economically dependent.

The household monthly income of the elderly respondents was grouped into seven broad groups for ease of analysis. Thus, Table 1 (b) is a two-way table distributing the elderly according to their monthly income groups and levels of economic dependencies

Table 1 (a)

Association between Gender and Economic Dependency

Gender	Types of Economic Dependencies (Number of Respondents)					
	Independent	*Partially Dependent*	*Fully Dependent*	*Total*	*Chi-square value*	*P value*
Male	181 (77.02)	161 (45.87)	20 (28.17)	362 (55.10)	78.55, df = 2	< 2.2e−16
Female	54 (22.98)	190 (54.13)	51 (71.83)	295 (44.90)		
Total	235 (100.00)	351 (100.00)	71 (100.00)	657 (100.00)		

Figures within parentheses indicate column percentages.

It can be observed from Table 1 (b) that household income level definitely has an impact on being economically "Independent" as well as "Fully Dependent". Lesser the income levels, more is the number of "Fully Dependent", which is well expected. However, lesser number of "Independent" elderly as the income level increases is quite intriguing. This is true for both the genders.

Since the p-values are very small in comparison to the chi-square values in both the cases, the association between the levels of economic dependence and income levels as well as between levels of economic dependence and gender is statistically significant. Hence there is enough evidence to reject both the first and second null hypotheses of the study. Economic dependency is found to be more in the extreme income levels. The middle income group are more independent compared to the lower and higher income groups. To compute χ^2, the income levels Rs 50,000 and above were clubbed together as some cell counts in the Fully Dependent category were less than 5.

It is to be noted that not all persons who were economically independent were financial providers and also, it is not that all those who were partially dependent did not act as financial supporters.

In Table 1 (c), the income and gender-wise distribution of the reverse dependents are shown.

Table 1 (b)

Association between Income Levels and Economic Dependency

Income Levels (In Rs)	Types of Economic Dependencies (Number of Respondents)					
	Independent	Partially Dependent	Fully Dependent	Total	Chi-square value	P value
< 10,000	35	56	28	119	43.025, df = 6	0.00
10,000–29,000	63	83	27	173		
30,000–49,000	51	65	8	124		
50,000–69,000	37	62	3	102		
70,000–89,000	26 / 86	51 / 147	3 / 8	80 / 241		
90,000+	23	34	2	59		
Total	235	351	71	657		

Table 1 (c)

Income and Gender-wise Distribution of Reverse Dependency

Gender	Household Monthly Income (in Rs)						
	< 10,000	10,000–29,000	30,000–49,000	50,000–69,000	70,000–89,000	90,000+	Total
Male	3 (9.68)	14 (45.16)	6 (19.36)	4 (12.90)	2 (6.45)	2 (6.45)	31 (100.00)
Female	1 (14.29)	3 (42.86)	1 (14.29)	1 (14.29)	1 14.29)	0 (0.00)	7 (100.02)
Total	4 (10.53)	17 (44.74)	7 (18.42)	5 (13.16)	3 (7.89)	2 (5.26)	38 (100.00)

Figures within parentheses indicate row percentages.

An interesting aspect of economic dependency is reverse dependency (Table 1c). Reverse dependency is the situation in which the children of the elderly are financially dependent on the elderly parent. Overall reverse dependency for the total sample population is 5.8 per cent, for males being 8.6 per cent, 2.4 per cent for females, reflecting the fact that more children are dependent on their elderly fathers. Since more males than females are economic support providers in all the income level households, so, a better indicative basis of

percentage calculation is to do it row-wise. Thus, in case of males, the highest percentage of reverse dependents, i.e. 45.16 per cent is found in the Rs 10,000–29,000 income category and the lowest, i.e. 6.45 per cent in the Rs 79,000–80,000 and Rs 90,000+. For females, the highest reverse dependents also belong to the Rs 10,000–29,000 income category and the lowest (nil) to the Rs 90,000+ category. Thus, reverse dependency predominates in the lower income groups. In case of the higher income groups, the intergenerational flow of wealth is from the children to the parents.

Contribution to Household Expenses

Like various other population groups who are subjected to stereo-typing based on gender, socio-cultural norms and values, elderly persons also get a blanket statement of being the "unproductive" group. In reality many of them continue to contribute to household expenses well beyond the age of 60 years. Contribution to household expenses indirectly throws light on the status of economic dependency of the elderly person. Contribution to household income may be done by elderly persons who do not necessarily have to be in a reverse dependency situation. Hence knowing about the economic contri-butors to household expenses, apart from knowing about the reverse dependency situation is necessary. Table 2 shows the distribution of elderly respondents according to their contribution to household expenses.

Table 2
Gender-wise Distribution of Contribution

Contributes	Male	Female	Total
Yes	285(78.7)	115(39.0)	400 (60.9)
No	77 (21.3)	180(61.4)	258 (39.3)
Total	362(100.0)	295(100.0)	657(100.0)

Figures within parentheses indicate column percentages.

Table 2 reveals that out of the total sample males, maximum, i.e. 78.7 per cent contributes to household expenses even at present, whereas only 39 per cent females do the same. The ages of the elderly respondents have been grouped into three broad groups to understand

if there is any effect of age groups on the contribution to household expenses. They are then further categorised on the basis of their gender. This is done in Table 2 (a), which is a two-way table distributing the elderly according to their age groups and gender.

Table 2 (a)
Association between Age and Gender for Contributing Elderly

Age Group (in years)	Male	Female	Total	Chi-squared value	P value
60–69	181 (63.5)	67 (58.3)	248 (62.0)	1.0056	0.6048
70–79	69 (24.2)	31 (27.0)	100 (25.0)		
80+	35 (12.3)	17 (14.8)	52 (13.0)		
Total	285 (100.0)	115 (100.0)	400 (100.0)		

Table 2(a) show the gender-wise and age-wise distribution of the total respondents with respect to contribution to household expenses. It was found that majority, i.e. 60.88 per cent (400 out of 657) contribute to household expenses.

Among the six urban centres (not shown in the Tables), the lowest in contribution to household expenses is in Tinsukia (49.6%) followed by Dibrugarh (51.7%) and the highest is in North Lakhimpur, i.e. 82.7 per cent. Non-contribution among females was found to be the highest, i.e. 73.0 per cent in Dibrugarh and the lowest, i.e. 35.7 per cent in North Lakhimpur.

Since the estimated p-value is large at 0.05 level of significance, there is not enough evidence against any null relationship between age and gender in the matter of household expenses. That is, the age and gender of the elderly persons are not found to be statistically associated in the matter of contribution to household expenses by the sample elderly persons.

Sources of Financial Support

It is necessary to know the sources of financial support of the partially and fully economically dependent elderly. People desire children, to be precise, sons (Reddy, 1986) for old age security. The

highest percentage of the sample elderly, i.e. 43.1 per cent are provided financial support by their children (either living with them or elsewhere), followed by self (40.8%) and spouses (17.4%). Least of them, i.e. 1.1 per cent are supported by neigh-bours/community/others, whereas a few, i.e. 1.7 per cent depend on past savings/rent, etc. As expected, more females (54.5%) than males (34.3%) are dependent on children. Similarly, more females (32.5%) than males (5.2%) are dependent on their spouses. Again, more males, i.e. 58.6 per cent than females, i.e. 19.2 per cent are self dependent.

District-wise, it is interesting to note that Tinsukia has the highest percentage of female respondents, i.e. 73.5 per cent as well as males, i.e. 54.5 per cent who depend on their children, making it the leading district in terms of financial support from children, 64.5 per cent. It has the lowest overall percentage, i.e. 30.5 per cent in case of self dependency. Least percentage of females, i.e. 13.0 per cent are self dependent in Dibrugarh and males in Sivasagar, i.e. 46.7 per cent. In North Lakhimpur, highest percentage of males, i.e. 85.1 per cent as well as females, i.e. 32.1 per cent are self dependent, making it the leading district in terms of self dependency. At the same time, it is also the district with the lowest percentage, i.e. 17.3 per cent depending on children (both males, i.e. 10.6 per cent and females, i.e. 28.6%).

The association between the different income levels and levels of economic dependencies is confirmed from this study. It has been found that at lesser income levels, the number of *Fully Dependent* elderly respondents is more. However, lesser number of economically *Independent* elderly respondents is also found as the income level increases. This may be explained by the fact that at very high levels of household income, the children might not allow their ageing parents to fend for themselves and at low household income levels, the elderly in the household has to venture out to earn their daily wages. This is true for both the genders.

Again, out of the total *Independent* elderly persons, more than three-fourths are males. However, more females, i.e. 71.83 per cent are fully dependent than males. Females are found to be more economi-cally dependent than their male counterparts as age increases.

For both males and female, reverse dependency predominates in the lower income groups. In case of the higher income groups, the

intergenerational flow of wealth is from the children to the parents. Maximum males contribute to household expenses even at present in contrast to females.

No significant association could be found between age and gender in the matter of household expenses. In other words, in the matter of contribution to household expenses by the sample elderly persons, it cannot be concluded with certainty that the elderly persons from a particular age group contributes more to the household expenses or whether it is the males who contribute more to the household expenses than the females.

Maximum are provided financial support by their children, followed by self (40.8%) and spouses (17.4%). More females than males (34.3%) are dependent on children. Similarly, more females (32.5%) than males (5.2%) are dependent on their spouses. Again, more males, than females are self dependent.

Conclusion

On the basis of findings of this study it may be suggested that the differential management with respect to gender and income levels of the elderly has to be adopted mainly at the initiative of the government. Also, preferential treatment is important for those in the higher age groups. Already the state of Assam has made the PRANAM (Parent Responsibility and Norms for Accountability and Monitoring) an Act. Strict enforcement of the law and timely reporting of the problem to the enforcement team in the district administration is the need of the hour. It is also important to ensure financial support of the female elderly and destitute elderly, particularly to those who are living without children or kith and kin.

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Elderly Living Arrangements: Insights from North-East India

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ABSTRACT

The present study was planned to explore the pattern of living arrangements of older adults in Northeast India. The study was conducted on the basis of the 60th round (2004–05) report of the National Sample Survey Organisation (NSSO). The researchers observed extreme dissimilarity in the pattern of the elderly living arrangements for the northeastern states of India. It was found that the elderly who were married and had children preferred to live with their family. In fact, the young family members, viz., children and grandchildren and the spouse are the major caregivers for them. The study divulges even after strong family value system in India significant numbers of elderly were forced to live alone in the absence of the spouse. The findings of this study disclosed that the demographic variables such as age, sex, marital status and number of surviving children become the important determinants of the elderly living arrangements in northeast India.

Key words: Elderly, Living arrangements, Demographic variables, Inter-Regional variations, Northeast, India.

The world has experienced increase in human life expectancy and India is not an exception due to a decline in both fertility and mortality (Chanana and Talwar, 1987; Visaria, 2001). At the beginning of the 20th century, life expectancy was about 25 years, which increased to 66 years at the present time in India (Bhagat, 2015). As a result, the number of older adults increased to 8 per cent in 2011 and it is expected to increase by 12.6 per cent in 2026 (Census, 2011). The pace of increase in the number of older population at such an alarming rate is a matter of concern for policymakers especially regarding the pattern of living arrangements of elderly (Rajan, and Kumar, 2003; Ahamed Golandaj *et al.,* 2013). It is worth mentioning that the elderly or old age is defined here in the line of 'National Policy on Older Persons' adopted by 'Government of India' in January 1999. The policy defines a person whose age is 60 years or above can be identified as 'senior citizen' or 'elderly'.

The changes in the age structure and switching from joint family to nuclear family are sources of concern for older adults and their caregivers in India (Gupta and Sankar, 2002). This is because, with the increase in the older population, there is simultaneously decline in the number of younger family members to take care of older adults (Ugargol, *et al*., 2016). Moreover, in India home-based care from family members as primary caregivers is the first and often the only option for a majority of older adults (Prakash, 1999;Devi and Indira, 2007). In fact, most elderly parents prefer to live with their children or family to living alone and they also expect some material assistance and social support (Alavi, *et al.,* 2011). In the absence of familial support, the older adults often prefer to stay in old-age homes provided they are economically affordable. However, in India, there are few old-age homes run by the state and central governments for the deprived and the poor elderly. The institutionalisation of the aged has not become popular and these facilities are not accessible especially to the rural areas (Dandekar, 1993, 1996). In such a situation, living arrangements of older adults are of great concern in India. It refers to the type of family in which the elderly live, the headship they enjoy, the place they stay in and the people they stay with, the kind of relationship they maintain with their kith and kin, and on the whole,

the extent to which they adjust to the changing environment (Rajan *et al.,* 1995).

Studies show that the living arrangements of older adults are broadly based on the socio-economic factors such as age, gender, marital status, number of surviving children, level of education, occupation and economic dependency (Sahayam, 1988; Yadava *et al.,* 1996; Prakash, 1999; Chakraborty, 2004; Panigrahi, 2013; Dhillon, *et al.,* 2016). Moreover, the studies also show that the living arrangements of the older adults are strongly associated with adverse health outcomes such as asthma, tuberculosis, malaria and jaundice among the elderly (Senery, 2011; Agrawal, 2012; Paul, and Verma, 2016). In fact, older adults who live alone are significantly more likely to suffer from these chronic as well as acute ailments than older adults who live with their family (Agrawal, 2012). Thus, in order to increase the welfare of senior citizens, the Government of India introduced a number of policies include Senior Citizens Act, 2007; Indira Gandhi National Old Age Pension Scheme (IGNOAPS); National Policy on Senior Citizens 2011, etc. Despite the various efforts, the Indian elderly are still vulnerable in terms of economic and health gains.

In aggregate, a number of studies have been undertaken to understand the nature, patterns and determinants of the living arrangements of older adults in India. However, all these studies were limited to eastern, western and southern parts of India. The important issue of the living arrangements of older adults is not properly addressed in North-eastern states of India, except for a few cases in Assam. India is a nation characterised by heterogeneous regions and thus what is true for one region may not be true for the other region. This gives us enough opportunity to carry out region-based studies which are different in terms of methodology, scale, and magnitude. This study is first of its kind to explore the pattern of Living arrangements of older adults in Northeast India (NEI).

Importance of The Study of Living Arrangements of Older Adults in North-East

Northeast India (NEI) is the eastern-most region of India. It comprises of the contiguous Seven Sister States (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura), and

one brother the Himalayan state of Sikkim. The region is surrounded by Bangladesh, Bhutan, China (Tibet) and Myanmar. It covers 2, 62,179 sq km and the population size is 4,55,33,982 (3.07%) (Census 2011). This region which is isolated from mainland India not only in terms of geographic consideration but also in terms of academic discussion. It has 7.8 per cent of the total area of the country and 3.9 per cent of the total population. 98 per cent of its border is international boundary with countries like China, Myanmar, Bhutan and Bangladesh which means only 2 per cent of its land is territorially contiguous to India through a 22 km corridor called Silguri neck. There are a total of 209 listed scheduled tribes in the region belonging to six different categories. There are a total of 192 languages and dialects in the region as against 1652 all India figure. This region, barring Assam in a few cases, hardly finds any place in most regional level or state level studies that explore the living arrangements of elderly in India.

In NEI as in most of the other region of India, people value the family as a social institution, and co-residence is a customary way by which families meet the needs of older adults. During recent decades, NEI experienced demographic and social changes which have led to an increase in the proportion of older adults (7% are aged 60 or more; Census 2011). Although the share of older people in NEI is lower than the all India average (8.5%), but the NEI is experiencing a faster growth rate of the 60 plus population than rest of India (see Appendix Table A1 and A2 for details). This implies that in the coming years this region will have a larger share of older people than overall India.

A backward region, with a higher percentage of older people, has serious implication on the type of living arrangements of older people. Unlike other developed regions of India, in NEI family is the only social institution which provides care and support to older adults. The old-age homes run by the state and central governments for the deprived and the poor elderly are very negligible compared to other regions. In this situation, family members are the first and last caregivers of older adults. Moreover, the per capita income of north-eastern states is low compared to overall India. This implies in the absence of family support, paid care and services are comparatively less economically affordable for older adults in NEI. So even if a small

proportion of older adults are living alone, it will be a great concern for the policymakers. This background *motivates us to conduct this study*. In fact, this study is very much necessary to understand the situation of older adults in NEI. *The novelty of the study is that it is the first attempt of this kind in this area.*

The paper is organised as follows: section 2 enlists the data source for this study. We outline the adopted methodologies, in section 3. Section 4 presents the investigations and the discussion of the results and section 5 concludes the study and suggests the induced policy measures.

Data Source

The study is entirely based on secondary data. Various census reports on the population of different ages and places are utilised for the study. However, for conducting this study we mainly rely on the report of the National Sample Survey Organisation (NSSO) 60th round (2004–05). The NSSO 60th round is based on the enquiry on morbidity and health care. The enquiry covered "the curative aspects of the general health care system in India and also the utilisation of health care services provided by the public and private sector, together with the expenditure incurred by the households for availing these services" (NSSO, 60th round, 2006). In addition, results on problems of the aged persons are also provided separately in the report. Moreover, this report also provides the data on the older members of the households, the number of surviving sons, daughters and dependents, economic status, usual activities, living arrangements, whether physically immobile, disabilities, self-reported health status, chronic health conditions, ownership and management of assets, management of social and religious matters, daily chores and on the availability of food, clothing and medicine (NSSO, 60th round, 2006). It covered the population in 29 states and UTs. Out of all states and UTs, we have concentrated only on the north-eastern region (NER). The NER comprises eight states viz., Arunachal Pradesh, Meghalaya, Nagaland, Assam, Manipur, Sikkim, and Tripura. The total sample size for NER was 3063 old persons, with 1726 men and 1337 women. Out of the total samples, the total number of observations for Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram,

Nagaland, Sikkim, and Tripura are 266, 944, 521, 259, 339, 107, 229, and 398 respectively.

The study mainly focuses on the status of living arrangements of elderly and variations across north-eastern states. In the line of the arrangements of NSSO we have considered five different living arrangements of older adults, viz., "Living alone", "Living with the spouse", "Living with the spouse and others members (Children and Grandchildren)", "Living without spouse but with children" and "Living with the others (other relations or non-relatives)".

Methodology

The methodologies used for the purpose of analysing the secondary data are discussed in the subsequent sections.

Statistical Analysis of Data

Chi-Square Test

The status of living arrangements of the elderly on the basis of demographic characteristics is analysed with the help of cross-tabulations with Chi-square. Here, we have tested the hypothesis that there is no significant association between living arrangements and demographic characteristics with the alternative of a significant association between living arrangements and demographic characteristics. The usual χ^2 statistics is used for this purpose. The χ^2 is given as follows:

$$\chi \quad \frac{(Observed \quad Expected)^2}{Expected}$$

ANOVA test

The "ANOVA test" is utilised to justify the regional variation of veteran living arrangements. The following hypothesis is tested by using 'ANOVA':

H_0: *No regional variation in the living arrangements of the elderly in NER*

H_1: There is regional variation in the living arrangements of the elderly in NER

We conclude that there is regional variation in the veteran living arrangements in NER if the calculated *F*-statistics exceeds the critical value at our chosen level of significance.

Results and Discussion

The results and the possible explanations of the results are discussed in this section.

Living Arrangements of Elderly in India

The increase in the longevity results in the expanding cohort of older ages. As a consequence of this, the numbers of aged persons are increasing rapidly and the living arrangements of these senior citizens of India are becoming increasingly important (Panigrahi, 2009). For the ease of the analysis NSS has divided the elderly living arrangements in India into five categories, viz., "living alone", "living with the spouse only", "living with the spouse and others members (Children and grandchildren)", "living without spouse but with the children" and finally, "living with the others (other relations or non-relatives)". The current scenario of the elderly living arrangements in India will be well understood if we discuss the issue in terms of location (rural and urban) and gender (male and female). This is exactly executed in the Table 1. The table presents the percentage distribution of the five categories of elderly living arrangements and thus gives us an overview of the elderly living arrangements scenario in India.

Table 1

Distribution of Indian Elderly by their Differential Living Arrangements (in percentage)

Living Arrangements	Rural		Urban		Total	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
Alone	0.70	2.00	0.53	1.63	1.23	3.63
With the spouse only	4.05	2.18	3.33	1.88	7.38	4.05
With the spouse and others members (Children and Grandchildren)	14.93	7.10	16.23	7.35	31.15	14.45
Without spouse but with children	4.20	11.88	3.85	12.05	8.05	23.93
With the others (other relations or non-relatives)	1.13	1.88	1.08	2.08	2.20	3.95

Source: Authors' own calculation based on NSS data.

The two most accepted pattern of living arrangement for the elderly in India are "living with the spouse and other members (Children and Grandchildren)" and "living without spouse but with children". The result is quite obvious. It only reflects the social structure of the Indian society where children and/or grandchildren are the most trusted and accepted caregivers for the elderly. The third important category of living arrangement is "living with the spouse only" in both rural and urban areas and for both male and female. However, more males (7.38%) in comparison to females (4.06%) are living in this arrangement. Again, the rural figures (6.23%) in this respect are higher than that of urban (5.21%) figures. Even after having strong social and family values a handful of elderly are forced to live alone. In fact, the table divulges that more rural elderly (2.7%) are forced to live alone in comparison to urban elderly. This is definitely a serious issue. As for the veterans who live alone, society becomes the first and foremost caregiver. The society with its appropriate social support system can perform its responsibility for veterans appropriately. In India, still, there is a dichotomy in the rural and urban economy. Hence, it is well accepted that the social support system in urban India is more active than that of rural India.

Another important observation from the table is that more elderly females (3.36%) are living alone compared to males (1.23%). The patent reasons for that are:

Firstly, the life expectancy for women in India is higher than that of men. Secondly, in traditional Indian society male generally, marry the younger female. These two ingredients force a more elderly female to "live alone" compared to that of an elderly male.

Living Arrangements of the Veteran in Northeast and India

The living arrangement of senior citizens in India is becoming increasingly important with the expanding cohort of older ages resulting from increasing longevity (Panigrahi, 2009). In order to understand the living arrangements of older adults in north-eastern states and India, we have considered the percentage distribution of various types of living arrangement (living alone, living with the spouse, living with spouse and children and others) in Table 2.

Table 2

*State wise living arrangements of elderly in Northeast
and India (in percentage)*

Living Arrangements States	Living Alone	With the Spouse Only	With the spouse and others	Without Spouse but with Children	Others	Total
Arunachal Pradesh	5.64	7.52	48.5	36.09	2.25	100
Assam	2.75	4.98	54.13	35.59	2.55	100
Manipur	2.12	4.8	56.62	33.2	3.26	100
Mizoram	1.47	3.83	58.11	32.74	3.85	100
Meghalaya	3.86	8.49	45.17	40.15	2.33	100
Nagaland	0.93	9.34	79.44	10.28	0.01	100
Sikkim	1.31	5.24	51.53	36.24	5.68	100
Tripura	6.28	14.57	42.71	31.15	5.29	100
NE	3.14	6.75	52.95	33.89	3.27	100
India	4.4	11.4	47.3	32.6	4.3	100

Source: Authors' own calculation based on NSS data.

A perusal of the table reveals that in NER and India the majority of the older adults are found to live with the spouse and others followed by living with the spouse and other members (Children and Grandchildren). The highest proportion of older adults live with the spouse and others is found in Nagaland (79.44) and the state is followed by Mizoram (58.11), Manipur (56.62). The corresponding lowest figure is reported for Tripura (42.71). The two others important living arrangements for older adults in India and NER are "living without spouse but with children" and "living with spouse only". This table reflects the structure of the Indian society where the caregivers for the older adults are the family members, viz., spouse, children or both. The table also reflects the strong traditional value systems of Indian society. But at the same time, it is to be noted here that even after the strong value system the older adults are forced to live alone. The highest percentage of the category "living alone" is obtained for Tripura (6.28), followed by Arunachal Pradesh (5.64) and Meghalaya (3.86). In this case the all India figure is 4.4 per cent. In fact, for Tripura and Arunachal Pradesh, the figures are

higher than the all India level. The graphical presentation of the same is given in Figure 2.

Figure 2
Living Arrangements of Elderly
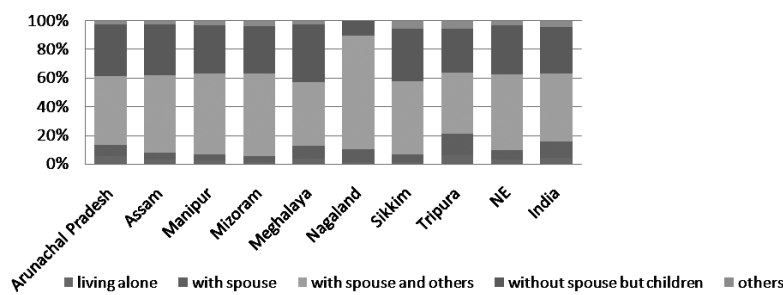
Source: Authors' own presentation based on NSSO data

After looking at the aggregate picture of the older adults living arrangements in India, we now explore the pattern of living arrangements in NER by sex and place in Table 3. Unlike India, it is found that in all the states of NER there is a huge variation in the living arrangement of rural and urban areas especially in categories "living alone" and "living with others". However, in case of other living arrangements, all the states have followed a similar pattern of living arrangements except Arunachal Pradesh, Mizoram and Nagaland. Further, as regards to the living arrangements of male and female older adults, we also find significant variations in NER.

The table reveals that in rural areas the frequency of "living alone" is more in case of male older adults than in urban areas. On the other hand, for female older adults, the proportion of "living alone" in Tripura, Assam, and Sikkim is more in rural than urban. Nevertheless, in Arunachal Pradesh, Meghalaya, Manipur, and Mizoram more female older adults are forced to live alone in urban areas than rural.

Table 3

Living arrangements of elderly by place and sex in Northeast, India (in percentage)

State	Living Arrangements											
	Rural						Urban					
	Living Alone	with the Spouse Only	With the Spouse and Others	Without Spouse but Children	Others	Total	Living Alone	with the Spouse Only	With the Spouse and Others	without Spouse but Children	Others	Total
Male												
Arunachal Pradesh	2.1	4.5	56	12.5	25	100	2.5	5.7	28.1	32.4	31.1	100
Assam	0.3	4.2	73.3	16.5	5.7	100	1	2.5	80	14.1	2.3	100
Manipur	3.5	5.9	51.6	17.9	21.1	100	0.2	6.6	70.3	7.5	15.3	100
Meghalaya	3.2	10.8	70	11.5	4.6	100	0	5.6	77.5	14.1	2.7	100
Mizoram	1	3	63	23.6	9.4	100	0.6	5.1	53.7	16.4	24.2	100
Nagaland	1.1	11.4	67.5	16.7	3.3	100	0	0	98.2	1.8	0	100
Sikkim	0.8	5.7	59	29.7	4.8	100	0	0	73.5	9.7	16.8	100
Tripura	4.3	21.7	55.5	14.2	4.3	100	4	12.2	78.6	5.2	0	100
Female												
Arunachal Pradesh	5	1.8	33.8	40.3	19.1	100	7	7.7	41.5	33.1	10.7	100
Assam	6.4	3.2	21.2	62.6	6.7	100	0	0	32.8	54.4	12.8	100
Manipur	1.1	1.6	29.7	48.2	19.3	100	4.9	0	34.8	42.8	17.6	100
Meghalaya	4.2	8.8	24.7	54.7	7.6	100	6.9	5	8.2	78.2	1.6	100
Mizoram	0	0.5	39.2	42.9	17.5	100	1.6	0.7	34.8	36.3	26.7	100
Nagaland	0	16.4	56	27.6	0	100	0	0	88.8	11.2	0	100
Sikkim	2.5	4.8	34.4	45	13.3	100	0	0	35.9	64.1	0	100
Tripura	13.2	8.6	15.4	52.1	10.7	100	3.9	3.1	36.4	47.8	8.9	100

Source: Authors' own calculation based on NSS data.

Distribution of Elderly Living Arrangements by Demographic Variables in Northeast India

As with growing age, everyone would like to live with someone preferably a relative if not non-relative. Thus one of the most important demographic determinants of elderly living arrangements is the age itself. For the ease of the analysis we classified age of the elderly into three categories, viz., younger old (age group 60–69), older old (age group 70–79) and oldest old (age group 80 and above). Other than age, the demographic variables like elderly gender, marital status, surviving children, surviving sons and surviving daughters are also important determinants of elderly living arrangements. In Table 4 we present the different living arrangements categories in relation to demographic variables along with the Pearson and Likelihood-ratio Chi-squares tests results for checking the statistical validity of the results. The Pearson and Likelihood-ratio Chi-squares tests results confirm all the selected demographic indicators have a significant impact on elderly living arrangements in northeast India (see Table 4). The percentages of three categories of elderly are 71.8, 21.9 and 6.3 respectively. The table also reveals that with growing age the living arrangement category "living alone" becomes non-preferred and thus the proportion of "living alone" elderly are decreasing over time with growing age. In fact, the proportion of elderly "live alone" is highest in the younger old group (5.2%), followed by older old (3.2%) and oldest old (2.4%). This finding is similar to earlier findings of Shah *et al.*, 2002; Liang, Gu and Krause, 1992; Ramashala, 2001; Zimmer and Kim, 2002, Panigrahi, 2009. Further, for younger old and older old groups, the two most preferred living arrangement categories are – "living with the spouse and others (mostly children)" and "living without spouse but with children" respectively for northeast India. But, for the oldest old group, the most common form of living arrangement category is "living without spouse but with children". The reason for such an arrangement pattern can be understood only by considering the second demographic determinant of the living arrangement, sex. The table confirms that for elderly women the common living arrangement category is "living without spouse but with children" whereas for elderly men it is "living with the spouse and others

(mostly children)". Thus more male elderly are found to "live with the spouse and others" than female in northeast India. In the case of the living arrangement category "living without spouse but with children", the percentage is high for female (52.9) compared to male (19.1). Furthermore, more female elderly are found to "live alone" and/or "live with others" than male. However, in the case of the living arrangement category "living with the spouse only", the proportion is high for the male. We also find that with growing age the greater proportion of elderly women are found to "live without spouse but with children". This may be because of the fact that in Indian society men generally get married to younger women and thus as they get older there is a higher chance of widowhood, with the number of widows exceeding the number of widowers. These elderly live with their children but without the spouse. As in other countries, in northeast India also, elderly with growing age prefer to live with others and thus the proportion of elderly "live with others" also increases with age. The Pearson and Likelihood-ratio Chi-squares test results confirm that the relationships between living arrangement and age, sex are also statistically significant. However, the relation between age and the living arrangement category "living alone" is quite complex and age alone can't be considered as the sole reason for that. In fact, when the elderly grow older they generally became economically dependent on others compared to the younger olds, who are supposed to be more economically active than the former (Panigrahi, 2009). Thus, with growing age elderly prefers to co-reside with others. "Hence, the relationship between age and living arrangements may be due to economic reasons rather than age, per se" (Panigrahi, 2009) and further analysis is required to identify this relationship.

As marriage is almost universal in India we can expect that the association between marital status and living arrangements may not be very prominent in the case of northeast India. In fact, in NER we find that the majority of the elderly are currently married (59.4%) or widow (38.4%), while the proportions of divorced/separated (0.9) and never married (1.4), are negligible. As is obvious, elderly who are currently married are more likely to "live with the spouse" (85)

Table 4

Distribution of Living Arrangements of Elderly by Demographic Variables in Northeaste India

Demographic Variables	Living Arrangements of Elderly (%)					Total	Obs (N)	Percentage	χ^2		df	Prob
	Alone	With the Spouse Only	With the Spouse and Others	Without Spouse but with Children	With Others							
Age***												
60–69	5.2	7.0	56.1	31.1	2.6	100.0	2199.0	71.8	Pearson	13.325	8	0.101
70–79	3.2	6.1	48.1	39.3	4.1	100.0	671.0	21.9	Likelihood-ratio	13.404	8	0.099
80 and above	2.4	5.7	34.2	46.6	8.3	100.0	193.0	6.3				
Sex*												
Male	1.9	8.5	68.8	19.1	1.7	100.0	1726.0	56.3	Pearson	33.252	4	0.000
Female	4.8	4.5	32.5	52.9	5.3	100.0	1337.0	43.7	Likelihood-ratio	34.322	4	0.000
Marital Status*												
Never married	28.6	NA	NA	NA	71.4	100.0	42.0	1.4	Pearson	376.179	12	0.000
Currently married	0.4	9.9	85.0	4.3	0.4	100.0	1818.0	59.4	Likelihood-ratio	367.891	12	0.000
Widowed	7.1	1.9	6.0	79.1	6.0	100.0	1176.0	38.4				
Divorced/separated	14.8	NA	NA	77.8	7.4	100.0	27.0	0.9				

Cont'd...

Cont'd....

Surviving Children*

0	11.3	30.4	19.2	8.7	30.4	100.0	115.0	3.8	Pearson	133.065	12	0.000
1	2.4	7.2	45.2	39.2	6.0	100.0	250.0	8.2	Likelihoo d-ratio	126.421	12	0.000
2	3.8	7.3	53.0	33.1	2.8	100.0	287.0	9.4				
3+	2.7	5.5	55.5	34.6	1.7	100.0	2411.0	78.7				

Surviving Sons*

0	9.2	19.9	32.6	18.4	19.9	100.0	261.0	8.5	Pearson	80.758	12	0.000
1	1.8	5.5	51.7	38.3	2.7	100.0	669.0	21.8	Likelihoo d-ratio	73.005	12	0.000
2	3.8	5.5	53.8	35.7	1.2	100.0	1062.0	34.7				
3+	1.9	5.6	57.9	33.1	1.5	100.0	1071.0	35.0				

Surviving Daughters*

0	4.5	11.1	44.5	30.3	9.6	100.0	449.0	14.7	Pearson	20.635	12	0.056
1	3.2	5.6	53.6	34.8	2.8	100.0	709.0	23.1	Likelihoo d-ratio	18.660	12	0.097
2	3.4	8.3	51.3	34.9	2.1	100.0	1001.0	32.7				
3+	2.2	3.8	58.4	33.8	1.8	100.0	904.0	29.5				

Source: Authors' own calculation based on NSS data

Note: df means degrees of freedom

* Significant at 1 per cent level, *** Significant at 10 per cent level

compared to other elderly. Again, the majority of elderly who are widow or widower co-reside with their children. Finally, as expected never married elderly are found to co-reside with non-relatives in higher proportion.

The presence of surviving children is one of the most important demographic determinants of the veteran living arrangements in northeast India. In fact, in Indian society, children specifically male children are considered as the security for the old age. In the present sample the percentage of elderly with no children, one, two and three or more children are 3.8, 8.2, 9.4 and 78.7 per cent respectively. The table reveals that for the elderly with no surviving children, three type of living arrangements are available viz., "living alone" (11.3%), "living with the spouse only" (30.4%) and "living with others" (30.4%). It is also true that the elderly with surviving children also "live alone". According to our finding, 8.9 per cent elderly are to "live alone" even though they have at least one surviving child. The table confirms that the majority of the elderly who have at least one surviving child live with or without spouse as the case may be but with their children. Thus, more the surviving children the greater is the chance for the elderly to co-reside with them. This result is similar to the earlier findings of Burch and Mathews, 1987; Rajan and Kumar, 2003; Zimmer and Kwong, 2003 and Panigrahi, 2009. The possible reason for that may be even after the breaking of the joint family, more surviving children means at least one of them may take care of the elderly parents. Again migration of the other children in search of livelihood may force any one of the children to take care of the elderly parents who didn't migrate. The significant result of the χ^2 test also confirms that surviving children is an important determinant of the living arrangements of the elderly.

Apart from the surviving children, the veteran living arrangements are also determined by the gender of the surviving children. In traditional Indian society, the strong preference for son arises because a son is considered as the caregiver of the elderly parents. But recently it has been observed that economically empowered daughter also becomes a care provider to her elderly parents. As a consequence of

this revolution of thoughts, we find both surviving sons and daughters become important demographic determinants of the elderly living arrangements. The table confirms that the elderly with surviving son preferred to live with them. It is interesting to note that 7.5 per cent and 8.8 per cent elderly who live alone have at least one surviving son and daughter respectively. This means that in the northeast India elderly prefer to live with their sons rather than with daughters. This may be because of social stigma that sons are socially more accepted caregiver for elderly parents than that of daughters.

Thus, from the table, it is clear that living arrangements of elderly are greatly influenced by demographic variables, viz., age, sex, material status, surviving children, surviving sons and surviving daughters. Moreover, if we look at the Chi-squares test result, it also confirms a significant difference in living arrangements for the elderly based on age, sex, and the number of surviving children.

Inter-Regional Variation of the Elderly Living Arrangements in NER of India

We can describe NER of India as "heterogeneity within homogeneity". These eight states are clubbed together because of their large scale homogeneity in the geographical and social structure. NER has its own diverse cultural backgrounds. Yet these states are heterogeneous with respect to religion, tribes, culture, food habits, etc. In fact, within this region itself, these seven sisters and one brother states have adopted different traditional value systems for senior citizens. Due to these dissimilarities, the living arrangements of older adults are also different within this region. In fact, the dissimilarity in the pattern of veteran living arrangements is a common phenomenon in northeast India. Thus it will be interesting to study the inter-regional variation of elderly living arrangements in northeast India. The result related to ANOVA is presented in Table 5.

Table 5
Inter-Regional variations in the living arrangements of elderly in North eastern states of India, ANOVA

	SUMMARY				ANOVA					
Groups	Count	Sum	Average	Variance	Source of variation	Sum of squares	df	Mean squares	F	p-value
Arunachal Pradesh	266	1123	4.22	0.82	Between Groups	23.214	7	3.316	4.864*	0.00
Assam	944	4072	4.31	0.61						
Manipur	521	2250	4.32	0.64						
Meghalaya	259	1113	4.3	0.73	Within Groups	2082.810	3055	0.682		
Mizoram	339	1473	4.35	0.52						
Nagaland	107	427	3.99	0.23						
Sikkim	229	1009	4.41	0.65	Total	2106.024	3062			
Tripura	398	1653	4.15	1.04						

Source: Researcher's calculation based on NSS data.

Note: df means degrees of freedom

The table reveals that the null hypothesis of no variation in the living arrangements across the north-eastern states of India is rejected. This is true from the fact that the F statistic (F=4.86) is statistically significant at the 1 per cent level. This implies that there is significant variation in the veteran living arrangements across north-eastern states of India. Further, the result showed that the value of variance is highest in Tripura (1.04) followed by Arunachal Pradesh (0.82), Meghalaya (0.72), and Manipur (0.64). On the contrary, the variance is lowest in Nagaland (0.23). This suggests that, within north-eastern states, the variation of elderly living arrangements is highest in Tripura.

Summary Statistics and Frequency of Veteran Living Arrangements in the North-East, India

An elderly person with growing age prefers to live with others as they need help to perform their daily needs. Most importantly elderly who are economically week need economic support for their livelihood. Thus when the elderly person lives with family (children with or without spouse) they really feel safe. In fact, in Indian society, living with the family is considered as the "*Panacea*" for the elderly. In

Indian society "family (spouse, children, grandchildren, etc.)" is considered as the most trusted "*caregivers*" for the elderly. The importance of the elderly living arrangements lies in the fact that it enables us to identify the elderly "*caregivers*". An elderly living with the family (for example with the spouse and/or children) means family members are the first and immediate caregivers. On the contrary, if an elderly lives alone then the society with appropriate social support system becomes the immediate caregiver. Under such circumstances, the matter "*elderly living arrangements*" becomes increasingly important.

We can get an overview of the living arrangements of the elderly simply by considering the "descriptive statistics and the frequency" of the five different living arrangements (as mentioned earlier) for Indian elderly. The Table 6 divulges the same for the elderly in northeast India.

Table 6

Summary Statistics and Frequency Of living Arrangements of Elderly in Northeastern States of India

| Dependent Variables | Summary Statistics | | | | | | Frequency | | |
	Mean	Standard Deviation	CV	Mini-mum	Maxi-mum	Sum	Freq-uency	Perce-ntage	Cumul-ative Frequ-ency
Living alone	25.25	12.05	47.72	3	107	202	96	3.13	3.13
Living with the spouse only	25.88	6.18	23.88	10	58	207	207	6.76	9.89
Living with the spouse and others	202.50	49.73	24.56	85	511	1620	1,622	52.95	62.85
Living without spouse but with children	129.75	33.51	25.83	11	336	1038	1,038	33.89	96.74
Living with others	12.50	2.88	23.08	0	24	100	100	3.26	100.00

Source: Authors' calculation based on NSS data.

The table reveals that in northeast India on average 25 elderly are forced to live alone. In fact, for 3.13 per cent elderly societal support

system becomes the first and foremost caregiver. The highest average is obtained for the elderly living arrangement type "living with the spouse and others", mainly with children. In percentage, approximately 56 per cent elderly in northeast India are found to live with their spouse and other members of the family. In traditional Indian society, the family is considered the main caregivers for elderly and northeast is not an exception of that tradition. The table also confirms that the second most important living arrangement category is "living without spouse but with children" with average 129.75. The table divulges that approximately 34 per cent elderly; children become caregivers in the absence of their life partner. Although average and the percentage figures disclose that "living with the spouse only" is the third most import living arrangements category for elderly but the C.V. ensures it is the most consistent type of living arrangements for elderly in the northeast. The highest inconsistency is found in the case of "living alone" (C.V. 42.72) and the result is quite obvious. The elderly who used to live with the spouse only after the death of the life partner is forced to live alone. Not only that the elderly who used to live with others have a high probability to be forced to "live alone". Thus who are "living with the spouse only" and "living with the others (non-relatives)" are vulnerable to "live alone". This implies that regarding elderly living arrangements we should give equal emphasis to these three categories of living arrangements, viz., "living alone", "living with the spouse only" and "living with the others (other relations or non-relatives)". Actually, the elderly who are "living with the others (other relations or non-relatives)", specifically living with non-relatives, are in greater peril as they used to live with paid caregivers (maid or servant) and the frequently occurring incidents portray the threat in which they are living. In fact, the Table 6 authorised us to identify that in northeast India approximately 13 per cent of elderly are living at a risk with no visible immediate "caregivers" and here comes the role of society. Elderly persons have given their services to the society and now society needs to take care of them by providing them a good life with its appropriate "*social support system*".

Conclusions

A broader understanding of the "caregivers" for the elderly in northeast India based on the observations from the NSS60th round on "Living arrangements of elderly" underpins the traditional conviction that family is the principal care providers of the elderly. On average 332 elderly in northeast India is residing with their children with or without the spouse. Interestingly, besides having strong traditional value, 3.13 per cent elderly are forced to live alone and another 3.26 per cent elderly are residing with other relations or non-relations. Along with this 6.76 per cent elderly are residing with the spouse only. This particular group is vulnerable to "live alone" or "live with other relations or non-relations" after the demise of their life-partner. Apparently more elderly females (3.36%) are found to live alone compared with males (1.23%) in northeast India. The study divulges that 13.15 per cent of the elderly in the northeast are living in a household where their immediate kinship is not present as one of the caregivers.

Living with a family with immediate kinship makes elderly both economically and socially secure. To tell the truth economic security of the elderly appears a major issue if they are not co-residing with their immediate kinship. Besides the economic security, social security of the elderly also becomes a matter of issue in the absence of co-residence of children. As mentioned earlier still in Indian society co-reside with immediate kinship is considered a *panacea* for the elderly. It is the responsibility of the society with the appropriate social support system to take good care of those elderly who live alone" and/or "live with the spouse only" and/or "live with other relations or non-relations". Here comes the difference between mainland India and northeast. The north-eastern region of India from the beginning is identified as a backward region, characterised by a poor social support system and high insurgencies. Under such circum-stances, we can't expect to have a prompt social support system for the elderly inhabitants of the region. Consequently, apart from economic security, universal social security for all the elderly becomes an immediate challenge for northeast India. Thus for northeast India, it is an emergency to frame suitable policy measures, along with other measures, to ensure familial care for the elderly. Expeditious action for

ensuring social as well as economic security to the vulnerable elderly is called for before thing worsens further. Ameliorating the conditions of the existing and side by side establishing new old-age homes with the support of non-governmental organisations and voluntary association can be considered as an option for the vulnerable elderly. Direct cash payment to the elderly through "*Old-age security*" to ensure economic security to the elderly is highly recommended.

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Appendices

Table A1
Age Wise Composition and Growth Rate

	2001		2011		Age Specific Growth Rate (2001–11)	
Age	*NE*	*India*	*NE*	*India*	*NE*	*India*
0–14	37.12492	35.6	32.77285	30.7	–13.27948	–15.9609
15–59	57.62777	58.2	60.62588	60.3	4.9452567	3.482587
60+	5.244737	6.3	7.00	8.5	26.58978171	25.88235

Source: Census 2001, 2011

Table A2
Life expectancy at birth for the north eastern states of India (2001–2005)

States	*Male*	*Female*
Arunachal	63.87	62.76
Assam	58.30	59.00
Manipur	68.92	71.12
Meghalaya	57.03	58.09
Mizoram	65.37	68.69
Nagaland	66.34	66.42
Sikkim	66.23	66.02
Tripura	66.92	69.54
NE	64.12	65.205
India	61.97	63.02

Source: Estimation of Life Expectancy at Birth for the North. Eastern States of India (2001–2005) Retrieved

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Prevalence and Determinants of Psychological Stress of Elderly in Bangladesh: A Cross Sectional Study

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ABSTRACT

The aim of the study was to assess the psychological stress of urban elderly living in the Sylhet district, Bangladesh. A total of 390 urban aged people were interviewed during February to April, 2016 through a structured questionnaire. Basic statistical tools along with logistic regression model were applied for analysis. It was found that 58.2 per cent elderly were suffering from psychological stress. From the logistic regression analysis, it was observed that sex, religion, age, income, blood pressure, physical exercise, and sleeping pattern were significant factors associated with psychological stress of elderly. Non-Muslim's elderly were suffering more than that of Muslim counterpart. Females were more prone to psychological stress than male. Poor elderly were suffering more than middle and high income elderly. Oldest elderly were more suffering than young elderly. Therefore, measures should be taken to create awareness among the elderly populations about psychological stress.

Key words: Urban ageing, Psychological stress, Religion, Family type

Ageing is a stage in human life that is normally associated with a decrease in physical and mental abilities. The reduction in these abilities together with inactiveness of present day lifestyle increases the problems facing the elderly and impose economically, socially and psychologically heavy costs on a given society (Aslankhani *et al.,* 2010). Health is not only about physical well-being, but also involves both social and psychological well-being. The psychological distress affects the patient's quality of life for assessment and treatment (Volgsten *et al.,* 2008). According to WHO, depression is a common mental disorder characterized by sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, feelings of tiredness, and poor concentration (Marcus *et al.,* 2012).

The elderly person residing in old age homes have more stress because of their staying away from children and they do not have anyone's support to carry their day to day activities and to share their feelings (Gulani, 2012). One of the important indices in elderly people, which make them to have a good quality of life, is their mental health. Some of the most important factors determining their state of mental health are loneliness and lack of social connections (Alizadeh *et al*., 2012). Stress is an issue for the elderly, in part because of other health problems and their reaction to them, and in part because of their loss of identity and a role in society. Stress is associated with certain particular life events, though stress can be caused by a number of different factors. Elderly people residing at old age home experience moderate to severe level of stress (Rani *et al*., 2016). Psychological distress among males depends on the socio-demographic character-istics. Twenty-eight per cent respondents were found to be psychologically distressed. The most common form of psychological distress was depression (Yusuf *et al*., 2012). Psychiatric disorders such as depression, stress, and anxiety are factors that affect the quality of life and bring about suicidal tendency and many physical problems, and socio-economic distress in elders. Anxiety disorders, depression, and stress prevail among the elderly in Iran. Some factors such as education, housing, medical condition, and marital status had signif-icant effects on anxiety disorders, depression, and stress (Babazadeh *et al*., 2016). Stress and psychosocial problems play a crucial role in late-life depression. Changes in positive life events, daily hassles

(worries), and mastery were significantly associated with changes in late-life depression among the oldest-old (Jeon and Dunkle, 2009). Socio-economic as well as demographic factors seems to affect the mental health of the elderly people, which in turn, can influence the whole society in different ways. It is necessary to be aware of the psychological conditions of the elderly people and take necessary steps to find solutions and effective strategies through intervention programs to reduce stress disorder, anxiety, and depression in society, especially, in the elderly population (Babazadeh *et al.*, 2016).

For change over time in depression, a number of researchers have examined the relationship between age and depression, but the findings are inconsistent. Some researchers found a curvilinear relationship between age and depression, showing that the youngest age groups and the oldest age group reported greater depressive symptoms than other age groups Gatz and Hurwicz, 1990; Newmann, 1989).

Elderly people are suffering with many physical, social, emotional and psychological problems which enhance the level of stress. Most of the studies carried out on this subject mainly focus on the socio-economic and health condition of elderly in Bangladesh. However, the psychological aspect of elderly people and its treatment is often neglected. Therefore, the present study is an attempt to identify the factors that affect psychological health or well being of the elderly in urban area of Sylhet district in Bangladesh.

Materials and Methods

The empirical data of this study was collected from 390 randomly selected respondents in the urban area of Sylhet district in Bangladesh during February to April, 2016. The respondents were the persons aged 60 and over. A structured questionnaire was administered to elicit the required information. Different statistical tools like Percentage frequency distribution, Chi-square test and logistic regression method was applied for data analysis.

Results and Discussion

Socio Economic and Demographic Characteristics of the Urban Aging

The percentage distribution of selected socio-demographic characteristics of urban elderly are demonstrated in Table 1. It is observed that most of the respondents (60.77%) are falling in the age group of 60–69 years and rest of the respondent (39.23%) in the age group 70 years and over. The mean age of the elderly is 69.33 years. About 72.56 per cent elderly are male and the rest (27.44%) are female. Most of the elderly (94.10%) are married. About 58.2 per cent elderly are suffering from psychological stress. Education is one of the most important factors, which affects the socio demographic condition of the elderly. It is obvious that a literate person lives a better life than an illiterate person. Over half of the elderly (56.41%) are illiterate. Religion is an important community characteristic. It is observed that 82 per cent are Muslim. Socio-economic condition may influence psychological situation of a person. Majority (74.10%) of the respondents have income less than 10000 Tk. It is observed that the average monthly income of elderly is 6446 Tk. Family type and take care are also two important factors of elderly. Most of the elderly (61%) receive take care by themselves followed by 35.64 per cent from their son and a few (3.33%) from their daughter. About 62 per cent live in joint family and the rest (38%) live in nuclear family. About two thirds elderly (73.85%) of the elderly take physical exercise sometimes and only a few (26.15%) of the elderly take physical exercise regularly. Body Mass Index (BMI) is an important indicator to assess nutritional status of a person. It is observed that most (72.31%) of the elderly belong to well nourished group followed by 4.10 per cent in under nutrition and 23.59 per cent in overweight (Table 1). The level of perceived stress of the geriatric patients with hypertension in India was assessed by using the Perceived Stress Scale (PSS) and found that 67.3 per cent of the elderly patients with hypertension had moderate perceived stress. It was also found that 51.8 per cent elderly belong to joint family in India (Malathy and Gandhimathi, 2017) while 62 per cent elderly live with joint family in Bangladesh.

A study on psychological stress among elderly in Iran was conducted and found that 57.4 per cent elderly were suffering from moderate to severe psychological distress (Alizadeh *et al*., 2012).

Table 1

Percentage Distribution of Selected Socio Demographic Characteristics of the Urban Aging

	Characteristics	*Frequency*	*Per cent*
Age	60–69	237	60.77
70–79	96	24.62	
	80 and above	57	14.62
Sex	Female	107	27.44
	Male	283	72.56
Religion	Muslim	320	82.05
	Non-Muslim	70	17.95
Marital status	Married	367	94.10
	Other (Divorce or widow)	23	5.90
Education	Illiterate	220	56.41
	Literate	170	43.59
Smoking habit	Regular	125	32.05
	Not regular	34	8.72
	No habit	231	59.23
Income	Poor (<10000Tk.)	289	74.10
	Middle (10000–19500Tk.)	70	17.95
	Rich (>20000Tk.)	31	7.95
BMI	Well nourished	282	72.31
	Under nourished	16	4.10
	Over weight	92	23.59
BP	High	145	37.18
	Low	125	32.05
	Normal	120	30.77
Take care	Daughter	13	3.33
	Son	139	35.64
	Self	238	61.03
Psychological stress	Yes	227	58.20

Cont'd...

Cont'd...

	No	163	41.80
Sleeping pattern	Not good	156	40.00
	Good	108	27.69
	Average	126	32.31
Physical exercise	Regular	102	26.15
	Sometimes	288	73.85
Family type	Nuclear	148	37.95
	Joint	242	62.05

Determinants of Psychological Stress of Urban Aging Using Logistic Regression Model

Results of the logistic regression model, where psychological stress is taken as dependent variable and sex, age, marital status, income, religion, education, BMI, take care, type of family, Blood pressure, physical exercise, sleeping pattern and smoking habit are considered as independent variables.

From the logistic regression analysis, it is observed that sex, religion, age, income, blood pressure, physical exercise, and sleeping pattern are significant factors associated with psychological stress of elderly. Female elderly have double psychological stress (2.12 times) than male elderly. Religion is an important factor for mental peace. Our analysis also supports this idea. Non-Muslim elderly are suffering from psychological stress 1.95 times more than Muslim elderly. Old (70–79 age group) and oldest old (80 + age) are suffering from psycho-logical stress 2.71 times and 2.85 times more than the young elderly (60–69 age group). Poor elderly as well as middle income elderly are suffering from psychological stress 2.71 and 1.31 times more than rich elderly. It implies that poor and middle income elderly are more prone to psychological stress. Therefore, income is an important factor associated with psychological stress. It is observed that aged people who are living alone and who are living along with their son are suffering 3.80 and 3.60 time more than the elderly who live with their daughter respectively. Elderly who have high and low blood pressure (BP) are suffering from psychological stress more than the elderly who have normal BP. Aged people whose sleeping arrangement are not good and average are suffering 3.48 and 1.69 times more than the aged

people who have good sleeping arrangement respectively (Table 2). Psychological distress among elderly women was deeper than elderly men. The rate of psychological stress increased with increased age, specifically in 60–79 years old however, this rate declined from age of 80 years and over (Alizadeh *et al.*, 2012).

Table 2
Logistic Regression Estimates of the Effects of Selected Socio Demographic Characteristics on Psychological Stress

Characteristics	Reference	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I. for EXP (B)	
								Lower	Upper
Sex (Female)	**Male**	0.752	0.347	4.714	1	0.030	2.122	1.076	4.185
Marital status (Married)	unmarried	–0.394	0.550	0.512	1	0.474	0.675	0.229	1.984
Religion (Non-Muslim)	Muslim	0.665	0.336	3.924	1	0.048	1.945	1.007	3.755
Education (Illiterate)	Literate	0.323	0.265	1.485	1	0.223	1.382	0.821	2.324
Family type (unit)	Joint	–0.227	0.267	0.722	1	0.396	0.797	0.472	1.345
Age	**Young old (60–69)**			11.665	2	0.003			
Old (70–79)		0.996	0.321	9.613	1	0.002	2.706	1.442	5.078
Oldest old (80+)		1.048	0.435	5.802	1	0.016	2.851	1.216	6.685
BMI	**Well nourished**			1.010	2	0.604			
Under nourished		–0.361	0.581	0.387	1	0.534	0.697	0.223	2.177
Over weight		–0.246	0.283	0.758	1	0.384	0.782	0.449	1.361
Income	**Rich (>20000)**			7.308	2	0.026			
Poor (<10000)		0.997	0.494	4.067	1	0.044	2.709	1.028	7.138
Middle (10000–19500)		0.273	0.532	0.263	1	0.608	1.313	0.463	3.725
Take care	**Daughter**			4.253	2	.119			
Son		1.335	.654	4.170	1	.041	3.802	1.055	13.696
Self		1.282	.654	3.839	1	.050	3.603	1.000	12.985
BP	**Normal**			6.552	2	0.038			

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High		0.719	0.295	5.925	1	0.015	2.053	1.150	3.663
Low		0.568	0.300	3.583	1	0.058	1.764	0.980	3.176
Physical exercise (Sometimes)	Regular	0.981	0.312	9.870	1	0.002	2.667	1.446	4.919
Smoking Habit	**Regular**			2.941	2	0.230			
Sometimes		0.476	0.303	2.476	1	0.116	1.610	0.890	2.915
No Habit		–0.067	0.447	.022	1	0.882	0.936	0.390	2.245
Sleeping Pattern	Good			13.896	2	0.001			
Not good		1.247	0.340	13.432	1	0.000	3.479	1.786	6.778
Average		0.527	0.316	2.786	1	0.095	1.693	0.912	3.143
Constant		–3.842	0.905	18.015	1	0.000	0.021		

Association of Psychological Stress with Selected Socio-demographic Characteristics

There may be an association between socio-demographic characteristics and psychological stress. For this, a set of socio-demographic variables such as income, education, sex, religion, age, family type, marital status, sleeping pattern, physical exercise, smoking habit, take care, BP and BMI are considered in this study.

It is found that there exists a significant ($p < 0.00$) association between income and psychological stress. Poor elderly are suffering more than middle and rich elderly which implies that economic condition is one of the most influential factors of psychological stress.

It is observed that educational status is significantly ($P < 0.02$) associated with psychological stress. Psychological stress among illiterate elderly (63.2%) is higher than that of literate elderly (51.8%).

Religion is significantly ($p < 0.03$) associated with psychological stress. Psychological stress among Non-Muslim elderly (70%) is higher than that of Muslim community (55.6%).

Psychological stress is significantly ($p < 0.01$) associated with sex. Female elderly (69.2%) are suffering from psychological stress more than male (54.1%) elderly.

It is noted that sleeping pattern is significantly ($P < 0.00$) related with psychological stress. The elderly whose sleeping pattern is not good are suffering from psychological stress more than the elderly

whose sleeping pattern is good and average. This indicates that good sleeping pattern is an important factor to determine the psychological stress of the elderly.

The study shows that take care of elderly is an important factor of psychological stress. There is a significant ($p < 0.03$) association between take care and psychological stress of elderly. The elderly who have received take care from their son are suffering more than the elderly who live with their daughter.

It is found that there is a strong association ($p < 0.00$) between psychological stress and Blood pressure of elderly. The elderly who have unusual BP (low and high) are more suffering more from psychological stress than the elderly whose BP is normal.

It is observed that psychological stress of elderly is significantly ($p < 0.00$) associated with their age. The oldest age group (80+) is suffering more than other groups (Table 3).

Thus it is clear from the analysis that socio economic and demographic characteristics influence the psychological stress of elderly.

A study on depression, anxiety and stress disorders among elderly in Iran indicates that gender, education and marital status are significantly associated with psychological stress (Babazadeh *et al.*, 2016).

It was observed that perceived psychological stress of elderly was significantly associated with gender, marital status, income and treatment compliance (Malathy and Gandhimathi, 2017).

Table 3
Association of Psychological Stress with Selected Socio-demographic Characteristics

Characteristics		Psychological stress		Total	Chi-square value	P-value
		No	*Yes*			
Sex	Female	33 (30.8%)	74 (69.2%)	107 (100%)	7.27	0.01
	Male	130 (45.9%)	153 (54.1%)	283 (100%)		
Marital status	Married	155 (42.2%)	212 (57.8%)	367 (100%)	0.49	0.48
	Unmarried	8 (34.8%)	15 (65.2%)	23 (100%)		

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Religion	Muslim	142 (44.4%)	178 (56.6%)	320 (100%)	4.88	0.03
	Non-Muslim	21 (30%)	49 (70%)	70 (100%)		
Education status	Illiterate	81 (36.8%)	139 (63.2%)	220 (100%)	5.14	0.02
	Literate	82 (48.2%)	88 (51.8%)	170 (100%)		
Family type	Nuclear	68 (45.9%)	80 (54.1%)	148 (100%)	1.67	0.19
	Joint	95 (39.3%)	147 (60.7%)	242 (100%)		
Income	<10000	98 (33.9%)	191 (66.1%)	289 (100%)	29.32	0.00
	10000–19500	43 (61.4%)	27 (38.6%)	70 (100%)		
	>20000	22 (71%)	9 (29%)	31 (100%)		
Age	60–69	120 (50.6%)	117 (49.4%)	237 (100%)	19.52	
	70–79	28 (29.2%)	68 (70.8%)	96 (100%)		0.00
	80 and above	15 (26.3%)	42 (73.7%)	57 (100%)		
BMI	Well nourished	110 (39%)	172 (61%)	282 (100%)	3.47	0.18
	Under nourished	7 (43.8%)	9 (56.2%)	16 (100%)		
	Over weight	46 (50%)	46 (50%)	92 (100%)		
Sleeping pattern	Good	61 (56.5%)	47 (43.5%)	108 (100%)	23.87	0.00
	Not good	43 (27.6%)	113 (72.4%)	156 (100%)		
	Average	59 (46.8%)	67 (53.2%)	126 (100%)		
New take care	Daughter	7 (53.8%)	6 (46.2%)	13 (100%)		
	Son	46 (33.1%)	93 (66.99%)	139 (100%)		
	Self	110 (46.2%)	128 (53.8%)	238 (100%)		
BP	High	50 (34.5%)	95 (65.5%)	145 (100%)	14.19	0.00
	Low	46 (36.8%)	79 (63.2%)	125 (100%)		
	Normal	67 (55.8%)	53 (44.2%)	120 (100%)		
Physical exercise	Regular	40 (39.2%)	62 (60.8%)	102 (100%)	0.38	0.54
	Sometimes	123 (42.7%)	165 (57.3)	288 (100%)		
Smoking habit	Regular	33 (26.4%)	92 (73.6%)	125 (100%)	0.61	0.74
	Not Regular	7 (20.6%)	27 (79.4%)	34 (100%)		
	No Habit	62 (26.8%)	169 (73.2%)	231 (100%)		

Conclusion and Recommendation

This sample profile indicates that majority (60.77%) of the elderly belong to young elderly group. Poor and middle income elderly are more prone to psychological stress. It is found that female elderly suffer from psychological stress more than male elderly. Similarly, Non-Muslim elderly are suffering more than Muslim elderly. It is observed that aged people who are living alone (self) and who are living along with their son are suffering more than the elderly who live with their daughter. Education is significantly associated with psychological stress. The educated elderly are suffering less than illiterate elderly.

The findings of this study may have some policy implications that would help the stakeholders as well as the government to take necessary steps to improve the mental condition of elderly. The elderly may live with their daughter to reduce the psychological stress. The government should take steps to educate aged population in order to lead healthy life.

Acknowledgement

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Geriatric Mental Health in Indian Prospective: Challenges, Research and Management

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ABSTRACT

The aim of this paper is to provide glimpses of demographic scenario of elderly in India and its consequences, need and status of geriatric mental health research. The data was collected from studies published in various journals on the issue. Studies indicate that the number of elderly above 60 years in India will increase to 198 million in 2030. The special features of the elderly population in India are: a majority of them being in the rural areas, feminization of the elderly population, increase in the number of the older-old especially above 80 years and a large percentage of the elderly being below poverty line. It is concluded that the mental morbidity is going to increase in future and there is a need to act quickly by professional and policy makers to focus on research in this area and dissemination of the research findings.

Key words: Elderly, Depression, Dementia, Research, Scale, Therapy.

During the recent years, rapid economic and technological changes have forced the society to adapt to rapid urbanization, industrialization and developments in information and communication technology. Further, the changing social scenario in the name of modernization is influencing the interpersonal relations in a negative manner. The Elderly are most vulnerable and neglected all over the world. Elderly population is highly prone for developing psychiatric morbidities due to ageing of brain, problems with physical health, cerebral pathologies, socio-economic factors such as decrease in economic independence and breakdown of the family support system.

India is the largest democracy of the world. The rapid increase in the proportion and number of older adults (60 years and above) in the population accompanied with the decline in the physiological functions, alteration in psycho-social milieu and deterioration in the quality of life have become the major area of concern for the academicians, clinicians, policy makers, researcher, etc.

Lack of trained professionals, scarce geriatric mental health infrastructure, and dearth of financial resources for geriatric mental health are some of the challenges that our nation faces (Prince, Livingston, & Katona, 2007). Geriatric mental health problems can be accurately diagnosed and effectively treated if help is sought early, but it is erroneously assumed that they are part of "normal aging" (Grover, 2014).

India has nearly 8 per cent senior citizens constituting the population. This is expected to escalate to 11.8 per cent by 2015 to 18.4 per cent by the year 2025. Population projections portray that the growth rate of Indian older adults is comparatively faster than in the other regions of the World including South Central Asia. This is primarily contributing to both proportionate and absolute increase in the population of elderly. The proportion has increased from 5.4 per cent in 1951 to 7.4 per cent in 2001 and increase to 18.4 per cent by 2025 and 21 per cent by 2050, which has been projected to be more than that of the worldwide average. (Sharma AL. 2003). Women in old age are more prone to social insecurity, health problems, and greater emotional, and financial insecurities (Patel, Kirkwood, & Pednekar, *et al.,* 2006; Singh, & Pradhan, 2014). As mentioned above, most of the

elderly live in rural areas and may be poorly educated (Vedantam, Subramanian, Rao, & John 2010).

Prevalence

The one year prevalence of psychiatric disorders (excluding cognitive impairment) among older adults (aged > 65 years) was found to be 13 per cent and the lifetime prevalence was found to be 21 per cent in epidemiological catchment area (ECA) study. It has been hypothesized that the 'real' prevalence rate is 25 per cent higher than that reported and it was projected to be 19.6 per cent (excluding delirium and other mental disorders secondary to general medical condition which are common in the geriatric populations).

Prevalence of Geriatric Psychiatric Disorders in India

Nandi et al., (1997)	*West Bengal*	*1.6%*
Reddy and Chandrasekhar (1998)	All states of India	3.13%
Premarajan et al., (1993)	Pondicherry	17.4%
Tiwari (2000)	Utter Pradesh	43.3%
Chowdhuryand Rasania (2008)	Delhi	49.2%
Tiwari et al., (2009)	Lucknow	17.3%
Seby et al., (2011)	Maharashtra	26.7%
Tiwari and Pandey (2012)	Lucknow	17.3% (U), 23.6% (R)

The prevalence rate has shown a great variation particularly in Indian context. This could be due to great socio-cultural diversity across the regions.

Social Factors and Geriatric Mental Health: Multiple social, psychological, and biological factors determine the level of mental health of a person at any point of time (Sudha, Suchindran, & Mutran, *et al.*, 2006). Older people are more likely to experience some events characteristic of the phase of the life they are in such as bereavement, a drop in socioeconomic status with retirement, or a disability (Kaushal, 2014). The special social challenges of the elderly population in India are as follows:

1. A majority (80%) of them are in the rural areas, thus making service delivery a challenge (Chakrabarti & Sarkar, 2011).

2.   The government pension scheme currently reaches only 2.76 million out of 28 million elderly people, mainly urban (Pal & Palacios, 2011).

3.   Feminization of the elderly population (51% of the elderly population are women; Kalavar & Jamuna, 2011).

4.   Increase in the number of the older-old (persons above 80 years).

5.   A large percentage (30%) of the elderly is below the poverty line (Reddy, *et al.* 2012).

There are several social factors that subliminally or sometimes, directly, affect the mental health of the geriatric age groups as follows:

Retirement: From the next day of retirement, the individual has no work to engage in (physically or mentally), his or her daily schedule is lost, and the motivation to look forward to something is also gone. Retirement brings in a sense of dependency which is not very pleasant to the senior citizen (Adams & Rau, 2011; Bloom, Mahal, Rosenberg, & Sevilla, 2010).

Housing issues: Children no more wish to stay with their aging parents due to the burden of care. In another scenario when housing becomes a challenge for the geriatric age group is when children decide to move in to another space or locality. Psychosocially, adjustment to a new place after having lived in a locality for longer period is a difficult adjustment to make for the elderly (Joshi, Kumar & Avasthi, 2003; Bartels & Naslund, 2013). Modern life style has created barriers for caring of elderly and time has become very precious for everyone in this rat race living condition in society so elderly people are being left unattended in family. Changing family value system, economic compulsions of the children, migration of children, neglect and abuse, etc. have caused elderly to take shelter in old age homes (Panday & Kumar, 2017).

Financial issues: A National Service Scheme (NSS) survey reveals that 12 per cent of the oldest-old, i.e., persons above the age of 80 years are still involved in some economic activity in order to meet their daily needs. Remittances from children are reported as their main source of income, as reported by 49% across the cities in an NSS survey. Most geriatric population finds it difficult to get insurance coverage and therefore have to bear the cost of their health-care

expenses. Several times, the elderly are denied adequate health care due to shortage of funds. Thus, financial dependence has a huge influence on the quality of life for the geriatric individuals (Pati, *et al.,* 2014).

Lack of transport: Many senior citizens from the urban and suburban areas, especially from rural areas, struggle to find reliable transportation. Some households do not have a vehicle, or share one among multiple family members. For those who are disabled, obese, or chronically ill, riding the bus or the subway can be a difficult undertaking (Singh, Kumar & Reddy, 2012).

Psychological factors: In old age people become weaker physically, mental health decline also starts, and financial problems also occur. Elderly people face many psychological issues which are related with coping, quality of life, adjustment, etc. Gender plays important role in these factors. These problems also vary between elderly in old age home and within family setup (Panday, *et al*., 2015, Panday, 2016; Panday & Srivastava, 2017; Panday & Upadhyay, 2019).

Obstacles, Challenges and Policies

There are many barriers for research to be conducted in India, which range from monetary to ethical and permission delivery dilemmas. Primarily, the lack of research can be attributed to the lack of funding from the government to support ongoing research. The Government of India is currently spending < 0.1% of its gross domestic product on geriatric health research and care (Brownson, Colditz & Proctor, 2017). With such little sponsorship, there is a huge lack of national data of the prevalent mental disorders, their epidemiology and impact across different religious, socio-economic, regional, cultural, and ethnic diversity (Helzer, Kraemer & Krueger *et al., 2009*).

The diagnosis of mental disorders in geriatric psychiatry can be particularly difficult. This is primarily because the pre-existing diagnostic criteria are not designed specifically to assess the mental health status of older people and thus leads to either a misdiagnosis of one's condition or leads to no diagnosis at all, leaving the disorder untreated (Azermai, *et al.,* 2012). Lucknow old age homes based study findings show that more than half of the inhabitants of old age homes were suffering from one or other mental health problem, depression being the most common one. The inhabitants suffering from

psychiatric illnesses had one or more associated physical morbidities (Kumar, Das & Rautela, 2011). The primary health-care physicians who visit them are not trained to identify and treat psychiatric issues such as dementia or depression in the elderly, seen in more than 40 per cent–50 per cent of the population (Brijnath & Manderson, 2011). NGOs such as Help Age India, the Age well Foundation, and the Dignity Foundation too are actively contributing, but still efforts are far from reaching to the masses.

Act for senior citizen in India: The Indian government launched the National Program for the Health Care of the Elderly (NPHCE) in 2011, as an implementation of India's international commitments to the UN Conventions on the Rights of Persons with Disabilities and the National Policy on Older Person as well as its national commitments to the Maintenance and Welfare of Parents And Senior Citizens Act, 2007 (World Health Organization, 2008; Murthy, 2011). The main aim of NPHCE is "to provide an easy access to promotional, preventive, curative and rehabilitative services through community based primary health-care approach" (Singh, Shukla & Singh, 2009).

Assessment

There is a number of scales available to assess the effects of psychological morbidity in older people but the use of scale depends on the purpose of assessment. The major relevant clinical domains in old age psychiatry are cognition, behaviour, functioning, mood and quality of life and caregiver burden.

Following are some rating scales:

1. *Geriatric Depression Scale (GDS):* The Hindi version of geriatric depression scale and its 15 item version has been developed and standardized specially for Indian population.

2. *Brief Assessment Schedule Depression Cards System* is interviewer rated test in which patients choose answers from a deck of cards.

3. *Cornell Scale for Depression in Dementia is* a 19 item scale on three point rating. Score > 8 suggests the significant depressive symptoms. It is the best scale to assess the mood in the presence of cognitive of impairment.

4. *Activities of daily living (ADL)* assessed by Bristol Activities of Daily Living Scale, Alzheimer's Disease Functional Assessment and Change Scale, Disability Assessment for Dementia, etc.

5. *Global Measures of Psychiatric Symptomatology* are assessed by Psycho-Geriatric Assessment Scale, Health of the Nation Outcome Scales 65+ and Cambridge Mental Disorders of the Elderly Examination are some of the commonly used scales.

6. For assessment of cognitive impairment various scales like Mini Mental State Examination (MMSE), Mental test score and abbreviated Mental test score, Clock Drawing Test (CDT) and Alzheimer's Disease Assessment Scale (ADAS) are in use.

Psychologiclal Disorder: There are some psychological disorders often seen in the elderly:

(I) *Old Age Depression & Associated Morbidity:* The prevalence of old age depression was found to be 0.9 per cent in Epidemiologic Catchment Area (ECA) study. However, the Indian studies have reported it as high as 53.7 per cent. Most studies have shown that late-onset depression relative to early-onset depression is associated with higher medical morbidity and mortality, greater disability and more neuropsychological abnormalities. Heart disease and cerebrovascular disease are frequently associated with depression. When associated with co-morbid vascular disease, there is greater impairment in frontal function, poorer insight, more psychomotor retardation, agitation and guilt, and more disability along with poor and unstable response to antidepressants. Geriatric patients comprise a particularly vulnerable group as they often have multiple co-existing medical and other psychological problems with depression (Jain & Aras, 2007). Many studies have looked at psycho-social factors associated with geriatric depression. Variables such as female sex, widowed status, nuclear families, unemployment, and stressful life events were found to be associated with geriatric depression (Rajkumar, *et al.,* 2009). Geriatric depression reduces the quality of life and increases the risk of suicide in the elderly. According to a WHO report, "patients over the age of 55 who suffer from depression have a four times higher death rate than those without depression" (Lall & Goyal, 2015).

(II) *Late-life Psychosis:* In old age, organic psychosis is more common than functional psychosis. Factors known to contribute to morbidity in late-life psychosis include level of psychiatric symptomatology, cognition, medical morbidity and disablement. The one-year prevalence of schizophrenia in old age has been found to be 0.2 per cent in ECA study. Other epidemiological studies found the 1-year prevalence of schizophrenia and related disorders to be 4.44 per 1000 to 7.1 per 1000 of the population (Meesters, Haan & Comijs *et al.,* 2012).

(III) *Dementia:* There were 3.7 million Indians with dementia in the year 2010 and the number is expected to double by 2030. The total societal impairment cost is about Rs 14,700 crore[1]. Eight large-scale epidemiological studies have indicated that prevalence for dementia for those aged >85 years in India ranges from 18 per cent to 38 per cent and, in those >90 years, it ranges from 28 per cent to 44 per cent (Kalaria *et al.,* 2008). Prevalence of mild cognitive impairment was found to be 14.89 per cent (Das, Bose & Biawas *et al.,* 2007).

(IV) *Geriatric substance abuse:* Substance abuse in patients aged 65 years and above is often underestimated and underdiagnosed, which can prevent them from getting the help they need (Murthy, Manjunatha & Subodh, *et al.,* 2010). The Family Health Survey of India (1998–1999) reported that regular consumption of alcohol was 18.6 per cent prevalent in elderly men and 3.1 per cent prevalent in elderly women. The prevalence of alcohol consumption among the elderly between the ages of 60 and 64 years was found to be 25.4 per cent, which declined to 10.5 per cent in the older cohort consisting of the elderly above the age of 75 (Benegal, 2005). Some reasons that the elderly take to drinking include retirement, financials rains, relocation, troubled sleep, familial conflicts, and physical or mental health degradation. Conclusively, the data are indicative of the fact that geriatric communities are extremely vulnerable to substance abuse like other socio-psychological problems (Sacco, Bucholz & Spitznagel, 2009).

(V) *Suicide in the elderly:* The ratio of completed suicide to attempted suicide for elderly in India is 1:7 (Radhakrishnan & Andrade, 2012). Among the elderly, isolation and loneliness, loss of economic independence, and reduced social activity contribute to

negative thought patterns (Jacob, 2008). Postmortem autopsy studies have revealed that between 71 per cent and 95 per cent of the elderly who completed suicide had been diagnosed with at least one mental disorder. The presence of serious, chronic medical illnesses is also considered to be a risk factor for elderly suicide (Shah, Bhat, MacKenzie & Koen, 2008).

Management

1. *Behavioral Therapy:* Behavioral therapy is based on a period of detailed assessment in which the triggers, behaviors and reinforces (also known as the ABC: antecedents, behaviors and consequences) are identified and their relationships made clear to the patient. Interventions are then based on an analysis of these findings. The efficacy of behavioral therapy has been demon-strated in the context of dementia in only a small number of studies.

2. *Reality Orientation:* Reality orientation is one of the most widely used management strategies by mental health professional for dealing with individual with dementia. The aim of this therapy is to provide help to those people who have problems with memory loss and disorientation by reminding them of facts about themselves and their environment. In this therapy mental health professionals work to help individuals with memory loss. Persons facing problems of memory loss are oriented to their environment with the help of using a range of materials and activ-ities. In this therapy, therapists consistently use orientation devices such as signposts, notices and other memory aids for improving orientation of individual.

3. *Validation Therapy:* Every human has need for validation and necessity of feeling love and acceptance. Validation therapy is based on therapeutic communication which can be used to connect with person who has moderate to late-stage dementia. This therapy gives more emphasis on the emotional aspect of a conversation and less on the factual content, thereby imparting respect to the person, their feelings and their beliefs.

4. *Reminiscence Therapy:* Reminiscence Therapy involves the discussion of past activities, events and experiences of an

individual with another person or group. Therapists use the old memory of an individual such as photographs, household, family holidays, wedding and other familiar items from the past, music and archive sound recordings.

5. *Incorporating religion and spirituality into geriatric mental health care:* Elders with greater religiosity were report more likely to good health status in various studies, and a positive association between organized religiosity (i.e., religious service attendance) and health status has been found (Agrawal, *et al.*, 2011).

6. *Rehabilitation facilities for the elderly and interventions in old-age homes:* Several types of early intervention for health and social services are in practice today (and can be accommodated in our country), as follows:

   (i) *Community based interventions:* These services also strive to give a greater degree of functional ability and independence. A challenge that remains is to have cost-effective programs (Jacob, Abraham, Abraham & Jacob, 2007).

   (ii) *Outpatient clinics:* These clinics are important for assessment and follow-up of mobile, geriatric patients.

   (iii) *Domiciliary visits:* Increasingly, assessments and treatments are offered in the patient's home; domiciliary visits also reduce the rate of hospital admissions (Dias, *et al.,* 2008).

   (iv) *Geriatric day care:* There are few day-care services by NGOs in India (i.e., Help Age India) and also state governments.

   (v) *Other forms of rehabilitation:*

      (a) *Residential care and nursing care:* The residents in both setups face more cognitive impairment, depression, and behavioral disturbances. Training the assistants and nurses can improve the functional ability of the residents

      (b) *Hospital care:* This may be either acute or a long-term care–depending on the purpose of admission.

      (c) *Respite care:* It involves care given to the elderly so that caregivers can take time off to relax or take care of their other responsibilities. Review scanning suggest that

respite care decreases family stress and improves family functioning, life satisfaction, attitudes toward family members with disabilities, and the physical and emotional health of the elderly.

(d) Home-based setups: In developing country elderly currently receive informal care often provided by spouses, adult children, and other family members and they are accounted for this. There are a few community-based health care-providing NGOs in India. The lack of community-based mental health-care services is a challenge for geriatric as mental health it hinders adequate care for the elderly and also increases their chance of developing mental disorders (Patel & Thara 2003).

In the Indian context, there is a dire need for the following:

1. *Free or subsidized memory clinics* for the underprivileged would be particularly helpful, as would free or subsidized medicine, the naming, positioning, and publicity of the clinic should take into account the current pathetic awareness about dementia in India.

2. *Remove stigma:* People assumed that a memory clinic is only for memory problems; they do not visit it for cognitive problems if there is no predominant memory problem.

3. *Families repeated visit* to clinic is a major challenge in India.

4. *Special care* needs to be taken while conveying the diagnosis initially as many families may not come for the next visit, the clinic may need to design and implement several processes it needs.

5. It may have to prepare or procure material required for its functioning:

   (i) Keeping in mind the societal environment and the target audience,

   (ii) Modified instruments and procedures for checking cognitive status (such as tests in local languages and tests for illiterate persons),

(iii) Treatment pathway, communication conventions, and counseling approach that take into account the need for overcoming stigma and myths and for reinforcing the diagnosis, possibly through repeated sessions,

(iv) Active publicity and myth-busting in the localities may be needed to make people aware that the clinic can be useful to them, use of the existing patient base and inpatient wards of hospitals to identify persons who may benefit from memory clinics.

(v) Awareness material and caregiver training modules suitable for the literacy and language proficiency of the target audience.

(v). Some materials should be usable to convince friends and neighbors about the diagnosis, more outreach efforts may be needed.

(vii) As families may not think of coming to the clinic, you may need to actively reach out to families that may need help.

6. Health education should aim to educate health workers and the community, to recognize the common symptoms of mental disorders and, in particular, to stress that depression and dementia are real disorders and not just the natural consequences of ageing.

7. The promotion of gerontology/geriatric medicine within Indian medical schools is an important agenda.

8. Mental health professional who works with older people must be especially aware of their own attitude toward the aging process and toward older people. Mental health professional must have an optimistic view of the last stage of life and genuine belief that older people have a right place in society and they are a reservoir of wisdom from their accumulated years of experience which will enable them to change (Kumar, Gupta, Kumar, Nehra & Nebhinani, 2012).

9. Specially psychiatric social work professional play wider role like:

(i)   Prevention of social dysfunction like abandonment of old age people, family problem, and human right violation against old age people through providing education, promoting awareness campaigns, social networking and family intervention.

(ii) Perform psycho-social assessment of inmates for effective service delivery. Assessment must cover the areas like psychological and emotional well-being, family, coping mechanism, risk assessment for depression, suicide and anxiety.

(iii) Provide psychological intervention like education, stress management, coping skill training, emotional support and combination therapies.

(iv) Creating social support from the community for the effective function of old age home.

(v)   Enhance and conduct multidisciplinary research relating to psychological and social perspectives in geriatric social work.

(vi) Pooling out of resources to effective functions of old age homes (Rajeev & Ajikumar, 2015).

Conclusion

For the past few years, research in the area of geriatric mental health has become increasingly popular. It's true that minimum recognition of the geriatric mental health, distinct clinical subject, and non-availability of infrastructure, poorly validated research data and indifferent academics are contributing to less involvement in research activities in this area. The number of old people and hence mental morbidity is going to increase in future and there is a need to act quickly by professionals and policy makers to focus on research in this area and dissemination of the research findings.

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Health Status of The Elderly: Pradicaments and Prospects in Urban Odisha

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ABSTRACT

In this paper an attempt was made to appraise the health status of the elderly with a view to explore the extent of family support in caring the elderly in urban areas of Odisha. The data for this purpose was gathered from randomly selected 204 (male = 108 and female = 98) elderly, sixty years and above. A questionnaire containing questions on three aspects of health, namely, ailment, medical treatment undergone by elderly and disabilities experienced by elderly was administered to the subjects individually. The evidence on ailment provides the incidence of illness among the elderly male and female. The information on disability gives the disabilities status in terms of visual, hearing, and locomotors disabilities. The information on medical treatment undergone provides nature and type of surgery of the elderly concerning their current health status.

Key words: Ageing, Ailments, Urban Family, Elderly, Quality of Life

Ageing is greatly associated with escalating health issues aggravated by increasing physiological changes and social isolation and dependency. Therefore, the international community and national policies and programs are tuned to provide greater access to healthcare by way of medical facilities, insurance, and social security. In the

backdrop of the significance of caring the elderly in the light of their growing proportion of population in the contemporary society, this paper attempts to inquire into the health issues, medical treatment and disabilities experienced by the aged people in the city of Bhubaneswar in Odisha. The total population of elderly is 9.5 per cent of total population of Odisha and in every 10 old people one is suffering from neglect, abuse by family. Due to negligence of offspring towards elderly; majority of elderly are living lonely life (Shah 1999; Behura and Mohanty 2000; Alam M 2006). Increase of aged population is one of the important accomplishments and most substantial features of the twenty-first century, which replicates the achievement of the process of human progress. Most important improvements in quality of diet, hygiene, medication, healthiness maintenance, educational knowledge and socio-economic support in general have made it possible for individuals to be alive longer. Growing life expectancy at birth and prolonged lifetime productiveness due to development in healthiness and medicinal services are the crucial factors driving "demographic transition". Elderly look forward for new prospects and scope as well as challenges. On the one side, it is accompanying with the active contribution of elder generations in both financial and social aspect to a great extent, on the other side, it postures various challenges and tasks. In emerging countries like India, charges of health-care structures, incorporation of elderly individuals as active mediators of social improvement and establishment of social safety systems to guarantee good physical shape and quality life in the years additional to elderly people's survives pose phenomenal challenges and tasks (Knodel, J. and Napaporn C. 1997). It has been broadly accepted that better health status is crucial to endorse active ageing. Good physical healthiness is not only about the nonappearance of ailment but progressively about a good quality of life particularly for the elderly individual. As the percentage of elderly individuals is growing internationally, the World Health Organization has termed for 'adding life to years', which is an obvious acknowledgement of the significance of Quality of Life (QOL) in accumulation to longevity for elderly people (WHOQOL 1997, WHO 2015). Active living longer and fitness convey great potential for financial and social growth and for individual fulfilment (UN, 2015). However, to appreciate that prospective, civilized human

beings everywhere feal the obligation to guarantee that old individuals have the means and care required for an excellence of life in the additional years.

The contemporary trend observed all over the world is the steady increase in the all proportions of elderly in the human population. They are vulnerable to several health issues and ailments due to psychological and biological predicaments. Hence, gerontologist in particular and social scientists in general have paid greater attention to the study of health status of the elderly.

Methodology

In this paper an attempt has been made to appraise the health status of the elderly with a view to explore the extent of family support in caring the elderly in urban areas. The data for this purpose was gathered through sample survey of 204 elderly and in the survey, questions were asked on three aspects of health, namely, ailment, medical treatment undergone by elderly and disabilities experienced by elderly. The evidence on ailment provides the incidence of illness among the elderly male and female. The information on disability gives the disabilities status in terms of visual, hearing, and locomotors disabilities. The information on medical treatment undergone provides nature and type of surgery of the elderly concerning their current health status.

Physical Disability: Disability related to walking, hearing, seeing and hand problem among the elderly has been measured in this survey.

Ailment among the Elderly: Illness among the elderly is one of the important indicators of their current health status. Illness suffered by the elderly during the time of interview is reflected here. The illnesses are blood pressure, Gastro esophageal, Diabetes and other problems such as cardiac problems, arthritis, kidney problems, asthma and paralysis.

The broad objective of this study is to examine the health challenges faced by the elderly with specific focus on the following:

1. To analyze the ailments affecting the elderly.
2. To find out the nature and type of medical treatment undergone by the elderly

3. To bring out the nature of disabilities experienced by the elderly.

Quantitative and qualitative data for this study was collected through face to face interaction with the elderly. Quantitative data was obtained through a sample survey conducted among the elderly of Bhubaneswar city in Odisha. This data was subjected to SPSS analysis. The survey data was also supplemented by qualitative data gathered through in-depth interview with elderly male and female respondents.

Gender Analysis of Health Status of Elderly in Urban Odisha

Social scientist propound that gender is an important variable in understanding of health status of elderly in general and status of health of elderly in particular. This is because gender is perhaps a major dimension that determines the nature of health issues, distribution of health care services and access to medical care. In the backdrop of the significance of gender in determining the nature and extent of wellbeing. This paper adopts a general perspective to inquire into the health status of elderly in urban Odisha.

Ailments of Elderly in Urban Odisha

Increasing age is associated with the occurrence of different types of ailments induced by physical, psychological and social conditions. The following chart depicts the data:

Figures 1
Graphical Representation Ailments of Elderly in Urban Odisha
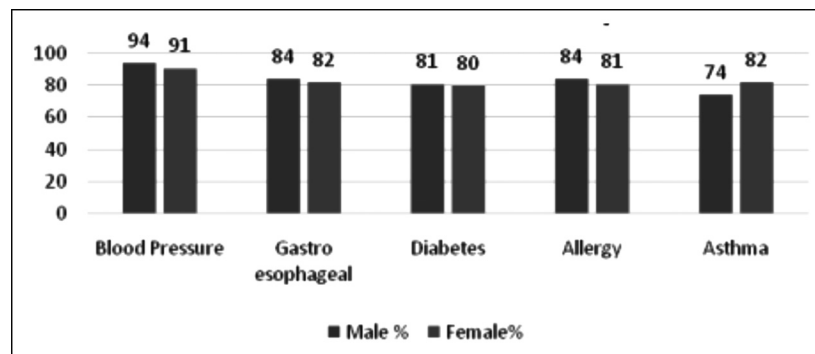
From above chart Figure 1 it is clear that irrespective of other factors majority of elderly suffer from chronic diseases. The highest percentage of suffering is in blood pressure because of their increase in age constraint. As we know the symptoms of asthma include shortness of breath, wheezing, coughing, and tightness in the chest. From the data it is shown that the percentage of females suffering from asthma is higher than the male counterparts because of involvement of female in domestic and cooking activities in unsuitable socio-environmental condition.

Surgery undergone by elderly in urban Odisha

Passage of years of life entails different encounters that cause damage to the health of an individual (Bali 1995). In order to overcome such exigencies medical treatment by way of surgery became necessary. The following table provide the data:

Table 1
Gender wise Surgery Undergone by Elderly

Gender	Surgery undergone		Total
	No	*Yes*	
Male	47	59	106
Female	46	52	98
Total	97	107	204

From the Table 2 we can say that considerable proportion of elderly have undergone medical surgery irrespective of gender factor in old age.

Disabilities of Elderly in Urban Odisha

Ageing is associated with gradual decline in the functionality of individual. Ageing is an inevitable process of demographic transition (Rajan 2016). Hence, the elderly experiencing declining function of their organs are likely to experience different extent of disability. The following table describes the nature and extent of disabilities:

Table 2
Gender wise Disabilities Experienced by Elderly

Gender	Disabilities experienced					Total
	Visual	*Hearing*	*Leg problem*	*Hand problem*	*Mental Depression*	
Male	23	22	10	11	40	106
Female	20	36	13	3	26	98
Total	43	58	23	14	66	204

From the Table 2 it is clear that majority of elderly suffer from one or more disabilities in respect to growing age irrespective of gender.

From the graph fig–3 it shows that the mental depression among elderly is high. We may think of disability as physical, but mental health problems can cause depression and impact physical work. Depression, bipolar disorder, and other conditions can be as disabling as any physical illness to elderly. Hence, mental health problems are the most common reason that elderly people file for Social Security disability.

Family and Public Support Towards Elderly

Family is the fundamental unit of society that provides social security to its members (Patel 2005). The elderly as they are crippled by age in addition to facing health problem are in utmost need of family support which could be either from spouse, offspring, in-laws and grandchildren. The following table elucidates the nature of family support to the elderly in facing health problem:

Table 3
Gender wise Elderly gets Support in Going to Hospital

Gender	Assisting you in going to Bank Hospital				Total
	Never	*Friends or neighbors*	*Family members*	*Self alone*	
Male	4	10	41	51	106
Female	5	9	42	42	98
Total	9	19	83	93	204

From the above Table 3 it shows that to go to hospital elderly get less support from society and family members. From the graph Figure 4 shows most of the elderly people go alone to hospital and their health status gets more deteriorated because of lack of any other psychological, physical and financial support from society in general and family in particular. Fewer children are available to support elderly parents and high numbers of older women experience loneliness within the family (Giridhar, 2014)

Conclusion

This study has brought to light the fact that all the elderly surveyed are afflicted by one or more ailments, a majority of them suffer from one or other form of disability and a sizeable proportion of them have undergone medical surgery. Older females from urban areas have low level health status and family support as compared to their male counterparts. Depression, bipolar disorder, and other conditions can be as disabling as any physical illness to elderly. Hence, mental health problems are the most common reason that elderly people file for Social Security disability.

Most of the elderly have to go out alone to hospital, bank or any personal work and their health status gets more deteriorated because of lack of psychological, physical and financial support from society in general and family in particular.

In this overall context, the general challenges that the elderly population faces are many. To begin with, it has its socio-economic implications. To alleviate this, the society will have to shoulder the responsibility of taking care and providing quality life to its elderly population, failing which this section of society will become helpless.

However, a detailed inquiry into this phenomenon elucidates the economic status of the elderly as well as his or her family support are to a greater extent found to be the major determinants of the health status of the elderly in urban society.

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Assessing Home Safety in Homebound Older Adults belonging to Upper and Middle Socio-economic Status

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ABSTRACT

The purpose of this study was to perform home safety assessment among home dwelling 100 older individuals of both genders (50 males and 50 females), age varying from 60 yrs to 80 yrs, belonging to upper and middles classes of socio-economic status. Their socio-economic status was determined by using Kuppuswamy's Socio-economic status Scale. These participants were administered BI (The Barthel Index) and Home safety tool individually. The findings of the current study revealed that the home-dwelling elderly participants of this study were moderately dependent on their caregivers in performing activities of daily living, required supervised assistance and increased effort while performing normal activities in and around the house with minimal difficulty. Majority of the respondents of this study did not use/require any assistive devices while performing ADL and were unaware about the solutions that can help improve their safety and reduce the difficulty faced by them.

Key words: Geriatric Population, Homebound, Socio-economic status, Home safety

In homebound older adults, their major priority is living independently. They reside in houses either with their spouses, family or alone. Independent living is often associated with mental and physical impairments. Risk for falls and unintentional injury is often associated with various symptoms such as chronic illnesses, decreased mobility, weakened vision, balance and strength affection, and increased risk factors within the home setting such as environmental (including internal and external) risk factors (Tanner, E.K., 2003).

Subsequent falls of about 45 per cent are very common in those who have had previous falls and one-third of total elderly population fall at least once each year (Rubenstein, L.Z., 1995). Mortality, diminished functional ability or permanent loss of independent living are common results of unintentional injury caused by falls.

Assessment of homes and surroundings is important to assess risk factors leading to falls in older adults and also for prevention of falls to promote independent living for as long as possible (Tanner, E.K., 2003).

Previous studies had various limitations as most of the studies had small sample size, high dropout rates or checklists were not clearly defined. Many studies have been conducted in different parts of the world but not many studies are found to be conducted on Indian Geriatric Population. Therefore, this study focuses on performing home assessments. It presents the purposes of home assessments, including internal and external environmental safety assessment, history of falls, use of personal precautionary techniques, risk and preparation for fire and disasters, and risk of crime. The classification of components of home safety assessment is based on findings of Elizabeth Tanner (2003).

All community based studies focus on socio-economic stratification as this is the key to understand affordability of health services, amenities and the ability to purchase things. When it is taken as a summation of education, occupation and income it reflects the value system expected for that level of education and occupation. Income is parallel to standard of living. Socio Economic Status (SES) is an established determinant of health. Kuppuswamy's socio-economic status scale is an important tool in hospital and community based research in

India which was originally proposed in 1976 (Kuppuswamy, B., 1981and Kumar, B.R., *et al.,* 2013).

Objectives of the Study

This study was conducted to assess the extent of assistance required, difficulty in doing ADL activities in and around the house, the equipment used/required for maintaining safety and reducing the risk of falls and physical safety which would enable home dwelling elderly persons to further reduce the risk of falls.

Method

Sample

The present cross sectional study was conducted with the aim to find out home safety assessments amongst home dwelling older individuals to prevent or reduce the risk of falls. For this purpose 100 home dwelling older individuals (50 male and 50 female) age varying from 60 to 80yrs. These elderly persons were residing in homes either alone or with family members. Institutionalized elderly and elderly belonging to lower Socio-economic status were excluded from this study.

Tools Used

1.	Kuppuswamy's Socio-economic status Scale was used to determine the socio-economic status of the participants.

2.	The Barthel Index (BI) was used to measure independence in the *activities of daily living* (ADLs) It measures the patient's daily functioning, specifically the activities of daily living (ADL) and mobility (Mahoney, F.I., 1965). Barthel index score was examined for each participant to assess his activities of daily living.

3.	Home Safety Assessment Tool (Tanner, E.K., 2013). The components of the Home Safety Assessment Tool are categorized into the following subscales: (1) Risk for Falls: External Factors (19 questions), (2) Risk for Falls: Internal Factors (2 questions), (3) History of Falls (2 questions), (4) Risk for Injury: Use of Personal Precautions (12 questions), (5) Risk and Preparation for Fire and Disasters (10 questions), (6) Risk for Crime (5 questions). Each

question is responded either as No or yes or N/A. The sub scale-Risk for Falls: External Factors is important to assess areas of risk.

Methodology

Each participant was informed about the purpose of the study and was asked to give a written consent prior to participation in the study. Consenting participants were then enrolled in the study. Thereafter an appointment was fixed for the investigator's visit to collect the data. The principal investigator visited homes in which dwell older adults. The researchers interviewed and assessed home safety of participants by using a home safety tool. The demographic details were collected from the participants and safety assessment was done by the therapist herself. Assistance was taken from the family members. In case of older individuals residing alone, assistance for filling the tool was obtained from the subjects themselves.

By using Kuppuswamy's Socio-Economic Status Scale the socio economic status was determined and they were classified as belonging to Upper and Middle Classes (upper middle and lower middle).

The functional independence of each individual was examined by using Barthel index. BI has 10 areas of activity viz., feeding, bathing, grooming, dressing, bowel, bladder, toilet use, transfers (from bed to chair and back), mobility (on level surfaces), and stairs. Total score may be from 0 to 100 in this scale. The scores ranging from 0–20 indicates "total" dependency, 21–60 indicate "severe" dependency, 61–90 indicate "moderate" dependency, and 91–99 indicates "slight" dependency (Shah, S., *et al.*, 1989). Low scores on individual items highlight areas of need.

All data collection described herein was approved by the institutional Ethics committee of School of Physiotherapy, D.Y. Patil Deemed to be University, Nerul, Navi Mumbai

Result

Table 1 describes the demographic details of the study.

Table 1
Demographic Details of Participants

Age group	No. of subjects
60–65	21
65–70	22
70–75	19
75–80	13
80–85	15
85–90	10
Total	100
Gender	
Male	50
Female	50
Total	100

Socio-economic status	
Class I	24
Class II	46
Class III	30
Total	100

Table 2 presents the BI scores of the subjects

Table 2
Barthel Index Scores of the elderly of this study

Barthel Score	Number of People
0–20	0
21–60	9
61–90	55
91–99	8
100	28
Total	100

As shown in Table 2, dependency of geriatric individuals was found out by using The Barthel ADL Index which suggests that

maximum number of geriatrics were moderately dependent on their care givers.

The Home Safety Assessment questionnaire comprised 4 Domains. Every domain had 6 sections. Every section in-turn had a number of questions which the subjects answered individually. The total score of each section in Assistance Domain of the questionnaire was 7; likewise, Difficulty domain was 4, Equipment and Safety domains were 2 each. At completion of the questionnaire, all the scores in each section were averaged. The final score of each Domain was then calculated as an average of each section scores. 100 geriatric subjects presented with varied scores in all the sections. Therefore, the total score of the 4 domain were classified in frequency intervals as shown in Table 3.

Average scores of each section of each domain of the question-naire were taken. It was observed that in the Assistance domain maximum assistance was required in the section 5 which included questions of Risk and Preparation for Fire and Disasters and least being required in sections 2 (Risk for Falls: Internal Factors) and 3 (History of falls) equally which suggests that minimal assistance (up to 25%) is required in section 5(Risk and Preparation for Fire and Disasters) of the Assistance domain. It was observed that in the second domain i.e., Difficulty, maximum difficulty was faced by the individual in section 5 (Risk and Preparation for Fire and Disasters) of the domain which suggests that minimal to moderate difficulty was faced by the subjects in this section. Equipment score in each domain is equal which suggests that people using equipment required equipment in all sections and those who didn't require equipment didn't use equipment in any section. It was observed that the in the Safety domain, maximum factors that were observed to be unsafe belonged to sections 3(History of Falls), 5 (Risk and Preparation for Fire and Disasters) and 6(Risk for Crime) equally which suggests that maximum modifications are required in these sections.

Average scores of each domain of the questionnaire were calcu-lated, as shown in Table 3 and Graph 1. It was observed that average score for assistance was 6.01 out of 7 which suggests that supervised assistance is required by most of the elderly people. The average score for difficulty was 3.34 out of 4 which suggests that increased effort is

required to perform normal activities in and around the house with minimal difficulty. Average score for equipment is 1.7 out of 2 which suggests that majority of people do not use any equipment in and around the house even though they have difficulty and using of the equipment may reduce the difficulty. The average score for safety is 1.66 out of 2 which suggests that most of the factors are ideal and safe to prevent or reduce falls.

Table 3
Average of Domain of the Questionnaire

Domains	Total average scores of each Section						Average Domain Score
	1	2	3	4	5	6	
Assistance score	6.3	6.5	6.5	6.3	4.7	5.8	6.01
Difficulty Score	3.4	3.5	3.5	3.6	2.6	3.5	3.34
Equipment Score	1.7	1.7	1.7	1.7	1.7	1.7	1.70
Safety Score	1.7	1.7	1.6	1.8	1.6	1.6	1.66

Further, each section and domain scores were classified according to frequency intervals so as to find the number of subjects presenting with similar scores. Table 4 shows the number of subjects in each section of the domain and their score intervals.

Graph 1
Average scores of the various domains of the questionnaire assessing the home safety amongst elderly population
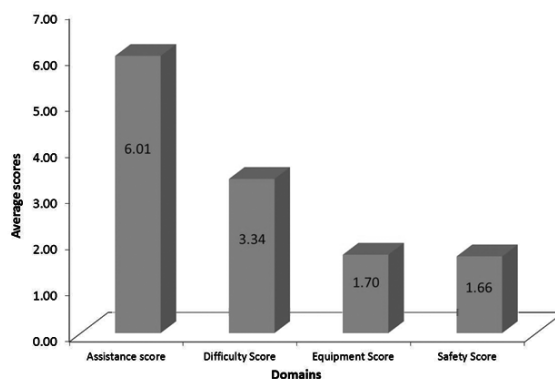
Table 4
Number of subjects and their score intervals in each section
and domain of the questionnaire

Domains	Score interval	Sections					
Assistance		1	2	3	4	5	6
	1–2	1	0	0	0	1	0
	2–3	1	0	2	1	1	1
	3–4	1	2	2	2	4	3
	4–5	5	1	1	4	43	8
	5–6	17	6	6	15	45	27
	6–7	72	45	24	47	4	50
	7–8	3	46	65	31	2	11
Total (n)		100	100	100	100	100	100
Difficulty	1–2	1	1	0	2	2	1
	2–3	11	3	5	4	73	9
	3–4	87	87	63	86	25	88
	4–5	1	9	32	8	0	2
Total (n)		100	100	100	100	100	100
Equipment	1–2	30	30	30	30	30	30
	2–3	70	70	70	70	70	70
Total (n)		100	100	100	100	100	100
Safety	1–2	98	87	71	72	100	93
	2–3	2	13	29	28	0	7
Total (n)		100	100	100	100	100	100

In the current study for the Assistance domain, Section 1 dealing with architectural details outside and inside the house, it was observed that 72 people had an assistance score ranging in class interval 6–7, 17 people had scores ranging in class interval 5–6, 5 in class interval 4–5, followed by people in class 7–8 and 1 in class intervals 3–4 and 1–2 each. Section 2 of Assistance Domain dealing with internal risk factors for falls, depicted that 46 people had their assistance score ranging in class interval 7–8, 45 people in class interval 6–7, 6 people having their scores in interval 5–6, 2 in class 3–4 and 1 in class interval 4–5. In Section 3 of Assistance Domain dealing with history of falls, it was

observed that 65 people had their assistance score ranging in class interval 7–8, 24 people in class interval 6–7, 6 in class interval 1–2, 2 in class intervals 2–3 and 3–4 each and 1 in class interval 4–5. In section 4 of Assistance Score, dealing with use of personal precautions which causes risk of injury, it was observed that 47 people had their assistance score ranging in class interval 6–7, 31 had their scores ranging in class interval 7–8, 15 in class interval 5–6, 4 in class interval 4–5, 2 in class interval 3–4 and 1 in class 2–3. In Section 5 of the Assistance Domain dealing with Risk and preparation for fire and disaster, it was observed that 45 people had their assistance score ranging in class interval 5–6, 43 had their scores in class interval 4–5, 4 in class intervals 6–7 and 3–4 each, 2 in class interval 7–8 and 1 in class interval 1–2. In Section 6 of the Assistance Domain dealing with Risk of Crime, it was observed that 50 people had their assistance score ranging in class interval 6–7, followed by 27 people had their scores in class interval 5–6, 11 having their scores in class interval 7–8, 8 in class interval 4–5, 3 in class interval 3–4 and 1 in class interval 2–3.

For the Difficulty Domain, Section 1 dealing with architectural details outside and inside the house, it was observed that 87 people had difficulty score ranging in class 3–4 followed by 11 people had scores ranging from 2–3 and 1 person each had scores in class intervals 1–2 and 4–5 each. Section 2 of Difficulty Domain dealing with internal risk factors for falls, depicted that 87 people had scores in class interval 3–4, 9 people's score ranges in class interval 4–5, followed by 3 in class interval 2–3 and 1 in class interval 1–2. Section 3 of Difficulty Domain dealing with history of falls, it was observed that of 63 people had score ranging in class interval 3–4, 32 people in class interval 4–5, followed by 5 in class interval 2–3. In section 4 of Difficulty Score, dealing with use of personal precautions which causes risk of injury, it was observed that 86 people had scores ranging in class interval 3–4, followed by 8 people's score ranging in class interval 4–5, 4 in class interval 2–3 and 2 in class interval 1–2. In Section 5 of the Difficulty Domain dealing with Risk and preparation for fire and disaster, it was observed that 73 people had scores ranging in class interval 2–3, 25 in class interval 3–4, followed by 2 in class interval 1–2. In Section 6 of the Difficulty Domain dealing with Risk of Crime, it was observed that that 88 people had their difficulty score ranging in class interval

3–4, 9 in class interval 2–3, 2 in class interval 4–5 and 1 in class interval 1–2.

For the Equipment Domain, Section 1 dealing with architectural details outside and inside the house, it was observed that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2. Section 2 of Equipment Domain dealing with internal risk factors for falls, depicted that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2. Section 3 of Equipment Domain dealing with history of falls, depicted that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2. In section 4 of Equipment Score, dealing with use of personal precautions which causes risk of injury, depicted that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2. In Section 5 of the Equipment Domain dealing with Risk and preparation for fire and disaster depicted that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2. In Section 6 of the Equipment Domain dealing with Risk of Crime, depicted that 70 people had their equipment score ranging in class interval 2–3 followed by 30 people's score ranging in class interval 1–2.

For the Safety Domain, Section 1 dealing with architectural details outside and inside the house, it was observed that of 98 people had their scores ranging in class interval 1–2, followed by 2 people's score ranging in class interval 2–3. Section 2 of Safety Domain, dealing with internal risk factors for falls, depicted that 87 people had their scores ranging in class interval 1–2, followed by 13 in class interval 2–3. Section 3 of Safety Domain dealing with history of falls, it was observed that 71 people had scores ranging in class interval 1–2, followed by 29 people in class interval 2–3. In section 4 of Safety Score, dealing with use of personal precautions which causes risk of injury, it was observed that 72 people had scores ranging in class interval 1–2, followed by 28 people in class interval 2–3. In Section 5 of the Safety Domain dealing with Risk and preparation for fire and disaster, it was observed that all 100 of people had their score ranging in class interval 1–2. In Section 6 of the Safety Domain dealing with Risk of Crime, it

was observed that 93 people had score ranging in class interval 1–2, followed by 7 people in class interval 2–3.

Discussion

Home safety assessment for prevention of risks of fall was conducted in the present research study amongst 100 home dwelling older individuals between the age group 60 to 90 years of age. Most home care providers agreed that any reduction in falls is worth the amount of time required to perform a home assessment and make recommendations for home modifications (Anemaet, WK *et al.,* 1999). The home dwelling older adults in this study belonged to Upper and Middle Socio-economic class who needed some assistance and had diffi-culty in at least some of the ADL activities such as bathing, working in kitchen, housekeeping, etc. According to the Barthel's Index, maximum individuals required moderate dependency on their care givers.

The average score of Assistance Domain suggests that most of the people needed supervised assistance. Majority of geriatrics had moderate dependency on their caregivers in performing activities of daily living and required supervised assistance. Mainly they required Assistance or were unable to perform activities in Section 5 (Risk and Preparation for Fire and Disaster). A study carried out by Elizabeth K. Tanner suggests that SSC 5 indicated that most participants were at low or no risk for fire, yet 28.4 per cent were poorly prepared to respond to fire or disaster. [Tanner EK, 2013]Whereas in India most of them didn't have any access to Fire extinguisher and majority buildings or apartments didn't have smoke detectors present. Many of them didn't have any emergency exit plans to escape fire from their house or their buildings. It was observed that in newer constructed buildings, the availability of fire extinguishers and emergency exit plan was more effective.

The average score of Difficulty Domain suggests that that there was increased effort required performing normal activities in and around the house with minimal difficulty. Maximum difficulty was faced in Section 5 (Risk and Preparation for Fire and Disaster) because they were unable to do it as they had no smoke detectors, fire extin-guisher or emergency exit plan. Other major difficulty faced by most

of the geriatrics was observed while getting in and out of the toilets and bed. All of them had western sitting toilet and thus didn't have any major difficulty using it but had difficulty while getting up and sitting because of unavailability or unawareness about use of grab bars which would reduce the difficulty. Majority had history of falls in bathroom area because of slippery flooring and unavailability of grab bars.

It was also observed that most of the participants didn't use/require any Assistive devices while performing ADL activities. Majority of them had difficulty in Performing ADL which could be reduced if Assistive devices were used. Majority were unaware about the solutions that can help improve their safety and reduce the difficulty faced by them. They could function independently if they made use of Assistive devices and other equipment appropriately. Energy expenditure for day to day activities can be decreased with use of assistive device and adaptive equipments (Bynum, H.S., *et al.,* 1987; Arborelius, U.P., *et al*., 1992). Even though it is suggested by their care givers that using of assistive device would reduce the difficulty and improve their functional activities, they do not have acceptance for it but in turn reduce or avoid performing the activities that cause or increase difficulty for, e.g., some choose to avoid going down for walk and would prefer walking in the house because of unavailability of lifts in the building rather than using a cane which decrease the energy expenditure and difficulty levels. Some people couldn't use appropriate assistive device because of the architectural barrier because of narrow doorways or bathroom doors. However, adaptive equipment use may be limited if architectural barrier exists (Anemaet, W.K., *et al.,* 1999). Even though the required moderate dependency on their care giver and difficulty faced by them can be drastically reduced if they use appropriate assistive devices, most of the people refuse to accept the use of the devices because of their mentalities.

The average score of Safety Domain suggested that overall Safety score of majority people is close to Safe and if taken proper care, the risk of falls can be further reduced. The safety score of majority of people was affected in Sections 3(History of Falls), 5(Risk and Preparation for Fire and Disaster) and Section 6(Risk of Crime). Mainly in section 4 because of unavailability of fire extinguishers, smoke

detectors, emergency exit plan as mentioned above. Other factors affecting safety score are unavailability of step tool, safety doors and unstable chairs and foot mats. Unawareness and availability of grab bars in the bathroom was observed to be major cause of falls in the bathroom, if they were available, the falls could have been prevented and the incidence of falls in the bathroom area would reduce drastically. A study done by B.S. Leclerc *et al.*, suggests that Relationship between home hazards and falling among community-dwelling seniors using home-care services stated that Home environmental hazards were found in 91 per cent of homes, with a mean of 3.3 risks per individual. The bathroom was the most common place for hazards. The presence of hazards was significantly associated with all falls and fall-related medical consultations, and showed relatively constant effects from one fall to another. [Leclerc *et al.,* 2010]

Conclusion

Assessment of intrinsic and extrinsic Home Safety parameters is essential for home dwelling geriatric population for effective prevention of falls leading to disabilities. The findings of the current study suggest that the home-dwelling Geriatric Population were moderately dependent on their caregivers in performing activities of daily living and required supervised assistance with increased effort required while performing normal activities in and around the house with minimal difficulty. It was evident that majority didn't use/require any assistive devices while performing ADL activities even though majority of study population had difficulty in performing ADL which could be reduced if assistive devices were used. Majority were unaware about the solutions that can help improve their safety and reduce the difficulty faced by them.

Recommendations

Assessment of Home Safety parameters is essential for home dwelling geriatric population for effective prevention of falls. It also allows geriatric population to perform their activities more efficiently. Thus, the medical personnel and care givers of the home dwelling geriatric individuals should be encouraged to undergo periodic Home Safety Assessment. Home Safety Assessment checklist would enable one to identify the functional levels, comfort and safety of geriatric

population in their homes and would help to evaluate the modifications and assistive equipment and devices required to reduce the risk of falls and improve their accessibility in and around their houses, thereby improving their level of dependency on care givers. Home safety assessment would also allow the geriatric population to perform their activities of daily living more efficiently. Therefore, the medical personnel and care givers of the home dwelling geriatric individuals should be encouraged to undergo periodic Home Safety Assessment.

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