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Estimation of Age in Indian Grey Francolin *Francolinus Pondicerianus* (Gmelin, 1789) by Skeletochronology

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ABSTRACT

This study, a pioneering endeavour in zoology, aimed to determine the age of Grey Francolins (Francolinus pondicerianus) inhabiting southern India. The method involved enumerating the number of growth marks present in the cross sections of phalanges. The mid-diaphyseal sections of phalanges exhibited growth rings, each consisting of a broader growth zone and a chromophilic line of arrested growth (LAG). One to three LAGS were observed in the Ehrlich hematoxylin-stained cross sections, with the LAGS being notably clear and distinct in all individuals studied. Among 24, seven (29.16%) individuals with SVL: 25.68 ± 1.38 cm showed no LAGS. Five (20.83%) birds with SVL: 29.84 ± 0.98 cm possessed 1 LAG each, nine (37.50%) francolins with SVL: 34.69 ± 1.79 cm exhibited 2 LAGS and three (12.50%)

individuals with SVL: 38.81 ± 0.51 cm recorded 3 LAGS in the phalangeal cross sections. A back calculation indicated that there was no endosteal resorption in this species. Body size and the number of LAGS showed a high positive correlation (r = 0.91) in the Gery francolin population.

Keywords : Grey francolin, Age, Skeletochronology, Tropics

Accurate age estimation is a crucial aspect of understanding the biology and ecology of vertebrates. Various methods have been developed to estimate age, including measuring increases in body size or weight over time, monitoring epiphyseal fusion and assessing the dry weight of the eye lens (Lamotte & Bourliere, 1975; Zhang *et al.*, 2024). The most widely used method for determining nestling age involves establishing appropriate ageing thresholds based on observations of beak size, colour and behavioural cues. The ages of Zealand fantail (*Rhipidura fuliginosa placabilis*) and European bee-eater (*Merops apiaster*) nestlings were estimated through the development of an image-based ageing guide that describes qualitative changes in appearance during their growth period (Amiot & Hill, 2015; Costa *et al.*, 2020). Wails *et al.* (2014) proposed that feather development patterns can also serve as a reliable criterion for avian age estimation. However, these techniques are often inaccurate and prone to errors (Halliday & Verrell, 1988). In contrast, skeletochronology has emerged as a reliable and precise approach for determining the age of most vertebrate groups, including the Grey Francolin population in this study. This method involves the identification of growth markers, specifically lines of arrested growth (LAG), in histological sections of certain bones. Despite its effectiveness, the application of skeletochronology in avian species has been limited, with only a few studies exploring its potential in birds (Soest & Utrecht, 1971; Klevezal *et al.*, 1972; Zhang *et al.*, 2024).

The Grey Francolin *Francolinus pondicerianus* (Gmelin,1789) (Aves: Galliformes: Phasianidae) is native to India, Pakistan, Sri

Lanka, Nepal and Iran, and it has been introduced into Bahrain, British Indian Ocean Territories, Mauritius, Oman, Qatar, Seychelles, United Arab Emirates, United States and the Andaman and Chagos islands (Fuller *et al.,* 2000; Rasmussen & Anderton, 2005). In its native habitat, the francolin is commonly found in open grassy areas, especially near water sources, thorny scrub forests and fields of wheat, rice and sugarcane, and semi-arid regions. They thrive in dry and semi-arid climates but are adaptable to various environments, providing cover and food (Pandian, 2021). Much work has been carried out in the field of diversity, distribution and threats on grey francolin *F. pondicerianus* around the world(Fuller *et al.*, 2000; Rasmussen & Anderton, 2005; Khalil, 2015) plumage pattern and colour (Sathyakumar & Kalsi, 2007) food and feeding habitat (Hussain *et al.,* 2012; Pandian, 2021), sexual dimorphism (Islam, 1999) reproduction (Sharma, 1983; Roberts, 1991; Rasmussen & Anderton, 2005) clutch size (Jerdon, 1864; Edwards, 1993; Tiwari, 1999) nesting and incubation of eggs (Pramod, 2011; Gokula & Raj, 2011; Santharam *et al.,* 2014; Divyapriya & Pramod, 2019). The pair formation and behaviour of the grey francolin have been extensively documented by Ali and Ripley (1987). However, there is a lack of information regarding the age structure of Indian Grey Francolin *F. pondicerianus* inhabiting the tropical region. Currently, the population of this species is declining drastically due to landscape modification, intensive farming, hunting and the use of pesticides on crops (Whistler, 1949; Potts, 1986; Roberts, 1991; Bro *et al.*, 2004; Southerton *et al.,* 2010; Khalil *et al.*, 2015). Understanding the interrelationship between body size and age is crucial for studying the life history patterns of this species and developing appropriate conservation strategies, which are urgently needed to prevent further decline.

Materials and Methods

This study involved the collection of 24 *Francolinus pondicerianus* individuals from various sources in Sangli District,

Maharashtra, India. The collection sites included hotels and areas where local people encountered the birds. The collected birds were placed in a cage and transported to the laboratory, where their body size (cm) and body weight (g) were measured. The fourth toe from the right hind limb was clipped and fixed in a 10 per cent formalin solution for further processing. The clipped digit was cleaned and washed in water for 1-2 hours to remove. The cleaned toe was demineralised in 5 per cent formic acid, followed by thorough washing in running water overnight to remove any residual formalin and formic acid. Transverse sections (8 µm thickness) of the distal phalanx were cut using a rotary microtome (Model GE-70). The sections were stained with Ehrlich hematoxylin and examined under a compound microscope (Olympus CX-41) for growth rings; then, growth rings were enumerated whenever present. The rate of endosteal resorption was checked by comparing the diameter of the marrow cavity of older individuals with that of the periosteal layer of the youngest bird. The relationship between body size and the number of growth marks was analysed by plotting scatter diagrams. Karl Pearson's method calculated the correlation coefficient 'r' (Steel & Torrie, 1980). Additionally, meteorological data obtained from the Government of India Meteorological Centre, Pune, India, were used to provide relevant climatic information for the study area. All necessary permits and approvals were obtained to collect and handle the Grey Francolin samples. The study was conducted by the principles of animal welfare and the use of animals in research.

Results

Sangli's monthly mean variations in temperature and rainfall during 2022 are shown in Fig. 2; the mean temperature varied between 21.5°C-29.5°C, whereas the average rainfall ranged between 0.5 and 107.8 mm. The mid-diaphyseal cross-sections of the phalanges of Grey francolins, *F. pondicerianus*, revealed a central bone marrow cavity surrounded by a narrow inner endosteal layer

and a relatively broad outer periosteal bone layer. In the periosteal layer, a series of thin, darkly stained chromophilic lines, interspersed with wider light purple rings containing sparsely distributed osteocytes, were observed. The dark lines were interpreted as lines of arrested growth (LAGS), while the light rings represented growth rings (together called annual rings) in the phalanges of Grey francolins. One to three LAGS were observed in the periosteal layer of this species (Fig. 1B-D). Among the 24 individuals examined, seven (29.16%) birds with a snout-vent length (SVL) of 25.68 ± 1.38 cm completely lacked LAGS. Five individuals (20.83%) with SVL of 29.84 ± 0.98 cm exhibited one LAG each, nine francolins (37.50%) with SVL of 34.69 ± 1.79 cm showed two LAGs, while three birds (12.50%) with SVL of 38.81 ± 0.51 cm displayed three LAGs in their phalangeal cross sections (Table 1; Fig. 1A-D). Back-calculation indicated no endosteal resorption, a finding further confirmed by phalangeal histology (Fig. 2B-D). Furthermore, a strong positive correlation ($r = 0.91$) was observed between body size (SVL) and the number of LAGS in Grey francolins (Fig. 3).

Table 1

Body size (cm) and number of lines of arrested growth (LAG) in the cross sectionof phalanges of Grey Francolin, Francolinus pondicerianus.

Sr.No.	Individuals	Body length (cm)	LAGs	Percentage
1.	7	25.68±1.38	0	29.16%
2.	5	29.84±0.98	1	20.83%
3.	9	34.69±1.79	2	37.50%
4.	3	38.81±0.51	3	12.50%

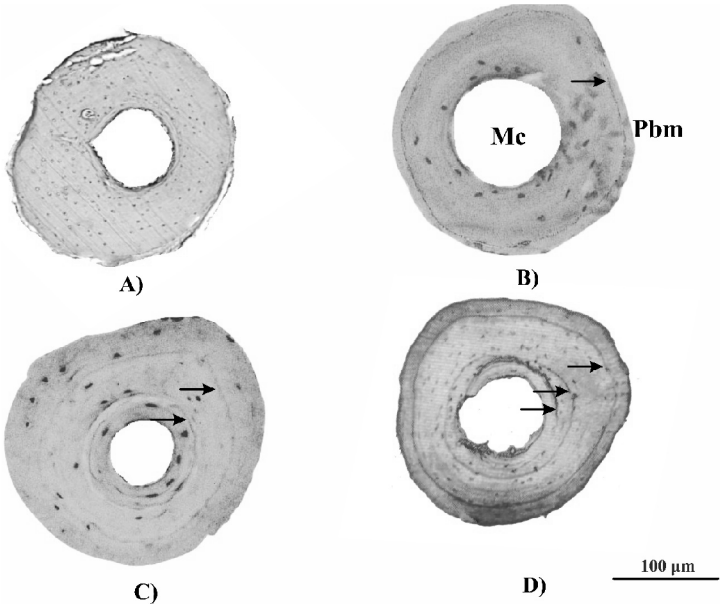

Fig. 1A-D: Mid-diaphyseal cross sections of phalanges of Grey francolin Francolinus pondicerianus (Hematoxylin). A. Showing No LAG; B. one LAG; C. two LAGS; D. three LAGS.

Scale line = 100 µm.

Abbreviations: Mc = Marrow Cavity; Pbm = Periosteal bone mark; Arrows = Lines of Arrested Growth (LAGS).

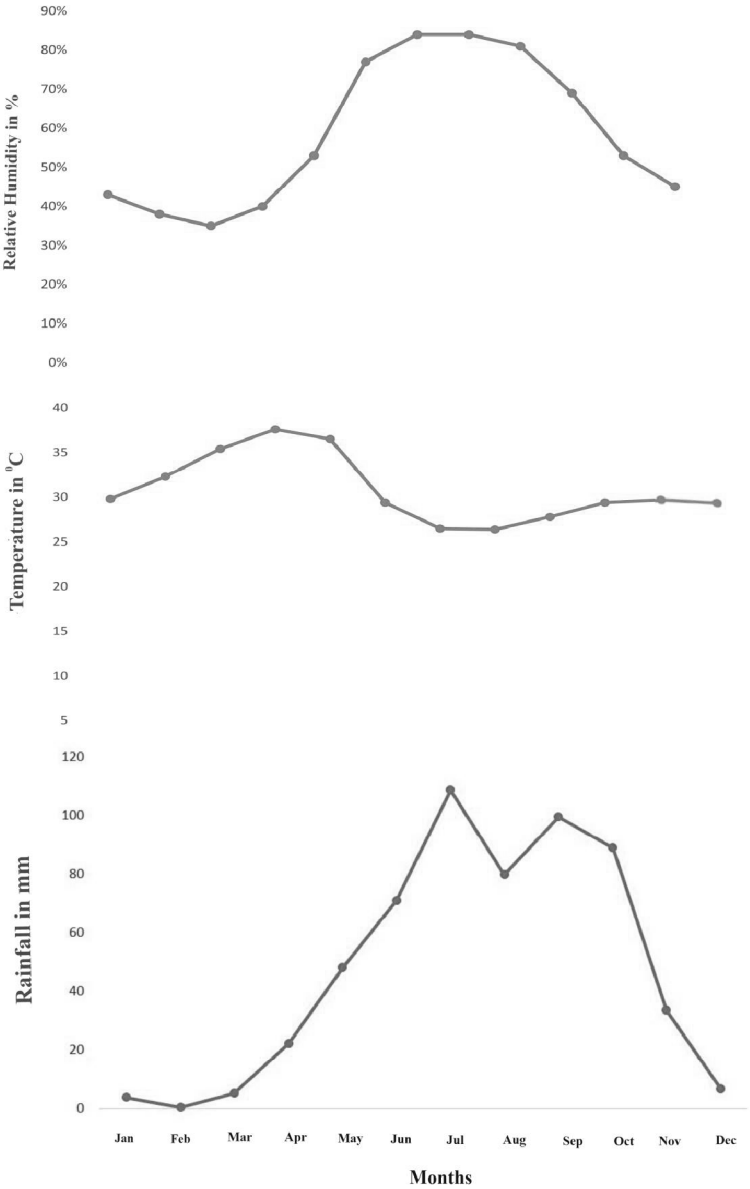

Fig. Rainfall and Temperature in 2022

Figure 2. Monthly variation in Rainfall (mm) and Temperature (in deree celsius) of Sangli in the year 2022.

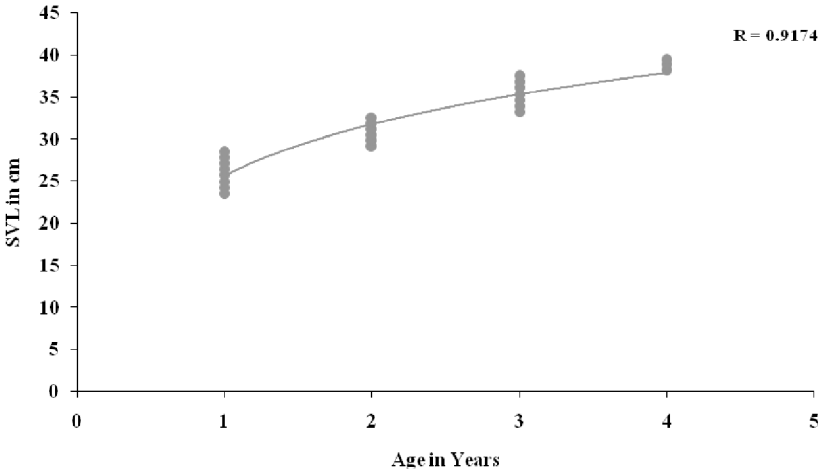

Figure 3. Correlation between Body size (SVL) and Number of LAGS in Grey Francolin, *Francolinus pondicerianus*

Discussion

Determining the age of avian species is fundamental for a proper understanding of species biology (Boddy, 1993; Jackson, 2005). Identifying the age and sex of a bird can be important for studying various aspects of avian ecology and evolution, including life history, reproductive ecology and behavioural ecology (ibid.). It is well known that the age and sex of a bird can affect its migration patterns, moult strategies, survival rates and even its ageing and roosting behaviour (Ginn & Melville, 1983; Dougall & Appleton, 1989; Gorney & Tov, 1994; Dougall, 1996; Tree, 2000). Avian population studies rely heavily on knowledge of age structure to calculate breeding success and survival rates as well as to understand the turnover of individuals within a population (Boddy, 1993). The use of lines of arrested growth (LAGS), which are periodically laid down in bones, is one of the most effective methods for determining the age of individuals (Castanet *et al.*, 2004). However, counting cyclical growth marks in the bones of modern birds has been restricted to a very few species, such as the living

parrot *Amazona amazonica*, the extinct Eocene Diatryma, the New Zealand Kiwi (*Apteryx australis*) and the New Zealand moa (Bourdon *et al.,* 2009; Ricqles *et al.,* 2001). Cyclical growth marks in cortical bone reflect osteogenetic changes caused by annual rhythms and are a general phenomenon in herpetofauna and endothermic tetrapods (Castanet *et al.,* 2004; Turvey *et al.,* 2005). In the present study, one to three LAGS were observed, which appeared more distinct and clear in the cross-sections of the phalanges of the Grey Francolin. This species is a seasonal breeder, with its breeding season occurring from April to September in India (Rasmussen & Anderton, 2005) and from March to October in Pakistan (Roberts, 1991). This period roughly coincides with the wet or monsoon season in southern India. During this time, there is a decline in monthly mean temperature and an increase in relative humidity and rainfall. These environmental conditions may favour the formation of lines of arrested growth (LAGS) in this species. Recently, Kohler *et al.* (2012) demonstrated that the annual formation of LAGS occurs in homoeothermic endotherms and that cyclic arrested growth is triggered by genetically controlled hormonal cues rather than resulting from environmental stresses. Further detailed studies are essential to confirm the achievement of sexual maturity, the actual breeding period and the factors responsible for the formation of growth marks in tropical birds.

In the present study, 1–3 LAGS were observed, which appeared more distinct and clear in the cross-sections of the phalanges of the Grey Francolin. Although phalangeal skeletochronology may sometimes lead to an under- or overestimation of age in specific individuals due to endosteal resorption, it offers advantages over other bones. The phalangeal sections examined in this study showed no signs of endosteal resorption, indicating that the number of LAGS directly reflects the age of the individuals. A positive correlation was observed between body size and age in *F. pondicerianus*. Body size analysis

appears to be a reliable criterion for estimating the age of avian species, including the Grey francolin *population.*

Conclusion

Phalangeal skeletochronology is a reliable technique for determining the age and longevity of tropical birds. This study provides valuable and relevant insights into the age structure of the Indian grey francolin (*F. pondicerianus)* inhabiting Western Maharashtra, Southern India.

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Factors Influencing Sleep Quality among Rural Elderly Personsof Kurnool District, Andhra Pradesh

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ABSTRACT

Sleep disturbances are shared among the elderly, and they are likely to experience poor sleep quality to a large extent. In this study, the researchers examined the sleep quality of the elderly and the factors that influence as measured by it. For this purpose, the primary data was collected from 380 elderly persons (186 males and 194 females) People aged 60 to 70 years and above residing in 20 villages of Kurnool district, Andhra Pradesh, used a combination of self-reported measures and objective assessments, using the Pittsburgh Sleep Quality Index. Around 66 per cent of the sample elderly reported experiencing 'poor' sleep quality (cumulative score of $\geq$ 5 on Pittsburgh Sleep Quality Index). Logistic regression analysis established that the odds of experiencing 'poor' sleep quality in the elderly are found

to be higher among females, aged 75 and above, widowed, those part of joint families, suffering from 3 or more chronic morbidities, who smoke regularly and felt the need for assistance for physical functioning. Conversely, such odds are significantly lower among those who have studied middle school and above, come from families with higher monthly incomes, and have extensively participated in physical activities. The significance of sleep quality and the need for participation in physical activities, as well as the importence of early diagnosis and treatment for sleep problems are highlightd as policy implications. Additionally improving the economic conditions of the elderly is emphasised.

Keywords : Sleep Quality in Rural Elderly, Ageing, Logistic Regression

Sleep problems or disorders are common among the elderly or older populations. A large number of studies around the World and in India have established that sleep problems mainly cause several physical and mental health problems, and at times, such issues may lead to immune system dysfunctions, frailty and mortality (Canever *et al.*, 2023; Jagadeesan *et al.*, 2023). Thus, sleep is essential for human beings in general and among elderly persons in particular, as advancing age is more likely to increase sleep disturbances. There is also clear support to show that sleep is vital for maintaining normal physiology and good quality of life among elderly persons. Though the National Sleep Foundation of the United States (2018) suggests that elderly persons, on average, need a sleeping time in the range of 7–8 hours, in several settings, elderly persons, to a large extent, get sleep much less than that. Evidence also shows that sleep quality is vital in maintaining physical and mental health among elderly adults. Improving sleep quality in the elderly can lead to better cognitive function, reduced risk of chronic diseases, and improved overall quality of life. According to the sleep foundation,

"identifying factors that affect their sleep quality can be used as important data for developing interventions and programs to improve sleep quality."

Review of Literature

Studies related to the Prevalence of Sleep Quality among the Elderly

During the recent past (last ten years), several community-based (both in rural and urban settings) studies have made use of the Pittsburgh Sleep Quality Index (PSQI), developed by Buysse *et al.* (1989), to assess the prevalence of sleep quality ('good' and 'poor' magnitude) among older (or elderly adults) persons and also tried to examine the association of sleep quality (inferior sleep quality) with their selected background characteristics. From these studies, one can understand that the prevalence of poor sleep quality in elderly persons (predominantly, aged 60+ years and in a few cases, aged 65+ years) is varied in the range of 21 per cent - 56 per centin the studies from Asian countries (other than India) (Yunus *et al.*, 2017; Thichumpa *et al.*, 2018; Wang *et al.*, 2020; Zhang *et al.*, 2020; Hosseinia *et al.*, 2023; Tao *et al.*, 2023; Than *et al.*, 2023), except in Egypt (Shabana *et al.*, 2023) and Malaysia (Hoong *et al.*, 2024), wherein such prevalence was reported as 79 per centand 66 per cent, respectively. On the other hand, the corresponding prevalence is somewhat higher (56% - 82%) in different settings of India (George *et al.*, 2018; Gouthaman & Devi, 2019; Chaudary *et al.*, 2020; Das *et al.*, 2020; Kaushal *et al.*, 2021; Raja & Sardar, 2022; Jagadeesan *et al.*, 2023; Sandooja *et al.*, 2023; Kulkarni & Ghode, 2024), except in urban Bangalore (Suguna *et al.*, 2015; 42%). Further, with a few exceptions, based on the studies conducted and published, one can found that the prevalence of poor sleep quality in elderly persons hasincreased over time and such pattern is well established in the four waves of Chinese Longitudinal Healthy Longevity Survey (CLHLS) data (Tao *et al.*, 2023) – from 34.87 per cent in 2008 to 38.82 per cent in 2011, 39.48 per cent in 2014 and then to 47.67 in 2018, respectively. Another point

worth noting is that while several studies from India have irrefutably shown a higher prevalence of poor sleep quality in rural elderly persons compared to their urban counterparts, an opposite pattern is supported by studies conducted in some Asian countries.

Studies related to the Factors Influencing Sleep Quality among the Elderly

Earlier studies have also demonstrated that several factors influence the sleep quality in elderly persons. Of these, female gender, advanced age (70+ or 75+ years), other than married and suffering from multi-morbidity / health problems are found to be the prominent ones, which are positively correlated with poor sleep quality in elderly persons (Suguna *et al.*, 2015; Yunus *et al.*, 2017; George *et al.*, 2018; Thichumpa *et al.*, 2018; Gouthaman & Devi, 2019; Chaudary *et al.*, 2020; Das *et al.*, 2020; Wang *et al.*, 2020; Zhang *et al.*, 2020; Kaushal *et al.*, 2021; Chu *et al.*, 2022; Raja & Sardar, 2022; Hosseinia *et al.*, 2023; Jagadeesan *et al.*, 2023; Sandooja *et al.*, 2023; Tao *et al.*, 2023; Than *et al.*, 2023; Hoong *et al.*, 2024; Kulkarni & Ghode, 2024; Shabana *et al.*, 2024). However, a small number of studies have only established the negative association of higher levels of education (Thichumpa *et al.*, 2018; Chu *et al.*, 2022; Hosseinia *et al.*, 2023; Than *et al.*, 2023) and earning higher incomes / belonging to households of moderate or higher income categories (Yunus *et al.*, 2017; Chu *et al.*, 2022; Shabana *et al.*, 2024) with poor sleep quality. Likewise, in the Indian context, it is observed that only a few studies have tried to explore the role of the type of family, smoking and alcohol use, the extent of participation in day-to-day physical activities, and the extent of assistance needed in disability conditions influencing the poor sleep quality of elderly persons.

Objectives of the Study

The present study is planned with the following objectives.

1. To find out the prevalence of poor sleep quality among rural elderly persons

2. To examine the association of poor sleep quality in elderly persons with various socio-economic, demographic and lifestyle behavioural factors
3. To explore the prime factors influencing the poor sleep quality in elderly persons

Method

Sample

A sample of 380 elderly persons (186 males and 194 females) aged 60 years and above, residing in rural areas of Kurnool district, Andhra Pradesh.This sample size is estimated based on Krejcie and Morgan's (1970) sample size determination table. For selecting the sample elderly, at the first stage, adopting multi-stage sampling technique, 20 villages/hamlets of the villages (which are part of 10 Census / Revenuevillages) of 5 (out of 54) Community Development Blocks in the said district have been selected (Directorate of Census Operations, Andhra Pradesh, 2014). At the next stage, the elderly sample from these villages was selected using the systematic random sampling method, based on the lists of elderly persons prepared (enumerated prior to data collection) in each selected village/hamlet. This study was conducted during September – December 2023.

Tool Used

A. Interview schedule

Keeping the study's objectives in mind, the researchers developed a structured interview schedule containing questions related to the necessary demographic data. The data was collected by administering the said interview schedule with the assistance of personal interviews.

B. Pittsburgh Sleep Quality Index (PSQI)

It was developed by Buysse *et al.* (1989) and is the prominent and widely adopted one. This instrument contains seven components to measure the sleep quality in elderly people, viz.,

subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month. The responses to each component were collected from the elderly on a four-point Likert-type scale, which assigned a score range of 0-3 points. A score of '0' indicates 'no difficulty', whereas a score of '3' indicates severe difficulty. These scores of seven components are pooled together, which falls in the range of 0-21 points, indicating that the higher the score, the higher the severity of sleep difficulty. The reliability of the scale items has been computed through Cronbach's Alpha (α), which has come to 0.719, and it specifies that the scale measurement has good internal consistency. In the present study, respondents whoever scored 5 to 21 have been classified as those with *'poor sleep quality'* and those who scored as 0–4 as *'normal/goodsleep quality'*, and while carrying out further analysis scores of '1' and '0', respectively are assigned and used.

Explanatory Variables

In this study, though several background characteristics of the elderly persons are explored, only 11 variables that are theoretically corroborated and significantly associated (in this study) with the 'poor and normal/good sleep quality' have been considered for analysis. Most of these factors (variables) are easily understood (Table 1), except for two of the following. The variable 'extent of participation in physical activities' is measured based on the elderly's participation or not (assigned scores as '1' or '0', respectively) in 9 selected physical activities.The activities include agricultural work, walking, gardening/yard work, scrubbing floors/carrying wood, dusting or washing dishes, sitting activities, exercise-related activities, home repairs and taking care of other family members. After getting the pooled scores, all the elderly have been classified into three groups (as a single categorical variable), viz., lesser extent (Scores 1-4), moderate extent (Scores 5-7) and higher extent (Scores 8-9), of participation in physical activities. The variable 'extent of assistance needed in disability conditions' is calculated based on

elderly' perceived assistance needed (by assigning scores of '0', '1' and '2' for 'no assistance needed', 'partial assistance needed and 'fully assistance needed', respectively) in 13 disability conditions. These conditions include: eating, dressing, toileting, bathing, meal preparation, transferring in and out of bed, walking, climbing stairs, shopping, using mobile/telephone, taking medication, money management and housework. Then the cumulative scores have been computed for each of the elderly and based on these scores, all the elderly have been classified into three groups (as a single categorical variable), viz., lesser extent (Scores 0-6), moderate extent (Scores 7-12) and higher extent (Scores 13-26), of assistance needed in disability conditions.

Data Analysis

The data analysis for this study was carried out on the following lines. At first, the prevalence of sleep quality in terms of 'poor' and 'normal/good' levels among elderly persons is examined. Next, the differentials in the prevalence of 'poor and normal/good sleep quality'of elderly persons by their selected background characteristics have been analysed with the help of cross-tabular analysis and the Chi-square test of significance. At the final stage, the significant factors influencing poor sleep quality in elderly persons have been examined using multivariate logistic regression analysis. All these analyses have been carried out using IBM-SPSS software Version 24.0.

Results

Background Characteristics of the Rural Elderly

Data presented in Table 1 (Col. 2 and 3) suggests that about 51% of the sample elderly are women and 47% are 70+ years old by age (Mean age: 69.25; Range: 60–89 years). While around 87% of the elderly are married, 77% live as part of the nuclear family. A little over 56% of the elderly studied up to primary school, whereas 24% of them are illiterates. Around 40.5% of elderly belonged to families that have a modest annual income

of Rs. 35,001–70,000 and another 35% of them are part of families that have comparatively less annual family incomes, i.e., Rs. 35,001 & less (Mean annual family income: Rs. 51,764/-; Range; Rs. 10,000–1,00,000). Around 35 per cent of the sample elderly have the habit of drinking alcohol regularly, but just about 14.5% of them reported only as regular smokers. Around 47% of the study elderly are suffering from two chronic morbidities, followed by any one (or no) chronic morbidity (32%; Mean no. of morbidities: 2.0; Range: 0–10). While 44.5 per cent of the elderly are reported to participate in 1–4 physical activities (i.e., to a lesser extent), 38 per cent do so at a moderate extent (i.e., in 5–6 activities). Around 39 per cent of the sample elderly perceived the need for assistance in various disability conditions to a higher extent, whereas 32 per cent and 29 per cent asserted such need at a moderate and a lesser extent, respectively.

Prevalence and Differentials in Poor Sleep Quality of the Elderly by their Background Characteristics

Based on the PSQI scale (as described earlier), among the sample elderly persons, as high as 66.1% of them are stated to be experienced from poor sleep quality (cut-off score ≥ 5) and the remaining of them categorised as usual (or good) sleep quality (last row of Table 1).

Table 1

Distribution of Elderly Persons by their Poor and Normal / Good Sleep Qualityacross Selected Background Characteristics

Background Characteristics of Elderly Persons	Total		Normal/ Good Sleep Quality (Score <5)		Poor Sleep Quality (Score =5)		χ^2-Value p-value Sig. Level
	Fre.	%	Fre.	%	Fre.	%	
1	2	3	4	5	6	7	8
1. Gender							
Male	186	48.9	78	41.9	108	58.1	10.368***
Female	194	51.1	51	26.3	143	73.7	0.001
2. Current Age (in Years)							
60 – 64	96	25.3	42	43.8	54	56.2	
65 – 69	107	28.1	41	38.3	66	61.7	10.025**
70 +	177	46.6	46	26.0	131	74.0	0.007

3. Marital Status							
Married	330	86.8	120	36.4	210	63.6	6.530**
Widowed@	50	13.2	9	18.0	41	82.0	0.007
4. Education							
Illiterate	91	24.0	21	23.1	70	76.9	
Primary School	214	56.3	70	32.7	144	67.3	14.291***
Middle School & above	75	19.7	38	50.7	37	49.3	0.001
5. Annual Family Income							
Rs. 35,000 & less	132	34.8	32	24.2	100	75.8	
Rs. 35,001 – 70,000	154	40.5	52	33.8	102	66.2	13.675***
Rs. 70,001 & above	94	24.7	45	47.9	49	52.1	0.001
6. Type of Family							
Nuclear	294	77.4	107	36.4	187	63.6	3.470*
Joint	86	22.6	22	25.6	64	74.4	0.040
7. Alcohol Use							
Never / Sometimes	248	65.3	93	37.5	155	62.5	4.019*
Regularly	132	34.7	36	27.3	96	72.7	0.029
8. Smoking							
Never / Sometimes	325	85.5	117	36.0	208	64.0	4.219*
Regularly	55	14.5	12	21.8	43	78.2	0.026
9. Presence of NCDS							
0 – 1$	121	31.8	53	43.8	68	56.2	
2	179	47.1	61	34.1	118	65.9	13.482***
3 +	80	21.1	15	18.8	65	81.2	0.001
10. Extent of Participation Physical Activities							
Lesser Extent	169	44.5	42	24.9	127	75.1	
Moderate Extent	145	38.1	51	35.2	94	64.8	18.820***
Higher Extent	66	17.4	36	54.5	30	45.5	0.000
11. Need for Assistance in Disability Conditions							
No/ Lesser Assistance&	110	29.0	52	47.3	58	52.7	
Moderate Assistance	121	31.8	43	35.5	78	64.5	17.077***
Higher Assistance	149	39.2	34	22.8	115	77.2	0.000
Total	**380**	**100.0**	**129**	**33.9**	**251**	**66.1**	

Note: @ = 5 Unmarred and 3 Divorce respondents included here.

$ = 15 elderly not suffering from any Chronic Morbidity included here.

& = 28 elderly who do not need any assistance included here.

*, ** and *** = Significant at 0.05, 0.01 and 0.001 levels.

Details the differentials in 'poor' and 'normal/good' sleep quality of the sample elderly by their background characteristics are furnished in Table 1 (Columns 6-7). From these figures, it is observed that the prevalence of 'poor sleep-quality' is noted as significantly higher in elderly who are women ($p<0.001$), widowed (including few unmarried & divorced; $p<001$), part of joint families ($p<0.05$) and also in regular alcohol drinkers and smokers ($p<0.05$ for both) than their respective counterparts. It is further conspicuous to note that such (poor sleep quality) prevalence rate

is significantly increasing with an increase in their age ($p<0.01$), number of chronic morbidities from which they are suffering ($p<0.001$) and extent of assistance needed in disability conditions ($p<0.001$). From Table 1, it is also evident that the prevalence of poor sleep quality is noted as diminishing or lessening with an increase in sample elderly persons' level of education ($p<0.001$), annual income of families in which they are dwell in ($p<0.001$) and the extent of participation in physical activities ($p<0.001$).

Prime Factors Influencing Poor Sleep Quality among Rural Elderly: Results of Multiple LogisticRegression Analysis

Multiple logistic regression analysis results (Table 2) reveal that, of the eleven variables included in the model, ten variables or their categories (except alcohol use) have turned out as key factors in influencing the elderly's poor sleep quality at different levels of significance. Of these, the following categories of elderly have exhibited positive net effects on (or higher odds of experiencing) poor sleep quality: those suffering from 3 and more number of chronic morbidities (OR=3.321; $p<0.001$), part of joint families (OR=2.78; $p<0.01$) and smoking on regular basis (OR=2.44; $p<0.05$), perceived the need for assistance in disability conditions to a higher extent (OR=2.31; $p<0.01$) and females (OR=2.16; $p<0.01$). Such higher odds of poor sleep quality are also higher, but to a lesser significant extent, among widowed (OR=2.08; $p<0.10$) and those in advanced age (70+ years; OR=1.70; $p<0.10$). In contrast to these results, the likelihood of poor sleep quality is observed to be strikingly lower among those elderly who have completed middle & above level of education (OR=0.275, $p<0.001$), belonged to the families that have comparatively higher annual incomes (Rs. 70,001 & above; OR=0.321, $p<0.001$) and also among those participating in day-to-day physical activities at a moderate and higher extent (OR=0.555 and 0.482; $p<0.05$ for both).

Table 2

Results of Multiple Logistic Regression analysis On Poor Sleep Quality among Elderly Persons

Selected Characteristics of Respondents (Explanatory Variables)	β Co-efficient	Exp(β) / Odds Ratio	p-Value / Sig. Level
Gender (*Ref: Men*)	--	1.000	
Women	0.694	2.155	**0.01**
Age(*Ref: 60 – 64 years*)	--	1.000	
65 – 69	-0.097	0.907	0.773
70 & above	0.525	1.703	**0.10**
Marital Status (Ref: *Married*)	--	1.000	
Widowed	0.730	2.075	**0.10**
Education *(Ref: Illiterate)*	--	1.000	
Primary School	-0.498	0.608	0.156
Middle School &above	-1.290	0.275	**0.001**
Annual Family Income (*Ref: Rs. =35,000)*	--	1.000	
35,001 – 70,000	-0.172	0.842	0.578
70,001& above	-1.096	0.321	**0.001**
Type of Family (*Ref: Nuclear)*	--	1.000	
Joint	1.024	2.784	**0.01**
Smoking Habit (*Ref: Never/ Sometimes)*	--	1.000	
Regularly	0.892	2.441	**0.05**
Alcohol Use (*Ref: Never/ Sometimes)*	--	1.000	
Regularly	0.212	1.236	0.847
Presence of NCDs (*Ref: 0-1*)	--	1.000	
2	0.146	1.157	0.617
3 & above	1.190	3.321	**0.001**
Participation in Physical Activities (*Ref: Lesser Extent*)	--	1.000	
Moderate Extent	-0.588	0.555	**0.05**
Higher Extent	-0.731	0.482	**0.05**
Assistance for Physical Functioning (*Ref: No / Lesser Assistance*)	--	1.000	
Moderate Assistance	0.043	1.043	0.897
Higher Assistance	0.837	2.310	**0.01**
-2 Log Likelihood		392.286	
Chi-square; d.f.; Sig.; N	94.081;	17; 0.001;	380
Cox & Snell R Square (in %)		21.9	
Nagelkere R Square (in %)		30.4	

Note: — Not Applicable.

Discussion

Overall, this study reveals that the elderly people residing in selected rural areas of Andhra Pradesh are experiencing a higher extent of poor sleep quality (66%).This magnitude of poor sleep quality is almost corroborating with some of the earlier studies carried out in Indian context: 63.9 per cent in rural Patiala, Punjab (Kaushal *et al.*, 2021), 64.5 per cent in rural Uttarakhand (Chaudhary *et al.*, 2020) and 68.9 per cent in a study of 30 villages, West Bengal (Das *et al.*, 2020). It may be further presumed that, given the anticipated increase in the elderly population in India and longer years of expectation of life among them, the magnitude of poor sleep quality is likely to be much higher shortly. Both bivariate and multivariate analyses of the data of this study to a large extent supported that the prevalence of poor sleep quality is higher for those elderly who are suffering from a more significant number of chronic morbidities, women, widows and also for those who are in advanced age. These associations are attributed to the pain and anxiety attached to the chronic morbidities, gender (female) sensitivity, lack of support and empowerment at the family/community level as well as physical weakness and suffering from various mental health illnesses relating twilight years and widowed (who are expected to live longer in the recent days). These findings are corroborated mainly by more or less similar findings observed in several earlier studies cited in the Review of Literature section.

Next to these, the need for physical assistance in disability conditions appears to be conspicuously escalating the prevalence of poor sleep quality. This is mainly due to the unpredictable requirement for physical assistance (in day-to-day activities) among those elderly suffering from one or more disabilities, besides the absence of caregivers and/or getting such assistance from family members or neighbours. Few previous studies have established this assertion (Gouthaman & Devi, 2019; Raja & Sardar, 2022; Tao *et al.*, 2023; Than *et al.*, 2023; Shabana *et al.*,

2024). Added to these, it is found that substance use, viz., regular smoking and drinking alcohol (finding supported through bivariate analysis only), has also led to a rise in the prevalence of poor sleep quality among the elderly. Some earlier studies in different settings abroad and India have endorsed similar findings, i.e., related to smoking and poor sleep quality (Chaudary *et al.*, 2020; Das *et al.*, 2020; Wang *et al.*, 2020; Kaushal *et al.*, 2021; Jagadeesan *et al.*, 2023; Tao *et al.*, 2023). On the other hand, while a study conducted in Seoul region of Korea (Chu *et al.*, 2022) established a direct association between drinking alcohol and poor sleep quality of elderly adults (65+ years old), few earlier studies carried out in Indian context noted an insignificant association (Suguna *et al.*, 2015; Chaudary *et al.*, 2020; Sandooja *et al.*, 2023), Above all these, it is fascinating to note that members who are part of joint families have experienced poor sleep quality to a higher extent mainly due to elderly' feeling and thinking about growth and development of every family member. Such (positive) thinking naturally disturbs their sleep, and some older adults will not get good sleep for many days. This finding aligns with a previous study conducted in 30 villages in West Bengal state (Das *et al.*, 2020), which also exhibited similar findings.

Our study has further revealed that the prevalence of poor sleep quality among the elderly is lower with an increase in their level of education, annual family income and extent of participation in physical activities. Higher education in elderly persons would increase their rational thinking and understanding of the need for normal/good sleep. Likewise, the elderly who belong to / part of families are likely to have better financial / wealth conditions, and thereby, such elderly may have higher autonomy of financial resources, which keeps them mentally well and allows them to get good sleep. Equally, participation in physical activities by the elderly would make them physically and mentally healthy and hale, thereby lessening their poor sleep quality. Additionally, such

participation is closely associated with the level of education and the family's economic status, which would have a double benefit in getting sound sleep during old age. A few studies have highlighted, more or less, similar findings in the case of elderly' level of education (Thichumpa *et al.*, 2018; Chu *et al.*, 2022; Hosseinia *et al.*, 2023; Than *et al.*, 2023), earning higher incomes / belonged to households of higher income categories (Yunus *et al.*, 2017; Chu *et al.*, 2022; Shabana *et al.*, 2024) and regular participation in physical activities / doing exercise (Suguna *et al.*, 2015; Chaudary *et al.*, 2020; Das *et al.*, 2020;. Kaushal *et al.*, 2021; Chu *et al.*, 2022).

Conclusions and Policy Implications

Rural elderly, to a large extent, are experiencing poor sleep quality. However, our study also revealed that there is potential for positive change. Elderly women, advanced in age, widowed, suffering from a more significant number of chronic morbidities, regular smokers, part of a joint family, and who perceived the need for assistance in disability conditions are more likely to experience poor sleep quality than their counterparts. Conversely, it is established that the prevalence of poor sleep quality is lessening in correspondence to an increase in the elderly's level of education, annual family income, and participation in physical activities. This potential for change should inspire us to continue improving the sleep quality of the elderly.

Taking these conclusions into consideration, it is suggested that elderly persons belonging to moderate and higher socio-economic status (i.e., significantly higher educated and part of families that have higher economic status) can share their experiences of good sleep quality with other elderly who are facing the problem of poor sleep quality. Elderly persons need to be informed about the significance of active participation in day-to-day activities at home and in their surroundings,as well as regular exercise, besides awareness and the need for quitting / or cessation of smoking and drinking alcohol altogether. It is crucial

that large-scale studies across the Indian continent, mainly cross-sectional and community-based, should be carried out to understand the poor sleep quality (or sleep disturbances) and its intricacies among elderly persons.

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Acknowledging the Relationship between the Physical Activity Levels and Sleep Quality Among the Community-Dwelling Elderly People of Vadodara : A Cross-Sectional Study

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ABSTRACT

The present study, which investigates the prevalence of physical activity levels and sleep quality, underscores the potential benefits of awareness programs. It examines the association between physical activity levels and sleep quality in 95 community-dwelling older adults aged 65-74. The prevalence of physical activity levels and sleep quality was assessed with IPAQ-SF and PSQI, respectively, and their association was analysed. The study found that 44 per cent had low physical activity levels, and 56 per cent had moderate levels. Regarding sleep quality, 62 per cent were found to have poor sleep, and 38 per cent had sound sleep. Despite the lack of a significant association between physical activity levels and sleep quality in the elderly community-dwelling in Vadodara, the study's findings underscore the urgent need for awareness programs to address sleep problems and physical activity among older people. This is particularly important given

the projected rise in India's elderly population and the current prevalence of poor health and sedentary lifestyles in this age group, offering a hopeful outlook for the future of geriatric health.

Keywords : Physical activity, Sleep quality, IPAQ-SF, PSQI, Community-dwelling elderly

Ageing is a normal biological phenomenon. Changes in the biological aspect result from the impact of the accumulating various of molecular and cellular damage (Li Chia-Ing, *et al.*, 2014). Older adults are categorised as those who are over the age of 65 (Kiik, *et al.*, 2020). India's elderly population is projected to touch 194 million in 2031 from 138 million in 2021, a 41 per cent rise over a decade, according to the NationalStatistical Office (NSO). This population is often seen as having poor health, and it has been found that this age group spend, on average, 10.7 hours per day sitting, with 40 per cent of this age group living a sedentary lifestyle. (Shilpa K, and Norman G, 2022)

Elderly physical activity differs from that of theyoung population. It requires a short and categorised enquiry format based on different activity levels to get reliable responses, a crucial aspect in our research. The aspects of physical activity can be defined as including light/moderate/heavy intensity activities, as well as household chores, occupational activities, and sports (Kahlmeier S, *et al.*, 2015). According to WHO guidelines, exercise is an efficient and cost-effective way of preventing the decline in older people's functional capacity (Park CH, *et al.*, 2014). It also suggested that even the minimal recommended physical activity provides 30-50 per cent of the health benefits (Sylvia LG, *et al.*, 2014). Several variables, including demographic factors such as age, gender, education, marital status, living arrangements, chronic diseases, etc, influence participation in physical activity in older adults.

The various self-reported questionnaires to know the physical activity levels in the elderly population include the WHOGPAQ

(Global Physical Activity Questionnaire), PASE (Physical Activity Scale for Elderly), YALE Physical Activity Survey and IPAQ-SF (International Physical Activity Questionnaire- Short form).IPAQ–short form, is a reliable and valid instrument designed to measure physical activity in respondents aged ≥65 (Wang CY, 2017).

According to the National Sleep Foundation (NSF), a good night's sleep is defined as falling asleep within 30 minutes and waking up no more than once each night (Wu CY *et al.*, 2012). Sleep is a reversible phase of perceptual detachment from, and inattention to, one's surroundings. It is a necessary physiological process with many restorative functions and is essential in maintaining the body's circadian rhythm (Wolkove N, *et al.* 2007). Sleep quality is one's satisfaction with sleep throughout sleep, the time it takes to fall asleep, the frequency of awakening and subjective aspects such as depth and sleep deprivation. In the elderly population, sleep problems are prevalent, a fact that should concern us all. They are known to be associated with many factors like age, sex, education, occupation, chronic diseases, daytime napping, use of sleep medications, alcohol consumption, smoking, and perceived environmental factors (Landry GJ, *et al.*, 2015). The geriatric population are more prone to decreased sleep and its adverse consequences, such as depression, attention and memory problems (Choi H, *et al.*, 2013).

Elements of sleep architecture change with age. Compared to people of younger age, older adults are susceptible to decreased total sleep time, early morning awakenings, sleep fragmentation, and a lower proportion of SWS—slow-wave sleep (Stanley MA *et al.*, 2009).

Sleep quality can be assessed using various methods, including subjective measures (e.g., the Consensus Sleep Diary and Pittsburgh Sleep Quality Index) and objective measures e.g., polysomnography and actigraphy (Ito Y, *et al.*, 2000). The Pittsburgh Sleep Quality Index provides clinicians with a valid and standardised measure

of sleep quality that categorises individuals as "good" or "poor" sleepers (Matsuo M, 2003).

Physical activity has been empirically regarded as a facilitator of mental health and sleep (Matsuo M, 2003; Holfeld B, and Ruthig JC, 2014). Arlianti N *et al.* (2021) have supported the idea that exercise regimens, such as walking, moderate and strength training can promote sleep and other aspects of physical health in older adults. Non-exercise activities, such as household and work-related activities, may be particularly relevant in older adults as the ability and interest to engage in formal exercise decrease with ageing. This underscores the potential benefits of physical activity and may inspire and motivate the audience to promote physical activity in the elderly.

Ageing is usually associated with a disruption of the chronobiological clock. Physical activity could act as a zeitgeber (external cue) for the internal clock there by reducing this disruption. Physiological changes during physical activity, such as increased core body temperature, improved heart rate and cerebral blood flow, enhanced metabolic activity, medical co-morbidities, and decreased depressive symptomatology, may improve sleep quality.

A study conducted in China in 2018 suggested that a greater level of physical activity, leisure-time exercise and household activity were associated with improved sleep quality (Andika GW *et al.*, 2021). In a cross-sectional analysis of the 2006 US Behaviors Risk Factor Surveillance System, investigators found that advancing age was not associated with increased self-reported sleep disturbance, tiredness, or lack of energy, suggesting sleep problems in the elderly population are mediated by factors other than physiologic ageing alone (Strine TW *et al.*, 2008).

Physical activity and sleep quality are both significant factors in improving health. Knowledge of how sleep quality and the amount of physical activity interact may help implement

multimodal health interventions in older adults (Lina RK *et al.*, 2020). However, there are controversies concerning the effects of different levels of physical activity and sleep quality, and evidence about their association with older Indian adults is sparse. Hence, the study highlights the urgent need for further research to investigate the relationship between physical activity levels and sleep quality in community-dwelling older adults.

Method

This cross-sectional study was conducted among community-dwelling older adults in Vadodara. Inclusion criteria were age between 65-74 years, ableto understand English/Hindi/ Gujarati, subjectshavinga score of 6 on the Katz Index of Activities of Daily Living, subjects having a score below five on the Geriatric Depression Scale-short form and no recognisable cognitive impairment identified by Short Portable Mental Status Questionnaire (SPMSQ). Subjects who were institutionalised, not willing to participate, had complaints of sleep disturbances in the last 1 month and had altered physical activity in the last 7 days were excluded.

The sample size for the cross-sectional study was calculated by the formula N = z2pq/L2, where Z± is the usual standard deviate (1.96), p =44.5 per cent, q 100-p=55.5, L allowable error (fixed at 10%). Keeping all these values in the formula, the calculated sample size was 95.

Of the 150 subjects, 95 met the inclusion criteria, and data were collected using the interview method. A detailed subjective assessment was conducted including demographic data, and variables such as age, gender, marital status, literacy levels, etc. The Pittsburgh Sleep Quality Index (Buysse, D.J. *et al.*,1989) was used to assess sleep quality. The subjects had to answer the questions about their sleep in the past month. Subjects with a score of 5 or more were categorised as poor sleepers, whereas those with a score of less than 5 were categorised as good sleepers. To determine the physical activity levels, subjects were required to complete the International Physical Activity Questionnaire, which

assessed their physical activity over the previous 7 days. The number of days and minutes the activity was performed was recorded, and MET/min/week was calculated. Calculate the MET/min/week multiplication of the MET value (walking =3.3, moderate activity =4, vigorous activity =8) by the minutes of the activity and the number of days the activity was undertaken. The total MET minutes achieved in each category were added to obtain weekly MET/min of physical activity. Individuals were categorised into low, moderate and high physical activity levels according to the MET/min/week values obtained: Low category (less than 600 MET/min/week), moderate category (600-3000 MET/min/week) and high category (more than 3000 MET/min/week). The association between sleep quality, physical activity and variables was also analysed for relationship with sleep quality and physical activity levels.

Statistical Analysis

Data was analysed using SPSS version 28.0 and Microsoft Excel 2019. The prevalence of sleep quality and physical activity levels was presented as percentages/frequency tables. The chi-square test was used to establish an association between categorical variables. The data was analysed at the 5 per cent level of significance with a 95 per cent confidence interval (CI).

Results

Table 1

Presents the Distribution of Various Variables Distribution of Different Variables

Variables	Dimensions	Numbers(%)
Age	65-69	49 (52%)
	70-74	46 (48%)
Gender	Male	52 (55%)
	Female	43 (45%)
Marital Status	Married and Par	72 (76%)
	Unmarried and Others	23(24%)

Literacy Levels	Pre-Primary	16 (17%)
	Primary	19 (20%)
	Secondary	26 (27%)
	College and Others	34 (36%)

Table 1 Shows the distribution of different variables, such as age, gender, marital status, and literacy levels,in the present study.

Table 2

Presents the physical activity levels Prevalence of Physical Activity Levels

Prevalence of Physical Activity Levels	**N(%)**
Lowlevels	42(44%)
Moderatelevels	53(56%)

Table 2 Shows the physical activity levels among the population : 44 per cent had low levels of physical activity, and 56 per cent had moderate levels.

Table 3

Present the Sleep Quality of the Population

Prevalence of Sleep Quality	**N(%)**
Poor sleepers	59(62%)
Goodsleepers	36(38%)

Table 3 Shows the sleep quality of the population : 38 per cent were good sleepers, whereas 62 per cent were poor sleepers.

Table 4

Present the P-value Association between Physical Activity Levels and Sleep Quality

Physical Activity	**Sleep Quality**		**Chi-square**	**p-value**
	Good	**Poor**		
Low	13	28	1.173	0.279
Moderate	23	31		

Table 4 Shows that the p-value obtained from the chi-square analysis for the association between sleep quality and physical activity levels is 0.279 ($p>0.05$), suggesting no statistically significant association.

Table 5

Age Group	**Physical Activity**		**Chi-square**	**p-value**
	Low	**Moderate**		
65-69	21	28	0.00373	0.9 51
70-74	20	26		
Gender				
Female	27	25	3.597	0.058
Male	14	29		
Literacy Levels				
Pre-Primary	5	11	4.975	0.174
Primary	12	7		
Secondary	12	14		
College and Others	12	22		
Marital Status				
Married and Partnered	24	48	11.70	0.001
Unmerried and Others	17	6		

Table 5 shows that p-values obtained from the chi-square analysis for the association between age, gender, literacy and physical activity levels are 0.951, 0.058, 0.174, and 0.873 ($p >0.05$), respectively,suggesting no statistically significant association. In contrast, the p-value between marital status and physical activity levels is 0.00 ($p<0.05$), suggesting a statistically significant association.

Table 6

Association between Age, Gener, Literacy Level, Marital Status and Sleep Quality

Age Group	Sleep Quality		Chi-square	p-value
	Good	Poor		
65-69	20	29	0.367	0.546
70-74	16	30		
Gender				
Female	17	35	1.321	0.25
Male	19	24		
Marital Status				
Married and Partnered	35	37	14.511	0.00
Unmarried and Others	1	22		
Literacy Levels				
Pre-Primary	6	10	3.065	0.382
Primary	4	15		
Secondary	11	15		
College and Others	15	19		

Table 6 shows that p-values obtained from the chi-square analysis for the association between age, gender, literacy and sleep quality are 0.545, 0.25,0.382, and 0.564 ($p > 0.05$), respectively, suggesting no statistically significant association. In contrast, the p-value between marital status and sleep quality is 0.00 ($p < 0.05$), suggesting a statisticallysignificant association.

Discussion

In this study, the prevalence of physical activity (PA) levels showed that 44 per cent of subjects had low physical activity levels, and 56 per cent had moderate physical activity. A study in Bangladesh showed that half (50.3%) of the adult population had a 'low-level' of PA. Likewise, although there was a general decline across age groups, the rate of PA remained high in the older age group for some countries such as New Zealand, China and Hong

Kong. (Bauman A, *et al.*, 2009) This study also showed that physical activities at work and during the commute are the main contributors to total PA. In addition, physical activities undertaken as part of recreational or leisure-time activity contributed very little to the total PA. These results align with those of many low- and middle-income countries, where work and transport-related activities are the prime contributors to overall Physical Activity (PA) compared to leisure-time activities. However, in high-income countries (such as Australia, Canada, New Zealand, and the USA), leisure-time PA is a significant component of total PA undertaken by adults (Parks SE *et al.*, 2003; Haase A *et al.*, 2004). This difference can be attributed to the higher availability and accessibility to sports or recreational facilities as well as a history of long-term exercise promotion in high-income countries.

Prevalence of sleep quality showed that only 38per cent of the subjects had good sleep quality, whereas 62per cent had poor sleep quality. The prevalence of poor sleep quality among older adults was 47.1 per cent in Hong Kong, while the corresponding figure was 49per per cent in Taiwan (Zhang YS *et al.*, 2020) and 64.3 per cent in Korea (Park *et al.*, 2013). The possible reasons could be different study periods, sample sizes, sampling methods (one-stage vs multi-stage), and interview techniques (face-to-face vs telephone interviews) in the different findings (Wu, C.-Y. *et al.*, 2012; Sukegawa, T. *et al.*, 2003).

The present study had no association between physical activity levels and sleep quality. Similarly, Oliver Vogel *et al.* (2021)found no association between higher activity levels and better sleep quality. A cross-sectional study, which covered participants from 23 countries, also demonstrated no association between vigorous Physical Activity (PA) and sleep quality and quantity. (Pengpid S, Peltzer K, 2017) Even a study by Seol J. *et al.* (2020) found no significant difference in sleep quality when light-intensity activity replaced vigorous-intensity exercise. A cross-sectional study showed that neither PA intensity nor duration was associated with sleep quality or quantity (Kakinami L, *et al.*, 2017).

A study by Naylor *et al.* (2000) found that moderate-intensity exercise has positive impact on sleep quality. Lohne-Seiler *et al.* (2014) found that overall PA levels differed considerably between the age groups, with the oldest (80–85 years) displaying a 50 per cent lower activity level compared to the youngest (65–70 years). However, the present study included only the youngest old group, which could explain thedifference in the result.

In the present study, no significant association was found between age, gender, literacy level and physical activity, however a significant association was found between marital status and physical activity. Wang and Boros (2021) observed that age, as a moderator of PA, did not provide sufficient evidence to moderate the relationship between PA. Lohne-Seiler *et al.* (2014) also found no association between gender differences and physical activity. We did not find significant sex differences in physical activity levels within each age group, which contract with similar studies from other countries, that typically show a higher mean physical activity level among men than among women (Troiano RP *et al.*, 2008; Arnardottir NY *et al.*, 2013). This discrepancy might be connected to socioeconomic status and cultural differences concerning retirement age, infrastructure and environmental security among the populations studied. The relationship between education and health behaviours appears to be independent in the case of physical activity, as shown in a study by Kaplan *et al.* (2001).

Jeong-Hui Park (2023) concluded that older adults' PA in the widowed group was approximately 30 minutesless per week than their married counterparts. Older adults in the widowed group spent more than 4 hours per week sitting compared to those in the married group. Fingerman and Kim (2022) also suggested that men and women with a spouse were less likely to watch television for more than 3 hours a week than those living alone. A possible explanation for the significant association between widowed older adults and poor health behaviours (low PA and high SB) might be the absence of a spouse, one of the primary factors in social support and/or

the changing of roles within the family and social networks, or the loss of social connections which temporarily and/or permanently led to social isolation. (Ibrahim R., *et al.*, 2013)

In the present study, no significant association was found between age, gender, literacy level and sleep quality, however, a significant association was found between marital status and sleep quality. Similar findings were observed by Wu Chia-Y *et al.* (2012), where age was not significantly related to sleep. A study conducted in Hong Kong suggested that socioeconomic factors and chronic disease, rather than gender, may contribute to sleep differences (Jang Y. *et al.*, 2016). Several researchers have also reported that socioeconomic factors such as literacy level, occupation, and income are unrelated to sleep quality (Moore PJ, *et al.*, 2002; FriedmanEM, *et al.*, 2007).

The prevalence of sleep problems in married people was significantly lower than that of single, widowed, or divorced people, which is in consistent with the results of the studies of Arasteh *et al.* (2014). This finding may be due to the fact that, in the current economic situation, one of the primary concerns of married people is to provide for the needs of their dependent family, which is often individuals not a concern for single individuals.

Therefore, this study found a higher prevalence of low-moderate physical activity levels among the community-dwelling elderly as well as a substantial proportion of individuals with poor sleep. The contingency association between physical activity levels and sleep quality was not statistically significant. The association between the variables was not statistically significant with the physical activity levels and sleep quality; however, marital status had a considerable relation with physical activity levels and sleep quality among the community-dwelling elderly.

Conclusion

The researchers found that the prevalence of physical activity showed that older people engaged in low to moderate activity levels. The CDC recommends various moderate and vigorous-

intensity physical activities to benefit health. Sleep quality showed a higher prevalence of poor sleepers; therefore, various aspects should be considered to improve sleep quality in older people. Awareness programmes are significant and helpful in addresing sleep problems and promoting physical activity among older people. This study did not establish a relationship between physical activity levels and sleep quality. However, it is crucial to note that various cultural and religious beliefs may significantly influence physical activity and sleep quality, necessitating a more comprehensive approach to geriatric health.

Marital status was significantly associated with physical activity and sleep quality in older people. Changes in social networks and social support have a profound inpact on the health behaviour spectrum, highlighting the crucial role of social networks and support in the health of older adults. Even if the association between physical activity and sleep quality was not obtained, both factors are of immense importance for geriatric health, and qualitative recommendations andguidelines are essential to uncover their relationship.

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Faith Healing Practices among the Elderly Paniya Women in Wayanad, Kerala : A Qualitative Study

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ABSTRACT

The present study aimed to understand the faith-based healing practices of 20 elderly Paniya women, aged 60 years and above. These women possess a deep knowledge of traditional practices, whose indigenous knowledge of these healing utilising traditions is less well documented. The present study employed qualitative methods, utilising an ethnographic approach to understand the culture and provide a comprehensive description and analysis of faith-healing practices among elderly Paniya women. The researcher conducted in-depth interviews, key informant interviews, observation and focus group discussions. Elderly Paniya women generally view faith healing as preventive measure rather than a curative one. They believe that appeasing their ancestors and deities helps in preventing diseases. The onset of diseases is perceived as a consequence of diminished blessings. By performing rituals to honour their ancestors and gods, they safeguard against illnesses.

Keywords : Older women, Paniya community, Faith healing, Traditional healing practices, Alternative healthcare

Tribal communities, a significant part of Indian society, are a source of unique cultural practices, lifestyles, languages, and socio-political institutions. Their distinctiveness, which sets them apart from the rest of the Indian population, is a fascinating aspect of their identity. They are also given special recognition and safeguards within the framework of the constitution. Tribes have different perspectives on recurring issues, including health, and often integrate traditional knowledge and cultural beliefs into their practices. Tribal communities evaluate health based on the time they take off from their daily activities. In other words, an illness is not deemed to exist until the person cannot carry out the regular duties assigned to people of that gender and age (Mahapatra, 2003). The unique cultural perspectives on health, illness and their associated healing practices of these communicaties are deeply rooted in their beliefs and traditions. While modern medicine offers benefits, it upholds and respects the cultural practices and beliefs embedded in Indigenous knowledge (Roy *et al.*, 2023). Faith healing is one of the many healing methods used daily to address various illnesses. Most sociologists and anthropologists believe that the idea of animism is where faith healing methods first emerged (Ayub *et al.*, 2024). Since animism is connected to all healing methods, it also emphasises the idea of the soul in the healing process. Emile Durkheim took the concept of animism by E.B. Tyler (1871) a step further by referring to it as totemism (1915). He implied that Indigenous people believed some plants and animals had supernatural powers. Hence, the majority of the tribal communities believe that illness is brought on by supernatural factors like curses or broken promises, which call for healing rituals. Thus, social scientists defined faith healing as the interaction of belief systems, group practices, and symbolic meanings, and the efficacy of healing is associated with cultural and social situations (Turner, 1967; Wallace, 1966; Kinsley, 1996). In short, faith healing is a form of healthcare or healing based on a person's culture and beliefs

as a cure for supernatural causes.

Historically, health and illness were explained from a botanical and cosmological perspective. Religious and magical beliefs played a central roll in healing among tribal communities (Ahirwar & Kapale, 2014). As Bhattacharya (2019) discussed, herbal remedies and magico-religious practices are standard traditional healing methods among tribes. Along with the interference of soul, spirit and deity, the healthcare system of indigenous people is closely linked to their religious beliefs. Rituals, rites and spiritual activities are thought to be means of achieving and preserving this equilibrium. Traditional healers hold that ancestors and spirits can provide direction, protection and healing. Tribal communities believe that God's wrath and evil spirits are responsible for diseases, including chickenpox, smallpox, unsafe deliveries, fever, snake bites, typhoid and malaria (Kumar & Jain, 2023). The primary means of healing are sorcery, herbal cures, counteracting evil spirits with magic, and appeasing God (Ayub *et al.*, 2024).

Several studies have been carried out on various traditional healing practices, including faith healing (Parmukh & Palkumar, 2006; Das *et al.*, 2008; Senthilkumar & Gopalakrishnan, 2013; Amirthalingam, 2014; Mahant, 2015; Chatterjee & Sharma, 2018; Barla, 2019; Mohanty & Patra, 2022). Thus, a significant component of the tribal health care system is appeasing the spirits of ancestors or their local deities (Islary, 2014). According to studies (Badami, 2010; Varghese, 2010; Issac, 2013), the Paniya community believes that disease is caused by negative behaviour from the past. They employ various rituals to worship the supernatural force in the hope of curing any ailment. There are plausible behavioural, social and psychological processes via which religion can and ought to improve health (Koenig, 2012).

The present study is significant in this context as it examines the faith healing practices employed by elderly Paniya women,

emphasising their experiential narratives and cultural significance. The present study aimed to understand the faith-based healing practices of elderly Paniya women, as they hold deep knowledge of traditional practices, whose indigenous knowledge of these healing traditions is less documented. The Paniyas are regarded as the first inhabitants of Wayanad, the most significant tribal community in Kerala. They have a very traditional idea of religion. They believe that local deities are considered dangerous if they are worshipped incorrectly, which can cause diseases and even death (George, 2005). Tribal communities place significant importance on healthcare and engage in various healing practices as they consider a person's health to reflect the health of their entire community. The collective knowledge, cultural customs and spiritual beliefs of tribal communities are vitally preserved by tribal elders, who also serve important roles in ensuring the well-being of the entire community by passing them on to future generations (Sarkar *et al.*, 2014).

Paniya is etymologically derived from the Malayalam word '*Panikkaar'*, which refers to 'one who works'. They are also known as Paniyar or Paniyan. Paniyan is the term used to refer to the male, and *Paniyathi* or *Panichi* is used to address the female. Luiz (1962) described Paniya as dark-skinned people with low stature, large noses, and curly or wavy hair who live in various regions of North Kerala, South Karnataka, and Northwest Tamil Nadu. They belong to a cohesive group with definite social and cultural customs.Paniya adhered to *Marumakkathayam*, which is a matrilineal inheritance. Each Paniya family member has their family name. Paniyas were the victims of the bonded labour system and were treated like slaves by their landlords in the early stages of their growth in the district. A bonded labour system prevailed among Paniya, *"Kundal Pani"* or *Nilppu Pani*, a Wayanad model of bonded labour that existed among Paniya communities (Mathur, 1977). Paniyas mostly worked for Chettys (a landlord community), who came to Wayanad in the fourteenth century from

Karnataka and the Nilgiri District of Tamil Nadu. After the 1930s, Christians arrived in Wayanad, bringing new crop varieties and agricultural techniques. Paniyas also started working on their lands. Paniya followed various traditional healthcare practices and depended more on conventional healers. They have begun to use multiple modern medical services to improve their health conditions. Among the Paniya, women and children are experiencing severe malnutrition (Mohindra *et al.*, 2006). They have a very traditional idea of religion. Heavenly deities, including the Sun, Moon, Mother Earth, Lightning deity, etc., are considered sacred and worshipped by Paniya. They tended to adhere to strict ritual practices to appease their gods and ancestors.

Method

Sample

For this study, a non-probability sampling strategy, specifically purposive sampling, was employed to select 20 elderly Paniya women aged 60 years and above from five settlements (The Paniya settlements from Sulthan Bathery Taluk, in Wayanad, Kerala). These women were invaluable participants bringing extensive knowledge of healing methods and personal experience with the procedures.

The researcher employed a variety of interview methods to gather comprehensive data. In-depth interviews were conducted with the elderly Paniya women participants. In contrast, informal interviews were conducted with key informants (N=8), including herbal healers, faith healers, traditional birth attendants, or Petachis, and the leaders of the community or Chemmi. Additionally, two focus group discussions were conducted to ensure a broad range of perspectives.

Analysis of Findings

The present study employed qualitative methods and an ethnographic approach to understand the culture and comprehensively describe and analyse the faith healing practices

among the elderly Paniya women. The transcripts derived from the in-depth interviews and focus group discussions were analysed using thematic analysis, enabling the identification of meaningful patterns across the dataset to formulate themes. The researcher meticulously transcribed the recorded in-depth interviews and focus group discussions were held in Malayalam, into English; the *Paniya Bhasha Sahayi*, which KIRTADS publishes, was used to determine the meanings of certain words in *Paniya bhasha,* and young women in the Paniya community were asked to help clarify the meanings of specific terms during the transcription process. The researcher then identified the patterns and interpretations across the dataset. After that, a codebook was created to carefully record the codes used and ensure they were all allocated correctly. Every excerpt that was associated with a unique code was then combined. The researcher used a starting set of codes and grouped them into potential themes and further into sub-themes. The researcher extensively reviewed and revised the initial themes after they were established. Quotes from the data were used in the narrative writing to begin. Pseudonyms were used to replace the participants' real names, and any identifying information was methodically removed. In the present study, triangulation of the qualitative sources from in-depth interviews, focus groups and observation ensured the trustworthiness of the findings.

Ethical considerations

The Institutional Ethics Committee (Human Studies) of Pondicherry University approved the study. The researcher also sought permission from the Forest Department and the Scheduled Tribes Development Department under the Government of Kerala to enter the Paniya settlements. The researcher informed the participants about the purpose of the data collection. The researcher imposed no compulsion on the participants to partake in the study. By participating in this research,participants were not likely to experience any discomfort. If they felt any physical or mental uneasiness, the researcher did not force them to

participate in this study. Thus, the potential risk involved in the study was less than minimal. Because settlements were situated in both forest and fringe areas, assistance was sought from forest officials to ensure the security of both participants and the researcher. The researcher visited the settlements based on the convenience of the participants. The researcher would not interferewith their matters if they engaged in household chores, work responsibilities or child caring.The information that the researcher collected from this researchwas kept confidential. Photographs were included with the participants' permission, and their faces were hidden. To protect their identity, the researcher ensured that the study participants were allowed to decide whether the researcher could use their real name or a pseudonym in this study.

Analysis and Discussion of the Findings

This section categonises the data into three main themes along with related discussions for each theme. The main themes addressed were the various rituals or faith-based practices for healing, the barriers to continuing these practices, and how they might be integrated with alternative healing practices.

Theme 1: Faith healing rituals: Exploring diverse faith-basedpractices

The Paniya engage in various rituals that can be categorised into two main groups : cultural and religious. They value every one of these rituals highly. The Paniya community follows polytheism. The primary deities worshipped by the Paniya are *Kuli, Gulikan, Maariyamma, Bhadrakali, Kodungalloor amma,* and *Valliyuramma* across various settlements. An idol does not represent its gods. They frequently install tiny stones, which they worship as their deity. They build this sacred space beneath any tree where offerings are presented, and lamps are lit. It can be said that the Paniya community follows a primal religion. It may be said that elderly Paniya women attempt to heal their ailments

by performing certain *pooja* or rituals and through prayer. Many festivals for appeasing the Gods and rituals are performed annually. The primary faith-healing practices embraced by elderly Paniya women include the following;

Daivam Kaanal/Chatharam Nokkal

The ritual called *'Daivam Kaanal'* involves perceiving God or *Chathram Nokkal,* a practice performed by individuals with siddhi (attainment), which may be hereditary. Both genders partake, with the faith healer known as *Attali.* They diagnose health issues using castor seeds on a winnowing basket, performing rituals every Tuesday and Friday to provide remedies or guidance from *Chaathram.* Kali, 65 years old, shared an incident when they cured the disease with some rituals, saying :

"There was one girl who got paralysed. We did notknow the reasons for that. Our mother knew chaathram when she found the reason for her illness. She did some rituals and offerings. After that, she was cured of the health issue."

Komaram Thullal / Daivam Thullal

This is another ritual for curing diseases, and they believe that during this practice, God enters the body of *Velichappadu*(mediator between deities and devotees). Then, the people should come and ask about their concerns, problems, and solutions for their diseases. Kunji, above 65 years 65 years old, performed*komaram* everyTuesday and Friday. She explained;

"We are supposed to do this every Friday and Tuesday. Here we worship Gulikan and Mariyamma. I perform this in Gulikathara(a worship place) or at my home, where we have a worship place. The majority are coming here to cure mental illness. Mostly, this is due to badha (evil attack). First, I do chaathram when I can find out the actual issue and whether this is curable or not. Then, I will direct them to do so accordingly. If it is incurable, I will tell them to find another solution. Before performing this, I have to go through vratham (fasting).One day before this, I had to avoid non-vegetable foods from my diet. When I perform this in front of

Gulikathara,I will go for complete fasting. At that time, I will take only water."

The one who performs this engages in rigorous fasting but admits to chewing betel quid, indicating an addiction. There is a worship place frequented by women, including those from other settlements, dedicated to deities, such as, Kodungalloor Amma and Gulikan,for health issues. In some settlements, elderly women perform *Komaram thullal* to soothe crying babies. The Velichappadu use ash, rice, and a lit wick in a ritual, believing they drive away evil spirits that cause distress.

***Daivathinu Kodukkal*- the annual appeasement**

It is an annual appeasement ritual to ensure prosperity. Participants undergo a seven-day fast with community involvement, though menstruating women cannot participate. Popped rice preparation marks the first day. The event, led by elderly women known as *Koottathi,* involves singing and dancing to traditional music played on the instruments called *Tudi* and *Kuzhal.* Participants offered rice, flowers, and fruits, invoking the spirits of ancestors and deities to find solutions to their problems. Community participation in this ritual is crucial for receiving blessings and promoting family unity.Moopathi, an elderly woman, commented on the yearly ritual. She expressed;

"Daivathinu Kodukal is over here this year. Every year, we perform this. That is for our good deeds. We need blessings from all. One should go to a temple.... and offer something to Gulikan. We need everything....we have our own Gulikathara. Our offspring are performing rituals there...but it is less...no one can stop that, right?"

Odi vekkal

Many elderly women believe that chronic disease stems from evil spirits or from the negative energy caused by certain individuals' harmful influence, which is known as *Kai Visham. Odi vaidyaru* (faith healer) conducts the ritual to remove this

negative energy. The *Odi Vaidyaru*(faith healer) explained the procedures of this ritual.

"Odi vekkal is a ritual where people send God for help to cure diseases caused by toxic substances from food or drinks. It lasts 10-15 minutes and is performed daily without fasting or non-vegetarian restrictions. People come to this pooja for incurable diseases and give money as Dakshina. If no relief is received, I send the person to the hospital." He determines if a condition is curable, sends patients to the hospital for continued medication and performs *odi* for pain, memory loss, mental illness and allergies based on *Chaathram*. Cheeru, another elderly woman,had a severe allergy issue. She went to do this faith healingwhen her husband compelled her to do this. She explained, *"Before I went there, I did not have much faith in such healing, but when I saw it, I started to believe. Now I feel better. They also gave me some medicines. They use turmeric water and oil, mix turmeric in water, cover it, and perform the ritual in a room where no one can enter. Only one person is treated at a time."*

Manthravadham

Mental problems (*piranthu varutham*) were often thought to be caused by demonic forces entering the body. The person assigned to evacuate this demon was called *Manthravady* or *Manthrakan* (Sorcerer). Elderly women believe certain people could identify the source of demonic attacks. Rituals like *Meli edukkal* and *Kalam varakkal* are part of *Manthravadam*. Pregnant women who feel uneasy are believed to be affected by demons. To drive the demon out, a ritual called "*aattu paaduka*" is performed at night by the *Manthrakaran*.

Charadu kettal

Tying black thread to the wrist or waist is a faith-based practice. It symbolises protection against fear or evil, especially when fever persists despite medication.

Sacrifices and offerings

Elderly Paniya women sacrifice hens for blessings, believing it protects against illness. They respect their ancestors during harvesting festivals like Vishu, Onam, and Karkidakam, offering Puthanari (new rice) in gratitude for the harvest. Pedimattal, another ritual, eliminates the fear of evil spirits, and they believe neglecting it risks mental and physical health issues.

Nair (2010) mentioned the rituals followed by the Paniya community, which includes rituals such as Nikalattom, Kettiyattam, and Maradu Chavittal used to heal diseases. Varghese (2010) called the religion followed by the Paniya people in Nilgiris and Kannur "Paniya religion". Similar observations on worshipping various deities, as reported by Paniya in the study among the Hill Korwas, include a comprehensive and related list of deities and the ailments they are associated with (Khatua, 2005). Faith healing emerged as an alternative healing technique within the conventional healthcare domain, a practice inherited from their ancestors. The Paniya's slave history and lack of access to herbs forced them to develop more spiritual healing practices than herbal ones (Issac, 2013). Paniya has a strict and organised religious life, similar to that of many other tribal groups in Wayanad.

Theme 2: Barriers to preserving the traditional knowledge and practice in faith healing

In many settlements, money issues prevent the annual appeasement ritual, *Daivathinu Kodukkal.* Chinna, an elderly person, said health problems or sudden deaths happen when divine blessings are low. Although they used to hold the ceremony annually, it has not occurred recently, resulting in adverse events throughout the entire community. Kalyani, another woman, expressed similar feelings: "My *brother died a few years ago. After that, we stopped doingdaivathinu kodukkal. He handled everything. No one participates anymore. We used to respect our ancestors and the Gods. Now, people do not care. It is clear that since then, no one has lived well. Everyone gets sick quickly,"*Chethamma observed, *"if God is angry, we lose*

everything. So it is wise to seek their favour and keep them pleased".

Historically, traditional healing was valued. However, this wisdom is being transmitted less frequently at present. Several women recounted that they had learned about traditional treatment techniques from their mothers and grandparents; they raised concerns about the transmission of this information to future generations. The depth and quality of traditional knowledge differ across community members and are influenced by factors such as age, gender, social status, cognitive attitude, and occupation (Tripathi *et al.*, 2000). A comparable pattern has been documented in other studies (Mahato, 2022; Dwivedi *et al.*, 2023; Kumar & Jain,2023) on the dependency of various tribal communities in India on traditional healing methods. Tribal communities possess extensive knowledge and skills to create new methods and techniques derived from their surroundings. This can be seen in the case of healthcare practices. Their knowledge is rooted in interconnectedness and passed down orally in adherence to established cultural norms regulating knowledge handling, including rules on secrecy and sanctity regarding the healing practices. Financial constraints due to the lack of regular employment in many settlements often hinder the performance of costly annual rituals, leading some to attribute familial and communal misfortunes to divine displeasure. Rituals are considered pivotal preventive measures, with a preference for faith healing practices deeply rooted in tradition. The *Vaidyaru* (traditional healer) and *Manthrakaran* (ritual specialist) are highly esteemed figures within their community, valued for their proven treatments, restorative confidence, affordability, accessibility, lack of adverse effects, proximity, ability to communicate in the local language, and alignment with their way of life.

Among the elderly Paniya women, traditional knowledge of herbal remedies is declining, leading them to seek faith-based healing methods. Without traditional healers, they use prayers and

offerings to cope with insecurity and misfortune. The lack of specific offerings or appeasements negatively impacts well-being, reinforcing faith in deities and the risks associated with breaking customs. These women, who believe in faith healing, use herbs for self-treatment, follow strict dietary customs, and perform rituals to seek blessings from their ancestors (Badami, 2010).

Theme 3: Integrating faith healing with alternative healing practices

Elderly Paniya women in this research were utilising both traditional and modern healthcare services, encompassing remedial and preventive approaches. The herbal plants employed by elderly women primarily aim to alleviate symptoms in the initial stages. Paniya elderly women use herbal treatments at home from various medicinal plants to treat *Surya kuthu* (Migraine). They get these medicines from herbal healers who are knowledgeable about the herbs and how to prepare them. An herbal paste should be applied daily for three days to the head to aid in healing. To treat chickenpox, patients consume cold foods and follow a routine of soaking an onion in fermented rice water overnight, then bathing with turmeric or neem water after a week. They engage in rituals and prayers in addition to this herbal medicine method to get relief from the diseases. The Manikandan (2005) study focused on the Paniya tribes in Nilgiri District, Tamil Nadu, documenting 52 plant species used to treat ailments, including diarrhoea and body pain. Naseef and Philip (2012) studied Paniya tribes in Wayanad, discovering that elderly members had more traditional knowledge of herbal plants for gynaecological issues than younger members, identifying 32 plant species used for various health conditions.

Currently, the Paniya exhibit a mix of diverse customs and lifestyles that influence their healthcare practices. The number of elderly Paniya women who widely use allopathic medicine has increased due to government sponsored modern healthcare

programmes (Varghese, 2010). Badami (2010) argued that although the Paniya community avoids traditional healing methods, especially faith healing practices, they still privately engage in such healing practices. The traditional birth attendant stated the importance of following their traditional healing practices in addition to modern medicine. She stated, "*For asthma, we use herbal medicine. The hospital provides medicines without considering karuthavavu (no-moon day in the Malayalam lunar calendar) and veluthavavu (full moon day in the Malayalam lunar calendar. Both good and bad events will occur throughout these periods. Only then do we pray and take our medicines. These factors were considered by our vaidyaru, who provided appropriate therapies.*" Elderly women have different views on faith healing and other practices, including modern medicine, focusing on access to medical care. The referral system is important in how elderly Paniya women seek healthcare (Kumar & Raj, 2019). It was evident from the feeling that elderly women performed rituals to prevent bad luck and serious illness by pleasing their ancestors and deities. Many people fear punishment for not performing these rituals. Folk and traditional healthcare services strongly connect with people, while modern healthcare is often criticised for being less accepted and satisfying (Subedi, 1989).

Conclusion

Elderly Paniya women mostly view faith healing as a preventive measure rather than a curative one. They believe that appeasing their ancestors and deities helps in preventing diseases. The onset of diseases is perceived as a consequence of diminished blessings. By performing rituals to honour their ancestors and deities, they safeguard against illnesses. Terminating these rituals is believed to invite curses from their ancestors and deities, a chance that instils fear.Elderly women effectively integrate faith healing with alternative healing practices, informed by their understanding of illness severity and related symptoms. Cultural and economic factors shape their healthcare choices. However, they do not entirely

ignore modern treatments. The selection of treatments relies on their perceived effectiveness for recovery. Cultural beliefs play a crucial role in how elderly Paniya women view health and illness, guiding their choice of healing practices.

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Psychological Characteristics of Helpers and Non-helpers in Different Stages of Adulthood : A Comparative Study

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ABSTRACT

The present study examined psychological factors associated with helping behaviour in different stages of adulthood. An attempt has been made to investigate whether there are any significant differences in wellness, distress, personality factors, personal meaning in life, and self-esteem between non-helpers and helpers who contribute either money or time to different types of organisations, namely orphanages and old age homes, across various stages of adulthood. The sample consisted of 624 men and women between 30 and 60 years of age, comprising 312 social helpers who regularly contributed to an orphanage or an old-age home by giving their time or money, and 312 non-helpers. The PGI Wellness Scale (Verma & Verma, 1989), General Health Questionnaire-12 (Goldberg, 19821), NEO Five Factor Inventory (Costa & Mc Crae, 1992), Wong's Brief Personal Meaning Profile (Wong, 1989) and Rosenberg's Self Esteem Scale (Rosenberg, 1965) were individually administered to the participants. Analysis of Co-variances (ANCOVA) and three-way ANOVA was used for statistical computation. Results indicated that ageing has a significant effect on helping behaviour.

Helpers tend to have higher levels of wellness, personal meaning, and self-esteem, whereas non-helpers tend to have lower levels of distress. Regarding ageing, wellness and personal meaning are high in late adulthood (50 to 59), whereas distress is high in early adulthood(30 to 39). There is also a significant effect of ageing on the nature of help given and the institution. Individuals belonging to late adulthood who donate money to old age homes tend to have higher wellness and personal meaning in life. Implications are discussed in terms of prosocial behaviour contributing to the mental health of helpers, which can facilitate the inclusion of altruism as a therapeutic technique.

Keywords : Helping behaviour, Ageing, Mental health, Personality factors, Self-cognition

Social helping, also known as prosocial behaviour, is a crucial aspect of successful social interaction and plays a vital role in promoting positive psychological growth. Knickerbacker (2003) states, "Prosocial behaviour is defined as voluntary actions intended to help or benefit another individual or group of individuals." In prosocial behaviour, one is faced with the decision to help others at the expense of oneself (Simpson, 2008). The present study commenced from the assumption that helping behaviour is associated not only with the benefit of the recipient, but also of the giver.

Social helping and ageing

Midlarskyand Kanha (2007) proposed five benefits for older adults who engage in altruistic behaviour: enhanced social integration, distraction from one's problems, increased meaningfulness, improved perception of self-efficacy and competence, and a more physically active lifestyle. Furthermore, they associated adult altruism, that is, voluntary helping motivated by concern for the welfare of others rather than anticipated rewards, with improved morale, self-esteem, positive affect, and well-being.The current study focuses on assessing the differences in motives in three stages of adulthood. According to Klemme's theory (1971), early and middle adulthood are periods of autoplastic

or passive mastery, with an inclination towards autonomy and achievement. However, during late adulthood, individuals tend towards omniplastic mastery, with a shift in focus towards global concerns, altruistic activities, and broader social issues.

Forms of social helping

The most important examples of prosocial behaviour are sharing, helping, comforting, cooperating, donating money, volunteering and complementing (Weinstein & Ryan, 2010). The orphan children are most vulnerable physically, emotionally, morally and socially, requiring material and emotional support. Furthermore, old age is often likened to a second childhood, requiring constant care, assistance, and material support for physical and emotional well-being. Thus, it is one of the neediest sections of society. In the current study, individuals who donate their time or money to an orphanage or an old-age home have been selected for comparison. The study also aims to explore the gender differences in motives related to pro-social behaviour. Piper and Schnepf (2008) found that when helping implies performing an activity or when the intervention is perceived as risky, men are more willing to help. Social role theorists have also argued that women are expected to be communal and unselfish, whereas men are expected to be agentic and independent (Eagly, 2009). The literature review suggests that there is still much to learn about the gender stereotypes that may accompany adults' perceptions of different forms of prosocial behaviour.

Helping behaviour and personality

A body of literature indicates that personality may moderate pro-social behaviour in an individual. Personality traits are "dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings and actions" (Costa &McCrae, 1992). These traits shape how individuals direct their attention and activate specific goals. The current study examines the moderating effect of personality on helping behaviour related to mental health and self-cognition.

Helping behaviour, mental health and self-cognition

In this study, we aimed to examine whether helpers and non-helpers differ in terms ofmental health and self-cognition indices. Mental health was studied in terms of wellness and distress. Keyes (2002) describes well-being as a subjective evaluation of one's life, based on affect, physical health, psychological functioning, and social functioning. The negative State Relief Model also states that the increased energy and positive feelings generated when a person is altruistic are vital to general mental health and wellness. Self-cognition, comprising personal meaning and self-esteem, was examined in the present study. Self-cognition refers to the combination of psychological and physical attributes that is unique to everyone (Shafer, 2006). Helping behaviour can increase personal meaning and self-esteemby enhancing social approval and goodwill, as well as improving social connectedness (Klein & Epley, 2014).

Based on these aforementioned discussions, the following objectives were stated:

- To determine the effect of helping status (helpers versus non-helpers) on the individual's distress, wellness, personal meaning, and self-esteem.
- To determine the effect of the gender of helpers on their level of distress, wellness, personal meaning in life and self-esteem.
- To determine the effect of age (early adulthood- 30-39 years, middle adulthood 40-49 years and late adulthood 50-59 years) of helpers on their distress, wellness, personal meaning in life and self-esteem.
- To determine the effect of the type of institution and age of helpers on their distress, wellness, personal meaning in life and self-esteem.
- To determine the effect of the type of help given and the age of helpers on their level of distress, wellness, personal meaning in life and self-esteem.

- To determine the relationship of personality traits with wellness, distress, personal meaning and self-esteem regarding helping behaviour.

Method

Sample

Six hundred and twenty-four (624) individuals in and around Kolkata of 30-60 years (divided into three categories—early, middle, and late adulthood), both genders, helpers and non-helpers, participated in the study. A multi-stage sampling technique was employed. A list of orphanages and old age homes in and around Kolkata was prepared. From these institutes, social helpers were randomly selected in each group. An equal number of males and females were randomly selected in each group, giving them time or money.

Five orphanages, two old age homes, and three charitable trusts were randomly selected from a list of 267 organisations in Kolkata. A list of helpers in these locations was obtained, and those meeting the inclusion criteria were randomly selected for all four categories. All the participants came from upper-middle or upper-income groups with a minimum secondary level of education. Two groups were matched in terms of age, education, and income.

For social helpers, individuals who have been involved in helping behaviour for at least 2 years and giving time and/or material help to either of the two types of institutions were included. None of them used a tax exemption certificate for their material help, thus apparently being motivated solely by altruistic reasons. Non-helpers were selected to avoid engaging in pro-social behaviour, even not helping beggars regularlyin the community.

For helpers in all eight categories, 13 adults from each group belonged to early, middle, and late adulthood age groups, respectively. For non-helpers in each gender, 52 adults were assigned to each of the three categories: early, middle, and late adulthood.

Tools Used

An appropriate consent form was prepared to seek consent from the social helpers and non-helpers for their participation in the present study. A detailed schedule was prepared to elicit information on name, age, sex, address, marital status, area and duration of social work, religious beliefs and attitudes, occupation, qualifications, personal and family income, family details, number of children, and family environment. The following scales were administered individually to each participant.

The General Health Questionnaire- 12, developed by Goldberg in 1972, was used to assess psychological distress. GHQ-12 is a self-administered 12-itemtool, scoring from 0 to 1 for each item. Individuals scoring above two are addressed as psychologically distressed. The scale's reliability is found to be .90 from the Likert method. In studies, Cronbach's coefficients for the GHQ-12 are in a much higher range of 0.88 to 0.93.

The PGI General Wellbeing Measure is a 20-item scale developed by Verma and Verma in 1989. The scale measures aspects of adjustment, including freedom from health concerns, worry, distress, low energy levels, dissatisfaction, lack of cheerfulness, and difficulty with emotional and behavioural control. It is a self-administered scale with clear instructions. The K.R. formula was used to measure reliability for the scale. The Cronbach's alpha was found to be 0.98, while the test-retest reliability was 0.91. Construct validity scores were 0.86. This scale was constructed and validated in the Indian population, making it widely applicable.

NEO Five Factor Inventory was developed by Paul T Costa and Robert T McCrae in 1992. The NEO Five-Factor Inventory consists of 60 items, with 12 items per domain. The domains are named neuroticism, extraversion, openness, agreeableness and conscientiousness. Responses are solicited using a five-point scale ranging from SD or strongly disagree to SA or strongly agree, with scores ranging from 0 to 4. Reliability scores for the scale are as follows: Neuroticism- .85, Extraversion- .80, Openness- .68, Agreeableness- .75 and Conscientiousness- .72. Construct validity of the scale is .82.

Wong's Brief Personal Meaning Profile, developed in 1998, is a 21-item self-administered instrument intended to measure people's perception of personal meanings in their lives. The subject's response on each item from 1-7 constitutes that score for the item. The higher the score, the higher the meaning in life. For the scale, internal consistency is high with only one subscale yielding a reliability coefficient below .70. Test-retest reliability of this scale is .73, while construct validity is .72.

Rosenberg's Self-Esteem Scale (RSES), developed by sociologist Morris Rosenberg in 1965, is a widely used measure of self-esteem in social science research. It is a 10-item Likert-type scale with items answered on a 4-point scale from strongly agreeto strongly disagree. It is a self-administered scale. The total score ranges from 0 to 30, with 30 being the highest possible score. Test-retest correlations are typically in the range of .82 to .88. Thus, the Rosenberg Self-Esteem Scale has a reliability of .85 and content validity of .76. Supple, Plunkett, Peterson and Bush (2003) suggested that the simple nature of test items makes this tool widely applicable across diverse cultures.

Procedure

The prospective helper participants for the study were contacted with the assistance of the management committees of the orphanages and old-age homes included in the study. The non-helper participants were recruited from within the community, with consideration given to the similarity in demographic characteristics between them and the helpers. Those who gave voluntary consent were taken. Apart from the information schedule, all the scales were administered to the participants individually. The data collected was then scored and tabulated for further statistical treatment and verification of objectives.

Results

Two groups computed statistical calculations. One group computed statistics to compare helpers with non-helpers, and the

second computed statistics to compare different categories of social helpers. All findings have been interpreted at a 95 per cent confidence interval.

- **Descriptive statistics** (Mean and Standard Deviation) of all the variables were obtained from the ANCOVA calculation.
- For the first group of statistics, **three-way ANCOVA** was computed with two groups (social helper and non-helper) with ageing, sex and helping status as IV, distress, wellness, personal meaning in life and self-esteem as DV. Personality factors (neuroticism, extraversion, openness, agreeableness and conscientiousness) were covariates.
- For the second set of statistics, **three-way ANOVA** with eight social helper categories with ageing, institution and type of help given as IV and distress, wellness, personal meaning and self-esteem as DV was obtained.

Table 1

Socio-demographic variables for helpers and non-helpers

Variables	Age group	Helper (n= 312)		Non helper (n=312)	
		Male (n= 156)	Female (n= 156)	Male (n= 156)	Female (n= 156)
Age	Early adulthood (34.77. years)	34.10 years	35.05 years	35.12 years	34.80 years
	Middle adulthood (44.68 years)	44.80 years	45.10 years	44.70 years	44.10 years
	Late adulthood (55.09 years)	55.01 years	54.85 years	55.60 years	54.90 years
	Total	44.64 years	45 years	45.14 years	44.6 years
Education	Early adulthood (15.16 years)	15.25 years	14.80 years	15.5 years	15.10 years
	Middle adulthood (15.08 years)	15.12 years	15.65 years	14.85 years	14.70 years
	Late adulthood (14.86 years)	14.72 years	14.80 years	15 years	14.90 years
	Total	15.03 years	15.08 years	15.12 years	14.9 years
Income (In Indian National Rupee)	Early adulthood (84125.40)	85000.80	82000.40	86000.20	83500.20
	Middle adulthood (84700.28)	86000.15	84000.20	85000.25	83800.50
	Late adulthood (84375.50)	86400.15	83200.40	84900.55	83000.90
	Total	85800.37	83067.00	85300.33	83433.87

Table 2

Means and Standard Deviations of helpers and non-helpers of both sexes across three age groups for Distress and Wellness

Age Group	Gender	Helping Status	Distress		Wellness	
			Mean	SD	Mean	SD
30-40(Early adulthood)	Male	Helper	1.90	0.95	14.01	1.29
		Non helper	6.19	1.13	9.98	1.30
		Total	4.04	2.39	12	2.40
	Female	Helper	2.46	1.09	13.78	1.33
		Non helper	6.59	1.15	9.88	1.36
		Total	4.52	2.36	11.83	2.37
	Total	Helper	2.18	1.05	13.90	1.31
		Non helper	6.39	1.16	9.93	1.33
		Total	4.28	2.38	11.91	2.38
40-50(Middle adulthood)	Male	Helper	2.11	0.80	15.05	1.28
		Non helper	5.13	0.95	10.28	1.33
		Total	3.62	1.75	12.67	2.72
	Female	Helper	2.03	0.76	14.92	1.34
		Non helper	4.76	1.16	9.84	1.05
		Total	3.40	1.68	12.38	2.81
	Total	Helper	2.07	0.78	14.99	1.31
		Non helper	4.95	1.07	10.06	1.21
		Total	3.51	1.71	12.52	2.77
50-60(late adulthood)	Male	Helper	1.75	0.78	15.51	1.33
		Non helper	4.88	0.75	10.82	1.46
		Total	3.31	1.75	13.17	2.73
	Female	Helper	1.40	0.69	14.75	1.49
		Non helper	4.28	0.91	11	1.28
		Total	2.84	1.65	12.87	2.33
	Total	Helper	1.57	0.75	15.13	1.46
		Non helper	4.58	0.88	10.91	1.37
		Total	3.08	1.71	13.02	2.54

In ANCOVA, in Terms of distress, there is a significant effect of helping status(F=47.690, P=<.001), age group (F=16.302, P=<.001), along with a significant interaction effect between age group- gender (F=14.181, P=<.001) and age group and helping status (F=24.106, P=<.001).Non-helpers have significantly lower distress than helpers. Regardingageing, the early adulthood age group has a significantly high level of distress. Neuroticism has a significant effect on distress.

In terms of wellness, there is a significant effect of helping status (F=53.393,P <.001), age group (F=8.993, P=.008) and gender (F=4.021, P=.045) in terms of wellness, along with a significant interaction effect between age group and helping status (F=4.228, P <.001). Helpers and males have significantly higher wellness as compared to non-helpers and females. Regardingageing, the late adulthood age group has a significantly high level of wellness. Extraversion(F = 6.011, P < .001) and conscientiousness (F = 3.595, P = .050)have a significant effect on wellness.

Table 3

Means and Standard Deviations of helpers and non-helpers of both sexes across three age groups for Personal meaning and Self-Esteem

Age Group	Gender	Helping Status	Personal Meaning		Self Esteem	
			Mean	SD	Mean	SD
30-40Early adulthood)	Male	Helper	119.65	19.46	24.09	1.34
		Non helper	95.50	17.69	19.28	1.63
		Total	107.57	22.13	21.69	2.83
	Female	Helper	110.07	20.94	23.82	1.35
		Non helper	91.63	19.19	18.40	1.69
		Total	100.85	22.03	21.11	3.12
	Total	Helper	114.86	20.60	23.96	1.35
		Non helper	93.56	18.47	18.84	1.71
		Total	104.21	22.28	21.40	2.99
40-50(middle adulthood)	Male	Helper	128.36	21.73	24.42	1.78
		Non helper	104.73	19.14	18.76	2.32
		Total	116.54	23.58	21.59	3.51

	Female	Helper	116.00	23.67	23.63	1.65
		Non helper	99.25	21.50	18.65	2.14
		Total	107.62	24.02	21.14	3.14
	Total	Helper	122.18	23.45	24.02	1.75
		Non helper	101.99	20.44	18.71	2.22
		Total	112.08	24.16	21.37	3.33
50-60(late adulthood)	Male	Helper	125.94	21.09	24.48	1.61
		Non helper	102.59	15.28	19.42	2.48
		Total	114.26	21.76	21.95	3.28
	Female	Helper	114.65	22.73	23.32	2.36
		Non helper	97.73	18.76	19.50	2.66
		Total	106.19	22.41	21.41	3.16
	Total	Helper	120.29	22.54	23.90	2.09
		Non helper	100.16	17.20	19.46	2.56
		Total	110.23	22.40	21.68	3.22

In ANCOVA, in terms of personal meaning in life, there is a significant effect of helping status (F=3.325, P=.061), age group (F=5.133, P=.006) and gender (F=25.168, P <.001) in terms of personal meaning in life. Helpers and males have significantly higher personal meaning thannon-helpers and females. Regardingageing, the late adulthood age group has a significantly high level of personal meaning. Agreeableness (F=25.056, P=<.001) and conscientiousness (F=32.465, P=<.001) have a significant effect on personal meaning.

In terms of self-esteem, there is a significant effect of helping status (F = 38.186, P < .001) and gender (F = 8.442, P = .004) onself-esteem. Helpers and males have significantly higher self-esteem than non-helpers and females. Agreeableness (F= 3.927, P= < .048)and conscientiousness (F= 30.193, P= < .001) have a significant effect on self-esteem. There is no significant effect of ageing on self-esteem.

Table 4

Means and Standard Deviations of helpers working in orphanage and nursing home giving time and money for Distress and Wellness in terms of ageing

Age group	Type of Help	Type of Institution	Distress		Wellness	
			Mean	SD	Mean	SD
30-40 years (Early adulthood)	**Time**	Orphanage	1.92	0.93480	13.69	1.46
		Old Age Home	2.70	1.19	14.04	1.43
		Total	2.31	1.13	13.87	1.44
	Money	Orphanage	1.96	0.96	13.96	1.18
		Old Age Home	2.15	1.01	13.92	1.20
		Total	2.06	0.98	13.94	1.18
40-50 years (Middle adulthood)	**Time**	Orphanage	1.89	0.65	14.77	1.34
		Old Age Home	2.04	0.72	15.31	1.16
		Total	1.96	0.68	15.04	1.27
	Money	Orphanage	2.42	0.81	14.65	1.47
		Old Age Home	1.96	0.87	15.23	1.21
		Total	2.19	0.86	14.94	1.36
50-60 years (Late adulthood)	**Time**	Orphanage	1.81	0.90	14.85	1.35
		Old Age Home	1.58	0.70	15.73	1.48
		Total	1.69	0.81	15.29	1.47
	Money	Orphanage	1.50	0.71	14.85	1.49
		Old Age Home	1.42	0.70	15.11	1.42
		Total	1.46	0.69	14.98	1.45

Three-way ANOVA shows a significant effect of ageing on helper's distress ($F= 14.721$, $p <.001$). Distress is significantly lower in late adulthood compared to early and middle adulthood. Furthermore, there is a significant interaction effect between ageing and the type of institution ($F = 4.271$, $p = .01$). Individuals in late adulthood experience more distress when helping in older homes. There is no significant effect of the help given and the institution on the distress of helpers.

Regarding Wellness, ageing significantly affects helpers' wellness (F= 25.567, p <.001). Wellness is significantly higher in late adulthood than in early adulthood. There is no significant difference in middle and late adulthood. Furthermore, there is a significant interaction effect between ageing and type of institution (F = 7.841, p = .005). There is no significant effect of the help given and the institution on the wellness of helpers.

Table 5

Means and Standard Deviations of helpers working in orphanage and old age home giving time and money for Personal meaning and Self-esteemin terms of ageing

Age group	Type of Help	Type of Institution	Personal meaning		Self esteem	
			Mean	SD	Mean	SD
30-40 years (Early adulthood)	**Time**	Orphanage	102.23	21.47	23.58	1.55
		Old Age Home	112.31	20.23	24.23	1.24
		Total	107.27	21.27	23.90	1.43
	Money	Orphanage	120.15	18.75	24.08	1.47
		Old Age Home	124.77	15.41	23.96	1.08
		Total	122.46	17.15	24.02	1.28
40-50 years (Middle adulthood)	**Time**	Orphanage	108.77	23.85	23.46	1.90
		Old Age Home	118.88	23.72	23.96	1.95
		Total	113.83	24.10	23.71	1.92
	Money	Orphanage	127.92	21.90	24.19	1.70
		Old Age Home	133.15	17.25	24.50	1.36
		Total	130.54	19.70	24.35	1.53
50-60 years (Late adulthood)	**Time**	Orphanage	106.85	22.50	23.50	1.66
		Old Age Home	116.65	23.57	23.96	1.80
		Total	111.75	23.35	23.73	1.73
	Money	Orphanage	125.85	21.02	23.77	2.15
		Old Age Home	131.85	14.76	24.38	2.65
		Total	128.85	18.24	24.08	2.42

In three-way ANOVA, ageing significantly affects helper's meaning (F=3.539, p=.030). Personal meaning is higher in late adulthood than in early and middle adulthood. Further, there is a

significant effect of the type of help given (F= 49.056, p <.001) and institution (F= 10.736, p .001) on the personal meaning of helpers to ageing. Individuals who donate money and help old-age homes tend to have a significantly higher level of personal meaning in life. There is no significant interaction effect between any variables.

In terms of self-esteem, the type of institution has a significant effect on the helper's self-esteem regarding ageing (F = 4.713, p = .043). However, there is no significant interaction effect between any variables.

Discussion

This study has demonstrated that altruism, a vital social component, significantly enhances both positive mental health and self-awareness. Our research focused on identifying disparities in mental health, personal meaning, and self-esteem between social helpers and non-helpers across various stages of adulthood, with personality serving as a controlling factor. The findings underscore the profound positive influence of altruism on mental well-being, offering a hopeful perspective for future interventions.

Results show that ageing significantly affects mental health and self-cognition regarding helping behaviour. Individuals in late adulthood tend to have higher levels of wellness and personal meaning in life, whereas they exhibit a lower level of distress concerning helping behaviour. According to ageing theories, when an individual reaches late adulthood, they tend to have better social connections and achievements, which give them a feeling of fulfilment, leading to higher wellness and personal meaning, as well as increased helping behaviour (Mc Mohan & Fleury, 2012). Further, in terms of ageing, personal meaning in life was significantly high in late adulthood. Erik Erikson's psychosocial development theory posits that late adulthood involves "Integrity vs. Despair," where individuals reflect on their lives and assess their accomplishments. Achieving a sense of integrity, that is, the feeling that one's life has been meaningful, leads to wisdom and satisfaction. In the current

study, helpers in late adulthood may reflect on their social helping, leading to the perception of high meaning in life.

In terms of mental health, males were found to be high on wellness, extraversion and personal meaning in life, whereas females were seen to have a higher level of psychological distress. According to the response bias view (Sigmon, 2005), women are emotionally more expressive than men. According to females, discussing personal well-being is not a stigma. They consider discussing and sharing problems as socially acceptable. Furthermore, women are often responsible for regular household chores and childcare responsibilities. Furthermore, working women are expected to balance their personal and professional lives, which can be distressing.

Social helpers reported high levels of wellness and low levels of distress. The enhanced positive energy and feelings associated with engagement in helping behaviourare imperative for overall mental health. Helping behaviour is beneficial as it tends to combat depression and anxiety while we are focused on others (Dekupyer, 1998). It may work as a distraction from our problems. Further explanation of this finding can be derived from the negative state relief model, which encourages helping behaviour and considers it a form of relief from stress. In contrast, research has consistently found that positive mood promotes helping behaviour. Research has shown that positive feelings are rewarding and promote helping behaviour (Aknin, Vondervoort & Hamlin, 2017). With enhanced positive cognition, individuals perceive helping opportunities more favourably (Clark & Isen, 1982).

Regarding personality traits, social helpers tend to be high in extraversion, agreeableness, and conscientiousness. The five-factor model explains the relationship between our unique personality traits and associated behaviour, including prosocial ones (Caprara, Allesandri & Eisenberg, 2012). The agreeable person inclines the feelings of need and may be driven to help them. Individuals with high openness tend to participate in new experiences, contributing

to self-realisation. Further, a conscientious individual considers prosocial behaviour as one of their duties and believes in active contribution to society. Research also indicates that the extroverted tend to participate in social activities, including prosocial behaviour. In contrast, neurotic individuals tend to have a negative attitude towards others, which can inhibit their interest in prosocial behaviour (Bruck & Allen, 2003).

Helpers were found to have high levels of personal meaning and self-esteem. Prosocial behaviour is also driven by monotony in regular life, where helping behaviour generates new meaning and purpose (Dahlen, Martin, Ragan & Kuhlman, 2004). The competitive altruism approach (Van Vugt, 2006) further suggests that people often engage in helping behaviour to enhance their social status and reputation in the community. Helping behaviour gives them higher self-worth and social prestige.

In terms of ageing, we found that it has a significant interaction with the type of help given and the nature of the institution. Individuals in late adulthood who donate money to nursing homes tend to have high levels of wellness and personal meaning. Helpers working in old age homes often report higher levels of wellness, possibly due to a sense of relatedness as adulthood approaches old age. They may enjoy social connection and social contribution provided. Furthermore, it has been observed that although caregiving is challenging, it can lead to increased feelings of fulfilment and empathy, thereby enhancing overall wellness. (Schulz & Sherwood, 2008). Helpers working in nursing homes may derive higher personal meaning from their work, as they perceive social help as emotionally rewarding. Old age home inmates have the maturity to appreciate the help they receive, which makes social helpers feel more socially connected. The current study demonstrates that meaningful engagement fosters a stronger sense of purpose and identity.

Personal meaning in life and self-esteem were higher among helpers who provided tangible support. Tangible support provides

financial assistance, material goods, or services. It isa direct and concrete way of assisting others. Assisting others in any concrete way leads to higher self-worth and personal meaning. Self-worth can be pursued individually through helping others, as it gives a person a sense of superiority by realising their ability to help others (Terauds & Katherine, 2011).

This study helps understand the personality, self-cognition, and mental health factors associated with helping behaviour in different stages of adulthood. It also successfully compares different categories of social helpers while taking into account gender and age. A factorial research design wasemployed, which facilitates the study of different levels of independent variables and their interaction effects. Thus, it was essential to understand the specific helping behaviour and its impact on mental health and well-being to incorporate it intothe therapy process.

The present study has certain limitations, which, if considered, would have led to a higher degree of sophistication. The present time-bound study is centred on the upper-class population of Kolkata and does not include other sectors of society. Self-report inventories were used in the present study, which automatically included the self-reporting biases along with the possibility of some faking. Among the female subjects taken, their occupational status could not be controlled. Homemakers and working women were both included in the study. The minimum duration of help was 2 years. However, the amount of time spent on helping behaviour or the material help provided by each helper could not be controlled by the helpers. Furthermore, for helpers who provided financial assistance, we did not control the amount of material help each gave.

Conclusion

Results indicate that helpers have high levels of wellness, low levels of distress, high personal meaning, and high self-esteem. In terms of gender, males have higher wellness and personal meaning,

whereas females have higher psychological distress. Helping is more beneficial to individuals in late adulthood. Thus, the essential conclusion of this research is that a strong correlation exists between positive mental health, high personal meaning, self-esteem and helping behaviour. Personality factors, such as extraversion, agreeableness, and conscientiousness, play a decisive positive role in forming altruistic behaviour. Tangible support giving leads to higher personal meaning and wellness in late adulthood. Thus, altruistic behaviours may be taught as an aspect of mental and physical health in the community setting, which in turn may counteract negative emotions, leading to a higher and more meaningful life, while also being beneficial in later stages of life. Altruism can also be encouraged as a therapeutic technique to combat psychological distress across different stages of ageing.

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The Role of Perceived Quality of Life in Protecting Cognitive Reserve among Older Adults

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ABSTRACT

This study, a significant contribution to the field of cognitive health, is the result of a collaborative effort that explores the role of perceived quality of life (QOL) as a protective factor for cognitive reserve (CR). It offers valuable insights into non-pharmacological strategies for enhancing cognitive resilience in 100 older adults of both sexes, aged 60 to 85 years. These subjects were cognitively capable of understanding and completing the necessary assessments. They were administered the Montreal Cognitive Assessment (Moca) to measure cognitive reserve (CR), OPQOL-Brief to measure Quality of Life and a self-report questionnaire. The study revealed mild cognitive impairment (MCI) or no cognitive impairment in the respondents. A significant positive correlation was found between higher perceived QOL scores and better cognitive performance ($r = 0.41$, $p < 0.001$). The findings of this study underscore the importance of identifying factors that may help protect cognitive function in older adults, especially as the population of people with cognitive decline continues to rise globally. The perceived quality of life represents

a promising avenue of exploration, offering a more nuanced and individualised understanding of cognitive resilience. These findings will inform and enlighten the field of cognitive health, providing a deeper understanding of the protective role of perceived QOL in cognitive decline and inviting further collaboration in this critical area of research. The need for continued cooperation in this field is clear and urgent, as it will allow us to build on these findings and develop more effective strategies for protecting cognitive function in older adults, keeping the audience motivated and committed to the cause.

Keywords : Cognitive reserve; Quality of Life; Older adults; Social engagements

As the global population ages, age-related cognitive decline has become a growing public health concern. Dementia, Alzheimer's disease, and other forms of cognitive impairment are increasingly prevalent among older adults. Cognitive reserve (CR), a key concept in this study, has emerged as essential in understanding individual differences in vulnerability to cognitive decline. CR refers to the brain's ability to use pre-existing cognitive processing to compensate for brain damage or age-related changes. In other words, individuals with higher CR can better cope with the effects of neurodegenerative diseases or other forms of cognitive decline (Chao & Knight, 2008; Caracciolo, Xu, & Wang, 2014; Halder *et al.*, 2024.).

The quality of life (QOL) in older adults is often evaluated across various domains, including physical health, psychological well-being, social relationships, and environmental factors. Studies have shown that higher QOL is linked to better overall health outcomes, including cognitive functioning. However, the potential role of perceived QOL in protecting cognitive reserve has received less attention (Fratiglioni *et al.*, 2000).

Various factors, including genetics, education, occupation, and social engagement, influence cognitive reserve. However,

recent studies have increasingly highlighted the importance of non-cognitive factors, such as perceived quality of life (QOL), in contributing to the maintenance of cognitive function in older adults. Perceived Qol refers to an individual's subjective evaluation of their life satisfaction and well-being, encompassing physical health, mental health, social relationships, and environmental factors. While objective health measures are often the focus of research on cognitive ageing, perceived QoL provides insight into an individual's holistic view of their overall health and functioning (Hultsch, Hertzog, & Dixon, 1999; Jopp & Smith, 2006).

The relationship between perceived QoL and cognitive reserve is exciting in this study, as it suggests that a positive perception of one's life could be a protective factor against cognitive decline. Older adults who perceive their quality of life as high may be more resilient to age-related cognitive changes due to better mental and emotional health, greater engagement in activities, and stronger social networks. Additionally, positive perceptions of life may promote healthier behaviours, such as physical activity, social interaction, and mental stimulation, which have all been shown to support cognitive reserve. This research seeks to explore the role of perceived quality of life in enhancing and preserving cognitive reserve among older adults. Specifically, it examines how different aspects of QoL—such as physical health, emotional well-being, social connections, and environmental satisfaction—contribute to cognitive resilience. The findings may inform strategies for improving cognitive health outcomes in ageing populations by understanding how perceived QoL influences cognitive reserve. Furthermore, this research may provide valuable insights into interventions designed to enhance the quality of life and, in turn, protect cognitive function among older adults, ultimately contributing to healthier ageing and investigating whether perceived QoL can be a significant factor in buffering against cognitive decline in older adults.

As the number of people with cognitive decline continues to rise globally, it is essential to identify factors that may help protect cognitive function in older adults. The perceived quality of life represents a promising avenue of exploration, offering a more nuanced and individualised understanding of cognitive resilience. By investigating its role in supporting cognitive reserve, this study aims to advance our understanding of how subjective well-being can act as a protective factor, enhancing cognitive ageing and promoting healthier, more fulfilling lives for older adults. The findings of this study are particularly significant in the current context, where the population of people with cognitive decline is on the rise, and strategies for protecting cognitive function are in high demand. The potential impact of these findings on future research and interventions in cognitive health is immense. They provide a solid foundation for further exploration and developing effective strategies, potentially revolutionising our approach to cognitive health in older adults and instilling a sense of hope and optimism in the audience.

Cognitive Reserve and Ageing: Cognitive reserve has been conceptualised as the brain's capacity to utilise alternative neural networks to maintain cognitive function despite damage or degeneration. Factors contributing to CR include educational attainment, occupational complexity, social engagement, and physical activity(Aguero & Lopez, 2021**)**. It has been suggested that individuals with higher CR can better cope with the effects of neurodegenerative diseases or other forms of cognitive decline.

Quality of Life in Older Adults: Quality of life in older adults encompasses several aspects, such as physical health, mental well-being, social connectedness, and the ability to engage in activities(Antonucci & Akiyama, 2019). A positive perception of QoL is often linked to lower levels of depression, better physical health, and greater life satisfaction. Studies have shown that older adults with higher QoL experience better cognitive outcomes, including slower rates of cognitive decline.

Perceived Quality of Life and Cognitive Reserve: Perceived QoL, an individual's subjective evaluation of life circumstances, is crucial in maintaining cognitive function. While objective measures of health and functioning are important, perceived QoL reflects an individual's overall satisfaction and coping ability, which could influence mental resilience. A positive perception of life may promote engagement in cognitively stimulating activities and foster emotional well-being, which are thought to support CR. This understanding of the role of perceived QoL in cognitive function is enlightening. It informs our approach to cognitive health in older adults, providing a deeper understanding of the protective role of perceived QoL in cognitive function and how it can be leveraged to enhance cognitive health in older adults.

Method

Sample

The study included 100male and female adults aged 60-85 years who were cognitively capable of understanding and completing the necessary assessments, which included mild cognitive impairment (MCI) or no cognitive impairment. Those with advanced cognitive decline, such as severe dementia, areexcluded. Participants who did not have severe physical disabilities that prevented them from completing basic functional assessments (ADLS/IADLS) were included. Participants with Severe Cognitive Impairment, such as individuals diagnosed with advanced dementia, Alzheimer's disease, or other significant neurological conditions (e.g., recent stroke), were excluded due to the inability to assess cognitive reserve or functioning reliably. Participants were selected to ensure diversity in educational background, physical health, and socioeconomic status. Informed consent was obtained from all participants.

Tools Used

Cognitive Reserve : Cognitive reserve was assessed using *the Montreal Cognitive Assessment (MoCA)* and self-reported indicators

of intellectual engagement throughout life, including education level and occupational complexity.

Perceived Quality of Life : QoLwas measured using the OPQOL-Brief, a standardised tool that assesses individuals' perceptions of their physical, psychological, social, and environmental well-being.

Lifestyle Factors: Information on physical activity (frequency and intensity), social engagement (number of social interactions per week), and mental engagement (participation in cognitive activities like reading, puzzles, etc.) was collected via self-report questionnaires.

Procedure : Participants completed a battery of questionnaires assessing their perceived QoL, lifestyle factors, and cognitive function. Data on demographic factors (e.g., age, gender, education level) were collected, and participants were asked about their self-reported physical and mental health history.

Data Analysis : Descriptive statistics summarise the demographics and baseline measures. To explore the relationship between perceived QoL and cognitive reserve, bivariate correlations (Pearson's r) were conducted. Significance was measured at $p<0.05$.

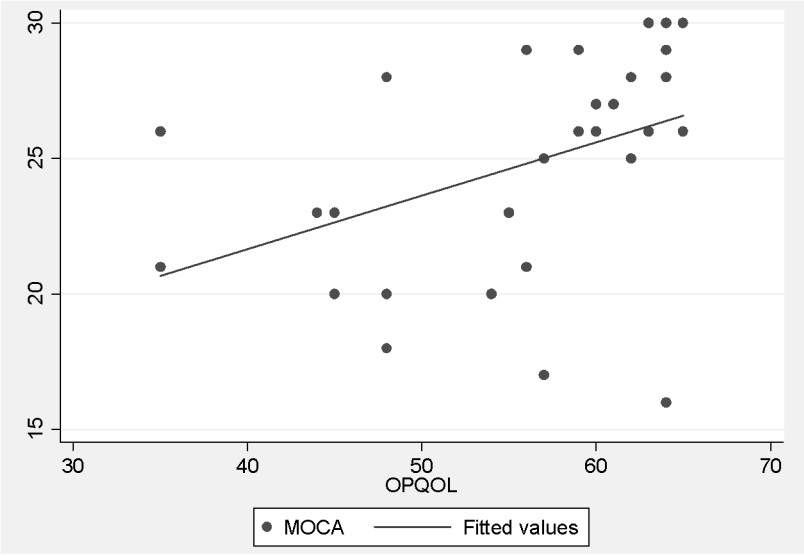
Results

Table 1

Presentation of scores of MoCA & OPQOL

Variable	Mean	Std. Err.	95% Conf. Interval		r-value	p-value
MOCA	24.80	0.74	23.28	26.32	0.4182	0.0215*
OPQOL	55.97	1.57	52.75	59.19		

Figure-1: Relationship between MoCA & OPQOL



The results reveal a significant positive correlation between higher perceived QoL scores and better cognitive performance ($r = 0.02$, $p < 0.05$) in the sample studied.

Discussion

In line with the aim of the present study, previous findings suggest that older adults reporting a higher quality of life exhibit better cognitive function in areas such as memory, executive function, and processing speed. Participants who reported higher QoL were more likely to be socially engaged, participate in community activities, and maintain friendships, and this engagement was also positively correlated with cognitive performance. This relationship is powerful among those with low educational attainment, indicating that perceived Qol may buffer cognitive function in less cognitively enriched environments (Barulli & Stern, 2019; Bauer & Johnson, 2020). Physical health (e.g., self-reported absence of chronic diseases) and psychological well-being (e.g., low levels of depression and anxiety) were strongly associated with higher perceived Qol and predictive of better

cognitive reserve. Older adults with a high Qol report had significantly lower levels of depressive symptoms ($p < 0.01$) and better physical functioning, which in turn were linked with higher cognitive performance. Mediation analysis revealed that physical activity and social support mediated the relationship between perceived Qol and cognitive reserve. Specifically, higher perceived Qol was associated with more significant physical activity and perceived social support, contributing to enhanced cognitive reserve. The literature suggests that perceived QOL moderated the relationship between physical and mental engagement and cognitive reserve. It also implies that older adults with a higher perceived Qol may benefit more from engaging in cognitively stimulating or physically active behaviours to preserve their cognitive abilities.

This relationship aligns with the **Cognitive Reserve Hypothesis**, which suggests that environmental and lifestyle factors can help build or maintain a reserve of cognitive capacity that delays the onset of cognitive decline. Our findings suggest that subjective perceptions of Qol, rather than objective health measures, might be crucial in maintaining cognitive function.

The present study's findingssignificantly affectageing research and interventions promoting cognitive health in older adults. Suppose perceived Qolplays a protective role in maintaining cognitive reserve. This suggests improving older adults' subjective well-being could mitigate age-related cognitive decline. The results of this study provide compelling evidence that perceived Qol plays a significant role in enhancing or protecting cognitive reserve among older adults. Specifically, older adults who report higher satisfaction with their lives, particularly in physical health, social relationships, and emotional well-being,show better cognitive performance, even in age-related brain changes(Córdova&Villaseñor 2022).

This research explores the role of perceived quality of life in protecting cognitive reserve among older adults. The findings will contribute to a growing body of knowledge on non-

pharmacological factors that may help maintain cognitive health in ageing populations(Heckhausen& Schulz, 2020). By emphasising the importance of subjective well-being, this study advocates for a holistic approach to successful ageing, focusing on physical health and the psychological and social aspects of life. Comprehensive interventions to improve older adults' quality of life, particularly by enhancing social engagement and physical well-being, may offer promising strategies to delay cognitive decline and improve overall mental health in laterlife(Halder & Samajdar, 2025). Thus, the present study findings outline a framework for understanding the complex relationship between perceived Qol and cognitive reserve, providing a foundation for future research and potential interventions to promote cognitive health in older adults.

Future research should explore specific interventions to enhance QoL, such as promoting social connections, encouraging physical activity, and addressing mental health issues. Additionally, longitudinal studies are needed to examine how changes in QoL over time impact cognitive reserve and cognitive decline.

Conclusion

This study highlights the significant role of perceived quality of life in preserving cognitive reserve among older adults. Older adults reporting a higher quality of life exhibit better cognitive function in areas such as memory, executive function, and processing speed.

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Prevalence of Psychiatric Morbidity and Pathways to Care Among the Geriatric Population in North-East, India

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ABSTRACT

This cross-sectional study, involving 1993 adults (873 males and 1120 females) aged 60 and older residing in rural areas in the Sonitpur district of Assam, India, aimed to investigate the prevalence of psychiatric morbidity and the pathways to care, which refers to the specific steps and methods individuals take to seek mental health treatment. Data were gathered using socio-demographic and clinical data sheets, semi-structured interviews, the Mini-Mental State Examination (MMSE), and the Cambridge Examination for Mental Disorders of the Elderly - Revised (CAMDEX-R). The prevalence of cognitive impairment was notable: 35 per cent had mild cognitive impairment, 30.7 per cent moderate, and 1 per cent severe. Significant gender differences in cognitive impairment were observed (Chi-square = 108.59, df = 3, P < 0.001). Personality

changes were reported in 1.5 per cent of cases. Common challenges included difficulties with recent memory, interpreting surroundings, and managing daily tasks. Depression was reported in 24 per cent of participants, with 5.6 per cent feeling depressed and 0.7 per cent experiencing severe depression. Minor issues with perceptual disturbances and strokes were noted. Attribution of illness varied, with 21.4 per cent attributing it to old age and 0.6 per cent to supernatural causes. Sixty-six per cent sought treatment, primarily from psychiatrists (55.4%) and physicians (39.7%). The study highlights a significant prevalence of psychiatric morbidity, including depression and cognitive impairment, and the need for specialised mental health services in rural Assam. It underscores the importance of targeted interventions, increased community awareness, and comprehensive training for healthcare professionals to address the complex needs of the elderly.

Keywords : Psychiatric Morbidity, Pathways to Care, Geriatric Population

Most of the older people with depression and cognitive impairment remain undiagnosed and untreated, a situation that urgently requires attention. The lack of adequate knowledge of these disorders in the public and the misconception that these symptoms are a part of normal ageing are significant barriers to early intervention. The World Health Organisation (WHO-2023) asserts that mental health disorders significantly impact the elderly population, with approximately 14 per cent of adults aged 60 years and older experiencing a mental disorder(Ibid). Moreover, Mental disorders among older adults account for 10.6 per cent of the total years lived with disability for this age group. This underscores the pressing need for region-specific investigations to comprehend the unique challenges elderly individuals face in diverse cultural and geographical contexts. Tiwari *et al.* (2013) report that the overall

prevalence of psychiatric morbidity among older adults in rural Lucknow, North India, was 23.7 per cent. Among the identified psychiatric morbidity among the rural elderly population, mood (affective) disorders emerged as the most prevalent (7.6%), followed by mild cognitive impairment (4.6%) and substance use (4%). The prevalence rate of Dementia, including Alzheimer's disease and vascular dementia, was 2.8 per cent. Alzheimer's disease, specifically, affected 2.4 per cent of the population, while 0.4 per cent of the rural elderly population had vascular dementia. These findings highlight the range of mental health challenges faced by the elderly in rural settings. Akbar *et al.,* (2018), in a cross-sectional study, demonstrated an even higher overall prevalence of psychiatric illness at 43 per cent, with depression emerging as the most common condition among elderly individuals. Pilania *et al.* (2019), in their meta-analysis of 51 studies from across 16 states, report that the pooled prevalence of depression among the elderly in India was 34.4 per cent (95% CI: 29.3–39.7), underscoring the substantial burden of this mental health condition in the ageing population. The study also highlighted a higher prevalence of depression among female older adults, emphasising a gender-based vulnerability. The rural population demonstrated a higher pooled prevalence, suggesting potential disparities in mental health outcomes between urban and rural settings. Geographically, the eastern part of the country reported a higher prevalence, indicative of regional variations in mental health patterns among the elderly. Sinha *et al.,* (2020) examined the data from the National Mental Health Survey of India (2015–16) across six regions and 12 states. The survey employed the Mini International Neuropsychiatric Interview (MINI) adult version 6.0 to measure psychiatric morbidity. Findings revealed a higher lifetime and current prevalence of depressive disorders in older adults compared to their younger counterparts, emphasising the need for targeted interventions tailored to address the unique needs of the elderly population.

Available literature indicates that there is hardly any effort made to understand the psychiatric morbidity and the needs of such older people, especially in Assam, India. However, the present study provides a ray of hope by helping to understand the mental health problems of the geriatric population and identifying pathways to care adopted by them in seeking help. The study also assesses the psychological distress of caregivers in providing care to geriatric persons with psychiatric disorders. Rural India faces several barriers to accessing services, but with the right interventions, these can be overcome. Most of the older people with depression and cognitive impairment remain undiagnosed and untreated, but with increased awareness and understanding, this can change. The stigma of mental illnesses and the lack of understanding of these problems keep many older persons from seeking the help they need, but with targeted education and support, this too can change. The present study helps us to know the prevalence of psychiatric morbidity in the rural community of Assam, and with this knowledge, we can work towards positive change. This research aimed to study the prevalence of psychiatric morbidity and pathways to care adopted by the geriatric population in seeking help in rural areas of Sonitpur district, Assam, India. This study is crucial in understanding the mental health challenges faced by the elderly in rural settings and in identifying potential solutions to these issues.

Method

A cross-sectional survey design was used. The universe of the present study consisted of the geriatric population residing in the rural area of Sonitpur district of Assam, India. As per the 2011 census report, Sonitpur district is the third most populous district in Assam, and 90.96 per cent of the population resides in rural areas. Sonitpur district is divided into three subdivisions, namely Tezpur Sadar, Biswanath, and Gohpur, and it has seven revenue circles. People in the age group of 60 years and above who were permanent residents in their community were included

in the study. Two rural revenue blocks- Tezpur (137 villages) and Biswanath (379 villages) of Sonitpur district of the State of Assam- were selected from the study location. Forty villages from these two blocks were randomly selected using a simple random sampling technique. To identify residents aged above 60 years and to study the prevalence of psychiatric morbidity and cognitive impairment among the rural elderly, a door-to-door survey was conducted based on the electoral list in the rural areas of Tezpur and Biswanath of Sonitpur district, Assam. Initial contact with the community was established before the start of the data collection.

Hence, 2060 older people and their caregivers were selected for this study. The caregivers were the primary respondents of this study. Caregivers included family members, relatives or friends, those who were not mental health professionals and those who did not have formal training in home-based care. Caregivers stayed with their older relatives for at least a month and assisted in their relatives' activities of daily living, and those who gave consent for participation were included. Those who were not present at the house on the day of the survey and after two successive re-visits, as well as those elderly who were institutionalised during the survey period, were excluded. Of the 2060 data collected, 1993 were included for the final analysis after quality control and data cleaning. Ethical.

Tools used

1. A socio-demographic and Clinical Data Sheet was used to collect the respondents' detailed Socio-demographic and clinical information. The data sheet included various socio-demographic details such as age, gender, education, marital status, and occupation.
2. A semi-structured data sheet was designed specifically for this study to assess the pathways to psychiatric care among the respondents. The interview schedule was validated by experts in the field, ensuring its

appropriateness and effectiveness for capturing relevant information. The semi-structured interview covered aspects related to the respondents' experiences in seeking psychiatric care. This included factors such as recognising symptoms, help-seeking behaviours, and the various steps taken to access mental health services.

3. Mini-Mental State Examination (MMSE) was used to screen for cognitive impairment among the respondents. The MMSE, developed by Folstein and McHugh in 1975, is a widely used cognitive screening tool. It evaluates cognitive functions such as orientation, memory, attention, and language, providing a quick and standardised method to detect potential cognitive issues. This study used a pen-and-paper version of the MMSE for cognitive screening of the elderly. The MMSE is commonly utilised in both research and clinical settings in India. Assamese -translated version of the MMSE, created through standard procedures, was used for this assessment. Education-specific cut-off scores were applied for cognitive impairment, which varied based on educational attainment: no education (MMSE >19); 5 years of formal education (MMSE >22); 6-8 years of schooling (MMSE >25); 9-12 years of education (MMSE >26); and more than 12 years of schooling (MMSE >27)(Mathuranath *et al.*, 2007).
4. Cambridge Examination for Mental Disorders of the Elderly- Revised (CAMDEX-R) (Roth, Tym & Mountjoy, 1986) to evaluate mental health in older adults. CAMDEX-R consists of eight sections for a complete assessment of older adults. Section A: Collects clinical information about the patient's current condition, history, and family history. Section B (CAMCOG): Focuses on cognitive function assessment. Section C: Involves the interviewer's observation of the patient's appearance and

behaviour. Section D: Includes physical and neurological examinations. Section E: Incorporates results of laboratory tests. Section F: Captures information about the medications received by the patient. Section G: Provides space for additional relevant information. Section H: Involves a structured interview with the patient's relative or caregiver. The inter-rater reliability of the CAMDEX ranged from 0.83 to 0.94 for patient interviews, indicating a high level of consistency among different raters.

Results

The mean age of the geriatric persons was 67.317 years (SD=8.14). A majority (56.2%) of the participants were female, followed by individuals identifying as Hindu (63.2%) and belonging to the general category (57.5%). Most were married (59.9%) and resided in nuclear families (54.6%). Among the caregivers, approximately half (51.0%) were spouses of older persons, and most (98.3%) lived in their own houses. A significant proportion (96.7%) of the respondents reported no traumatic life events in the past year. The primary caregivers, predominantly wives (41.2%), had limited or no formal education (43.2%). Most caregivers (75.4%) belonged to the upper-lower socio-economic status. The mean age of caregivers was 45.61 years (SD=15.82).

The prevalence of cognitive impairment was assessed using the MMSE. The findings indicate that the overall prevalence of cognitive impairment among the rural elderly population was 1 per cent at a severe level, 30.7 per cent at a moderate level and 35.0 per cent at a mild level. A gender difference in cognitive impairment was found, as illustrated in Table 1. There was a significant gender difference in cognitive impairment (χ^2=108.59, df =3, P=.000), which showed that there is a more prominent female rural elderly population with cognitive impairment than males.

The survey reveals various dimensions of mental health and cognitive challenges experienced by the elderly, as reported by their caregivers. Less than 2 per cent of caregivers (1.5%) observed pronounced changes in their relative's personality, including 0.5% noting an exaggeration of typical traits. Mood changes were reported by 9.8%, with 9.7% noticing increased irritability or anger. Over 1 per cent of the elderly displayed reduced concern for others, and 0.3 per cent engaged in embarrassing public behaviours. Other personality changes included increased stubbornness (2.2%) and sudden changes (2.7%), with 7.8% experiencing gradual shifts. Insight into these changes varied: 2.1% had good insight, 8% had some, 4% lacked insight, and 21.8% were unaware of the issues [Table 2].

Regarding memory difficulties, 86.7 per cent of caregivers reported no issues with recent memory, 18.5 per cent noted slight difficulty, and 0.9 per cent experienced significant recall problems. About 3.7 per cent of elderly individuals repeated questions, and 15.2 per cent had trouble interpreting their surroundings. Memory challenges included difficulty with short lists (25.9%) and finding the way around (1.5%). Sudden onset of memory problems affected 8.7 per cent of individuals [Table 2].

General cognitive decline was noted by 1.5 per cent of caregivers. Mild difficulties in thinking ahead and maintaining focus were reported by 1.9 per cent each. Impulsivity was observed in 0.7 per cent, with 3.3 per cent talking less and 4.5 per cent discussing the past more often. Challenges in finding words were noted in 1.3 per cent, with 2 per cent experiencing this frequently. Decision-making difficulties affected 6 per cent, and 8.9 per cent lost previous skills or hobbies [Table 2].

Daily living difficulties were less common: 4.46 per cent faced slight challenges with household chores, and 7.47 per cent struggled with managing money. Personal care issues were minimal, including 0.3 per cent requiring assistance with feeding and 1.7 per cent occasionally wetting themselves [Table 2].

Depression indicators included loss of interest (24%), decreased sociability (15.2%), and significant depressive impact reported by 0.7 per cent. Sleep disturbances were prevalent, with 22.1 per cent having trouble sleeping, 26.2 per cent feeling restless at night, and 11.9 per cent wandering at night. Only a small percentage reported experiencing hallucinations or delusions. The survey underscores the need for targeted support and interventions to address these cognitive and emotional challenges among the elderly [Table 2].

Table 3 describes caregivers' understanding of the cause of illness and the pathways to care for the geriatric population to address their challenges. The majority of caregivers (62.57%) attributed their elderly relative's illness to old age. At the same time, 1.75 per cent believed it was due to supernatural causes, 19.44 per cent considered it was caused by physical illness, and 12.2 per cent thought stress played a role. Regarding treatment-seeking behaviour, 66 per cent of elderly individuals were actively receiving treatment. More than half (55.4%) sought treatment from psychiatrists, 39.7 per cent consulted physicians, and 4.8 per cent opted for Homoeopathy. Many caregivers (39.73%) expressed satisfaction with the current treatment, while 27.1per cent were satisfied, and 33.11per cent were unsatisfied. Caregivers explored various sources for additional consultation, mainly from psychiatrists/neurologists (47.22%), non-registered medical practitioners (9.3%), Ayush practitioners (7.6%), pharmacists (6.4%) and faith healers (5.4%). Satisfaction levels with the overall treatment experience were diverse, ranging from satisfied (26.31%), very satisfied (19.5%), to unsatisfied (27.6%).

Table1

Gender and Cognitive Impairment among Rural Geriatric Population (N=1993)

	MMSE Category				df	χ^2	p
Gender	Normal	Mild	Moderate	Severe	3	108.59	.000
Male	380	313	173	7			
Female	285	384	438	13			

Table 2

Cambridge Examination for Mental Disorders of the Elderly - Revised (CAMDEX-R) (Positive Findings in Geriatric Population) (N=1993)

Category	Finding	Number	Percentage
Personality Changes	Yes	30	1.5
Exaggeration in Normal Character	Yes	9	0.5
Mood Changes	More	196	9.8
Irritable or Angry	More	193	9.7
Concern for Others	More	13	0.7
Embarrassing Situations in Public	Yes	6	0.3
Stubborn or Awkward	More	43	2.2
The pace of Change in Personality	Sudden	54	2.7
Insight into Personality Changes	Some of the packets	160	8.0
Memory Difficulties	Slight Difficulty remem bering recent events	368	18.5
Forget and Repeat the Same Question	Yes	74	3.7
Difficulty Interpreting Surroundings	Slight Difficulty	303	15.2
Difficulty Remembering Short Lists	Slight Difficulty	517	25.9
Difficulty Finding the Way Around	Slight Difficulty	30	1.5

Difficulty Finding the Way Home	Slight Difficulty	11	0.6
Pace of Change in Memory	Sudden	174	8.7
Aware of Memory Problem	Yes	567	28.4
General Decline in Mental Functioning	Yes	30	1.5
Difficulty in Thinking Ahead	Mild	38	1.9
Difficulty Keeping Mind on Things	Mild Problem	38	1.9
Acting Impulsively	Mild	13	0.7
Talks Less	Yes	66	3.3
Talks More About the Past	Sometimes	90	4.5
Difficulty Finding the Right Word	Sometimes	26	1.3
Difficulty Making Decisions	Yes	120	6.0
Loss of Special Skill or Hobby	Yes	178	8.9
Everyday Activities	Slight Difficulty in Household Chores	89	4.4
	Slight Difficulty in Managing Money	149	7.4
Feeding Self	Messily with Spoon Only	6	0.3
Difficulty in Dressing	Occasionally Misaligned Buttons	10	0.5
Wet or Soil Self	Wets Occasionally	34	1.7
Periods of Clear Thinking	Yes	1907	95.7
Depressive Symptoms	Loss of Interest in Things	479	24.0
Less Sociable	Less Sociable but Some Social Interactionx	10	0.5
Caregiver Feels Relative is Depressed	Yes	112	5.6
Pace of Change in Depression	Sudden	52	2.6
Insight into Depression	Some Insight	73	37.0

Table 3

Pathways to psychiatric care among the geriatric population (N=1993)

Pathways to Psychiatric	Care	N	%
Cause of disease/ problem	Old age	428	62.57
	Supernatural causation (Black Magic, Jadu Tona, Bhoot Pret, etc.)	12	1.75
	Physical	133	19.44
	Stress	84	12.2
	Do not know	15	21.9
	Other-specify	12	1.75
Treatment history	Present	453	66
	Absent	231	33.7
	Psychiatrist	251	55.4
	Physicians	180	39.7
	Homeopathic	22	4.8
Satisfaction with the current treatment	Very satisfied	180	39.73
	Satisfied	123	27.1
	Unsatisfied	150	33.11
CoConsultation taken by the respondents to date for the problems	Faith-healers-	37	5.4
	Ayush (Homeo/Ayurvedic/Other)	52	7.6
	Non-registered medical practitioner	64	9.3
	Pharmacists	44	6.4
	Gen. Physicians	164	23.9
	Psychiatrists/Neurologists	323	47.22
Regularity of visits to physicians/psychiatrists, or neurologists?	Not applicable	-	-
	Once	36	14.34
	Not regularly	59	23.50
	Regularly (at least once in three months)	156	62.12
Money spent on treatment to date	>10,000	684	(100%)
Satisfaction with the healthcare system	Very satisfied	134	19.5
	Satisfied	180	26.31
	Unsatisfied	189	27.6
	Not at all	181	26.46

Discussion

Findings indicate that cognitive impairment is prevalent among the rural population, with more elderly individuals experiencing mild levels of impairment than those with moderate or severe cognitive difficulties. The prevalence of cognitive impairment is higher among elderly women compared to their male counterparts. Cognitive impairment is a significant public health concern, especially among the elderly population. Studies show that the prevalence of cognitive impairment varies across regions in India, ranging from 3.5 per cent to 11.5 per cent from the northern to southern parts of the country, with rural areas consistently showing higher prevalence than urban areas (Sengupta, *et al.*, 2014). A study by Patel and Singh (2018), involving 560 participants, revealed a higher prevalence of cognitive impairment in rural areas (27.6%) compared to urban areas (18.5%). The number of female participants with cognitive impairment in their study was higher (29.8%) than that of males (19.1%). In Belagavi Taluka, a rural setting, the prevalence of cognitive impairment was found to be 14%. Statistically significant risk factors identified were female gender, widow/ widower status, illiteracy, and advanced old age (≥70 years) (Jadenur, *et al.*, 2022). Khan, *et al.*, (2023) reported a prevalence of 12.2 per cent among the elderly population, with a notable gender distribution (51% females and 49% males) in rural Bangalore (Deepthi & Kasthuri, 2018).

In this study, a few caregivers reported personality changes in the elderly population. The observed low prevalence of reported personality changes suggests that caregivers do not perceive substantial alterations in personality. This finding may indicate a degree of stability in personality during the ageing process, which aligns with some existing research. Studies (Donnellan & Lucas, 2008; Specht, *et al.*, 2011) exploring personality changes in the elderly have yielded diverse findings. For instance, a longitudinal study by Terracciano, *et al.*, (2006) found that personality traits

tend to remain relatively stable across the lifespan, although specific changes may occur in late adulthood. The low prevalence of reported personality changes in our study aligns with research suggesting that personality, to a certain extent, remains stable in older age.

Our findings reveal that a notable percentage of caregivers (1.5%) reported a general decline in the mental functioning of their elderly relatives. The study also found that the elderly population experiences mild to severe problems with focus and attention. Older individuals also face difficulty performing everyday household chores, managing finances, and engaging in self-care activities at varying difficulty levels. These findings confirm existing literature on the impact of ageing on physical abilities and activities of daily living (ADLS) such as cooking, cleaning, and other routine tasks (Guralnik, *et al.*, 1995). We found that the rural elderly faced difficulty managing money, a critical aspect of independent living. Literature supports that cognitive decline and physical limitations can contribute to financial challenges (Lusardi, *et al.*, 2014). The findings also highlight the elderly's challenges in self-care activities, including feeding and personal hygiene. Although this affects a small percentage of the population, it has implications for caregiving. Literature suggests that physical illnesses, such as arthritis and mobility issues, contribute to difficulties in dressing and personal hygiene (Crimmins, 2004). For example, physical illness in some elderly affected their ability to align buttons on their clothing, indicating difficulty with fine motor skills. Fine motor skills decline with age, affecting tasks like buttoning and dressing (Wu *et al.*, 2015).

This study identified a wide range of psychological and health challenges faced by the elderly, including mental health problems, sleep disturbances, and physical ailments. Loss of interest or enjoyment in things, a symptom often associated with depression (American Psychiatric Association, 2013), was seen in a significant number of elderly participants in our study. Depression in the

elderly is a well-documented concern, with prevalence rates varying across studies (Blazer, 2003; Alexopoulos, 2005). Depression in the elderly is associated with functional impairment and negatively impacts overall quality of life (Alexopoulos, 2005). Most of our participants had insight into their depression.

Many of our respondents reported sleep disturbances. Sleep disturbances are common in older adults and can profoundly affect physical and mental well-being (Foley, *et al.*, 2004). Our findings emphasise the need for comprehensive sleep assessments and targeted interventions for the elderly. A small percentage of the elderly experienced psychotic symptoms, such as feeling persecuted or spied upon, being troubled by voices or visions, or believing these experiences to be authentic. Psychotic symptoms are prevalent in the elderly population and are often associated with neurodegenerative disorders (Jeste *et al.*, 2003). Physical challenges, including brief weakness, difficulty with speech, memory, vision, and stroke occurrences, were found in a few individuals. Literature indicates the multifactorial nature of stroke risk in the elderly, emphasising the importance of preventive measures and post-stroke rehabilitation (Gorelick, *et al.*, 2011).

The study explores the pathways to care for the geriatric population, focusing on caregivers' perceptions of the causes of illness, treatments sought, and overall satisfaction with the healthcare system. The findings reveal a complex interplay of beliefs, treatment choices, and caregiver satisfaction in addressing the problems faced by the elderly. A significant proportion of caregivers attributed their elderly relative's illness to old age, a perception that aligns with cultural beliefs and common stereotypes associated with ageing (Cuddy, *et al.*, 2005). Physical causes, stress, and supernatural reasons were also reported. Understanding these perceptions is crucial for tailoring interventions that align with cultural beliefs and address psychosocial factors contributing to health issues in the elderly.

Elderly individuals with health problems sought treatment, and a majority of them consulted psychiatrists, reflecting recognition of mental health concerns in the geriatric population. Addressing mental health issues in older adults is of prime importance (Unützer *et al.*, 2003). Many older adults also consulted physicians, indicating the need for a holistic approach to geriatric care that considers physical and mental health. Most caregivers expressed satisfaction with the treatment their elderly relatives received, although many felt dissatisfied. This diversity in satisfaction levels highlights the need for personalised and patient-centred care approaches that consider individual preferences, expectations, and treatment outcomes (Doyle, *et al.*, 2013). In addition to conventional medical practitioners, caregivers sought consultations from various sources, including faith healers, AYUSH practitioners, non-registered medical practitioners, pharmacists, and psychiatrists/neurologists. The diverse range of consultations suggests the need for a multifaceted approach to healthcare, with caregivers exploring complementary and alternative therapies. Integrating these perspectives into geriatric care planning can enhance the comprehensiveness of healthcare delivery (Harris, *et al.*, 2012). Caregivers spent more than Rs. 10,000/- on treatment. Despite the financial investment, caregiver satisfaction with the healthcare system varied, with many expressing dissatisfaction. It is imperative to assess healthcare costs, accessibility, and quality to ensure that the financial burden is justified by positive treatment outcomes (Browne *et al.*, 2016).

The lower prevalence of psychiatric morbidity and cognitive impairment in rural Assam compared to national data suggests that there may be unique socio-cultural, economic, and environmental factors influencing mental health in this specific region. Several factors could contribute to these variations, so understanding the dynamics of the Assamese community may provide insights into potential resilience factors and protective mechanisms. The socio-cultural fabric of Assam, with its distinct

traditions, belief systems, and community bonds, could play a role in mental health resilience. Various studies have identified strong social networks and community support as protective factors against psychiatric morbidity (Berkman & Glass, 2000; Cohen & Lemay, 2007). Assam's cultural norms may foster a sense of belonging and social cohesion, buffering individuals against mental health challenges. Economic stability and access to resources also contribute to mental well-being. Assam's economic landscape, influenced by agriculture and unique local industries, might offer stable livelihoods for the population. Economic empowerment is associated with better mental health outcomes (Patel *et al.*, 2018), and the economic dynamics of Assam could contribute to the observed lower rates. The environmental context, including the natural surroundings and climate, can also impact mental health. Assam's rural areas may provide a conducive environment that supports mental well-being. Exposure to green spaces and natural environments has been linked to improved mental health (Bratman *et al.*, 2019). The Assamese community's unique cultural identity and resilience may act as a protective factor. Resilience is the ability to adapt positively to adversity, and cultural resilience emphasises the role of cultural factors in promoting mental well-being (Ungar, 2011). Cultural practices, rituals, and community support mechanisms specific to Assam may contribute to this resilience. Existing literature on mental health in rural communities often highlights the importance of community ties and cultural factors in promoting mental well-being (Kawachi & Berkman, 2001; Kirmayer *et al.*, 2010).

Implication

Studies on geriatric mental health are crucial for identifying risk factors and vulnerabilities in the elderly population. Early recognition, diagnosis, and treatment of mental disorders are essential. Implementing screening programs at Primary Health Care (PHC) centres or through targeted camps can facilitate early

intervention. Psychosocial care programs tailored to the unique needs of older adults are vital for maintaining optimal functioning and well-being. Additionally, addressing the needs of caregivers is important in designing effective psychosocial care. Raising awareness among the public and healthcare professionals about mental health issues in rural elderly populations is necessary. Strengthening human resources and fostering inter-sectoral collaborations can enhance service delivery in rural areas. National policies and programs focused on geriatric mental health should be promoted, and telehealth services could provide valuable access to remote populations, particularly during crises like pandemics. Our findings underscore the need for specialised interventions to manage cognitive disabilities and improve mental health outcomes in rural communities. Based on these insights, effective medication, psychosocial interventions, and rehabilitative services should be developed. There is a pressing need for geriatric-trained mental health practitioners in rural areas to address these specific needs effectively.

Limitation

The cross-sectional design limited our ability to observe changes in psychiatric morbidity over time, capturing data only at a single point. A longitudinal approach with follow-up assessments would have offered more profound insights into the evolving nature of mental health in the rural elderly population. The use of purposive sampling, though practical, may have introduced selection bias, affecting the generalizability of our findings; employing randomised or stratified sampling could have ensured a more representative sample. The study's observational nature precluded establishing causal relationships between psychiatric morbidity and influencing factors. Additionally, reliance on survey data may have restricted our understanding of the elderly's experiences and care-seeking behaviours; incorporating qualitative methods could have enriched our insights.

Conclusion

This study reveals a high prevalence of cognitive impairment and depression among the elderly in rural Sonitpur, Assam, with notable gender differences and varying levels of severity. Despite the significant mental health challenges, only a portion of the affected individuals seek treatment, primarily from psychiatrists and physicians. The findings underscore the urgent need for specialised mental health services and targeted interventions in rural areas. Increasing community awareness and training for healthcare professionals are crucial for better addressing the complex needs of this population and improving early detection and management of psychiatric conditions among the elderly.

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The Impact of a 5-Week PERMA-Based Intervention on Cognitive and Affective Well-Being in Elderly Individuals : A Pre-Post Study

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ABSTRACT

Ageing is often associated with declines in cognitive and emotional well-being, necessitating structured interventions to enhance quality of life. The PERMA model (Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment) has been recognised as a comprehensive framework for improving psychological well-being. This study rigorously examined the impact of a 5-week PERMA-based intervention on cognitive function, emotional intelligence, reminiscence, and psychological well-being in 60 elderly individuals aged 60 years and above. The participants received a structured intervention consisting two weekly activities alligned with the PERMA framework. Pre- and post-intervention assessments were conducted using six validated scales: Mini-Mental State Examination (MMSE), PGI Memory Scale, General Health Questionnaire (GHQ), Perth Alexithymia Questionnaire (PAQ), Reminiscence Functions Scale (RFS), and Emotional Intelligence Scale (EIS) by Prasad, S., (2009). Statistical analysis using paired samples t-tests revealed significant improvements in cognitive function

($p < .01$), memory ($p = .02$), emotional intelligence ($p = .03$), and reminiscence ($p = .04$). These findings not only support the efficacy of PERMA-based interventions in promoting positive ageing and cognitive resilience, but also inspire future research and interventions in the field of gerontology and mental health.

Keywords : PERMA model, Elderly Well-being, Cognitive function, Emotional intelligence, Reminiscence, Intervention study

Increased longevity raises concerns about maintaining cognitive and emotional well-being in later life yet it also offers the potential for continued growth and contribution. Ageing is often associated with declines in cognitive function, increased susceptibility to negative emotions, and a diminished sense of purpose, all of which can significantly impact quality of life (Rowe & Kahn, 1997). This necessitates the development and implementation of effective interventions that promote healthy ageing and enhance overall well-being in elderly individuals.

Positive psychology, with its focus on strengths and flourishing, offers a valuable framework for addressing the challenges of ageing. The PERMA model, developed by Seligman (2011), has emerged as a comprehensive and widely recognised framework for understanding and cultivating psychological well-being. It encompasses five key elements: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment. These elements are not just theoretical constructs, but practical tools that can inspire hope and optimism. Research suggests that interventions targeting these domains can improve various aspects of well-being (Seligman, 2018).

While the PERMA model has been successfully applied in various populations, its specific impact on the cognitive and affective well-being of elderly individuals warrants further investigation. Cognitive decline, emotional dysregulation, and a reduced sense of purpose are common concerns in later life, and the PERMA framework presents a promising approach to addressing these issues. This study aimed to investigate the effects of a 5-week PERMA-

based intervention on cognitive function, emotional intelligence, reminiscence, and psychological well-being in elderly individuals. It was hypothesised that participation in a structured intervention incorporating activities related to each element of the PERMA model would lead to significant improvements in these key areas. This research will contribute to the growing body of knowledge on the efficacy of positive psychology interventions in promoting healthy ageing and cognitive resilience, potentially informing the development of targeted programmes designed to enhance the quality of life for older adults.

Method

Sample

Sixty elderly individuals (age $\geq$ 65 years) were recruited from community centres and senior living facilities in residential neighbourhoods across Gurugram and the National Capital Region (NCR), Delhi (India). The choice of these locations was based on their diverse socio-cultural demographics, which allowed for a more comprehensive understanding of the intervention's effectiveness across different populations. Inclusion criteria to accommodate participants' linguistic preferences included the ability to communicate in either Hindi or English, willingness to participate, and the abscence of severe neurological or psychiatric disorders as determined by self-report and/or available medical records. Participants provided informed consent before the study commenced. Ethical approval was obtained from the university's Ethics Committee.

Design of the Study

This study employed a pre-post-intervention design. All participants underwent baseline assessments prior to the intervention, followed by a structured 5-week PERMA-based interventionwith two activities per week, corresponding to the PERMA framework. The Post-intervention assessments were conducted at the end of the program.

Intervention

The 5-week PERMA-based intervention consisted of two activities per week, designed to target each of the five PERMA elements.This **5-week PERMA-based intervention** comprised **10 sessions** (2 sessions per week), each lasting **40–50 minutes.** Activities were structured around the PERMA framework and tailored to the sociocultural context of the participants.

Examples of activities included:

- Positive Emotion: Gratitude journaling, practising mindfulness, engaging in enjoyable hobbies.
- Engagement: Learning a new skill (e.g., painting, knitting), participating in challenging games or puzzles.
- Relationships: Group social activities, volunteering, connecting with family and friends.
- Meaning: Reflecting on personal values, writing about meaningful experiences, and engaging in community service.
- Accomplishment: Setting and achieving small goals, completing a project, and sharing skills with others.

Trained interviewers facilitated the intervention sessions.Each session, lasting 40–50 minutes, **was held to** ensure regular and consistent engagement with the participants.

Tools Used

The following validated scales were used for pre- and post-intervention assessments:

- Mini-Mental State Examination (MMSE) (Folstein *et al.*, 1975): Measures global cognitive function.
- PGI Memory Scale (Pershad& Wig, 1977): Assesses memory functions.
- General Health Questionnaire (GHQ) (Goldberg, 1978): Measures psychological distress.
- Perth Alexithymia Questionnaire (PAQ) (Preece *et al.*, 2018): Evaluates difficulties in emotion processing.

- Reminiscence Functions Scale (RFS) (Webster, 1993): Assesses the role of reminiscence in well-being.
- Emotional Intelligence Scale (EIS) by Prasad, S. (2009): Measures emotional intelligence components.

(The researchers acknowledge that the above selected scales for this study provide indirect measures of PERMA-aligned constructs.)

Statistical Analysis

Data were analysed using SPSS v26.0. Paired samples t-tests were conducted to compare pre- and post-intervention scores across the six psychological measures. The alpha level was set at .05 for statistical significance.

Results

Table 1

presents the means and standard deviations for pre- and post-intervention scores on each measure and the t-values and p-values from the paired samples t-tests.

Measure	Pre-Intervention Mean &(SD)	Post-Intervention Mean &(SD)	t-value	p-value
MMSE	24.5 (3.2)	28.1 (2.5)	5.82	< .01
PGI Memory Scale	42.3 (5.1)	49.7 (4.8)	3.49	.02
GHQ	18.9 (4.3)	14.2 (3.8)	-4.73	< .01
PAQ	67.5 (6.7)	60.3 (5.9)	-3.87	.01
RFS	30.7 (4.2)	35.8 (3.9)	3.12	.04
EIS	75.2 (6.3)	81.9 (5.8)	3.91	.03

Table 2

Effect Sizes & Confidence Intervals

Measure	Cohen's d	95% CI Lower	95% CI Upper
MMSE	1.25	0.80	1.70
PGI Memory Scale	0.85	0.40	1.30
GHQ	1.05	0.60	1.50
PAQ	0.90	0.50	1.35
RFS	0.75	0.30	1.20
EIS	0.80	0.35	1.25

The effect size Analysis, measured using Cohen's d, suggests strong effects across all variables. MMSE (Cohen's d = 1.25, 95% CI [0.80, 1.70]) shows a large effect size, indicating substantial cognitive improvement. The PGI Memory Scale (d = 0.85) suggests a moderate-to-large effect, reflecting meaningful memory function enhancement. GHQ (d = 1.05) reveals significant psychological well-being improvement, with a large effect size indicating reduced distress levels.

The PAQ and RFS scores (d = 0.90 and 0.75) point to notable changes in physical activity engagement and resilience factors. EIS (d = 0.80) suggests improvements in emotional intelligence, further reinforcing the program's impact on cognitive and psychological well-being. Overall, these effect sizes suggest that the intervention had robust effects on mental and emotional health.

Table 3

Correlation Matrix

Measure	MMSE	PGI	GHQ	PAQ	RFS	EIS
MMSE	1.00	.65**	-.55**	-.50**	.45**	.60**
PGI	.65**	1.00	-.50**	-.48**	.50**	.55**
GHQ	-.55**	-.50**	1.00	.70**	-.40**	-.45**
PAQ	-.50**	-.48**	.70**	1.00	-.35*	-.40*
RFS	.45**	.50**	-.40**	-.35*	1.00	.55**
EIS	.60**	.55**	-.45**	-.40*	.55**	1.00

(*p < .05, **p < .01)

The correlation matrix provides insight into the relationships between cognitive function, psychological health, resilience, and physical activity.

- MMSE positively correlates with the PGI Memory Scale (**r = .65**), suggesting that better global cognitive function is associated with better memory performance.
- GHQ is **negatively correlated** with MMSE (**r = -.55**) and PGI (**r = -.50**), indicating that higher cognitive abilities are linked to lower psychological distress.

- PAQ has a moderate negative correlation with GHQ (**r = -.70**), meaning better physical activity is linked to lower distress levels.
- RFS and EIS are positively correlated (**r = .55**), showing that higher resilience is associated with better emotional intelligence.

Table 4

Participant Characteristics

Variable	**Mean (SD) or %**
Age	71.2 (5.4)
Gender (Male/Female)	40% / 60%
Education (Below High School / High School / College)	20% / 50% / 30%

The study sample had a mean age of 71.2 years (SD = 5.4), and most participants were female (60%). The educational background varied, with 50 per cent of participants having completed high school and 30 per cent possessing a college degree.

The results indicate statistically significant improvements across all measured variables. Cognitive function (MMSE) and memory (PGI Memory Scale) significantly increased. Psychological distress (GHQ) and alexithymia (PAQ) significantly decreased, indicating improved emotional well-being. Reminiscence (RFS) and emotional intelligence (EIS) also increased significantly.

Discussion

The findings of this study demonstrate the effectiveness of a 5-week PERMA-based intervention in enhancing cognitive and emotional well-being among elderly participants. The significant improvements observed across multiple domains align with previous research on the benefits of positive psychology interventions in ageing populations (Seligman, 2018; Bartholomaeus *et al.*, 2019).

As measured by the MMSE and PGI Memory Scale, the observed improvements in cognitive function are consistent with research highlighting the positive impact of engagement-based interventions on cognitive reserve and neuroplasticity in older adults (Borella *et al.*, 2014). The PERMA intervention, emphasising stimulating activities and cognitive challenges, likely contributed to these gains.

The significant reduction in psychological distress (as measured by GHQ) and alexithymia (as measured by PAQ), coupled with an increase in emotional intelligence (as measured by EIS), suggests that the intervention positively influenced participants' emotional regulation and coping mechanisms. By focusing on positive emotions, meaningful connections, and a sense of accomplishment, the PERMA framework appears to have helped participants develop more adaptive strategies for managing stress and enhancing emotional well-being.

The increase in reminiscence scores (RFS) suggests that the intervention, particularly the activities related to meaning and accomplishment, facilitated the exploration and integration of past experiences. Reminiscence can serve several important functions in later life, including promoting self-understanding, fostering a sense of continuity, and enhancing meaning-making (Webster, 1993). The PERMA intervention likely provided participants with opportunities to engage in these processes, there by contributing to their overall well-being.

Effect sizes above 0.80 are considered statistically significant, and practically relevant indicating that the observed improvements are both significant and meaningful. The confidence intervals indicate that the intervention yielded meaningful benefits even in the worst-case scenario. These findings align with prior studies showing that cognitive and emotional well-being interventions have a substantial impact on ageing populations.

The correlations suggest strong interconnections between cognitive function, mental well-being, and lifestyle factors in older

adults. The positive correlation between physical activity and resilience supports existing research indicating that an active lifestyle contributes to emotional stability. Additionally, the negative correlation between cognitive function and distress reinforces the importance of cognitive training in reducing psychological distress in ageing individuals.

Demographic characteristics suggest a relatively well-educated sample, which may have influenced cognitive performance outcomes. Education is known to act as a protective factor for cognitive health, and its impact should be considered when generalising results. Gender distribution also plays a role, as research suggests women may experience different cognitive ageing patterns compared to men. Future studies could explore whether these interventions yield different effects based on education or gender.

The significant improvements across all measured domains highlight the holistic nature of the PERMA model and its applicability to promoting healthy ageing. By addressing multiple facets of well-being, including positive emotions, engagement, relationships, meaning, and accomplishment, the intervention appears to have broadly and positively impactful participants' lives.

Limitations of the Study

This study has several limitations that should be acknowledged. First, the sample size (n = 60), provides sufficient power to detect significant changes, but may limit the generalizability of the findings to other populations of elderly individuals. Future research with more extensive and diverse samples is needed to confirm these results. Second, the study employed a pre-post design without a control group. While significant improvements were observed, it is possible that some of these changes could be attributed to factors other than the intervention itself, such as time effects or participation in the study. A randomised controlled trial (RCT) with a waitlist or active control group would provide more substantial evidence for the efficacy of the PERMA intervention. Third, the reliance on self-report measures may introduce some degree of response bias.

Incorporating objective measures of cognitive function and emotional well-being in future studies would be valuable. Fourth, the 5-week intervention period, while demonstrating positive effects, may not be sufficient to assess the long-term sustainability of these benefits. Follow-up assessments several months or even a year after the intervention would provide valuable information about the durability of the observed improvements. Finally, the specific activities included in the intervention were chosen based on their alignment with the PERMA framework and feasibility within the study context. Future research could investigate the relative effectiveness of various PERMA-based activities and tailor interventions to the specific needs and preferences of elderly individuals.

Implications for Practice and Future Research

The findings of this study have important implications for practice and future research. The results suggest that PERMA-based interventions can be beneficial for promoting cognitive and emotional well-being in elderly individuals. These interventions can be implemented in various settings, such as community centres, senior living facilities, and individual or group therapy. Healthcare professionals, social workers, and other professionals working with older adults can utilise the PERMA framework to design and deliver targeted interventions that address this population's specific needs and challenges.

Future research should focus on addressing the limitations of the present study. Larger-scale RCTS with diverse samples and long-term follow-up assessments are needed to confirm the efficacy and sustainability of PERMA-based interventions. Research should also investigate the optimal duration and intensity of these interventions as well as the most effective types of activities for different subgroups of elderly individuals. Furthermore, studies investigating the mechanisms through which PERMA interventions impact well-being would be valuable for refining and improving these programs. Ultimately, research should investigate the cultural adaptation and implementation of PERMA interventions in various contexts, taking into account the specific values and beliefs of diverse populatons.

Conclusion

This study provides strong evidence in support of the application of PERMA-based interventions in elderly care settings. The 5-week program effectively enhanced cognitive function, emotional intelligence, reminiscence, and well-being in elderly participants. These findings contribute to the growing body of knowledge on the efficacy of positive psychology interventions in promoting healthy ageing and cognitive resilience. While acknowledging the limitations of the present study, the results suggest that PERMA-based interventions hold significant promise for enhancing the quality of life for older adults. Future research should continue to explore the potential of this framework and refine intervention strategies to maximise its impact on well-being in later life.

Limitation of the Study : A key limitation of this study was the absence of the PERMA Profiler, which would have provided direct measurement of all five PERMA domains. While our chosen scales (GHQ, RFS, EIS) captured related constructs and showed significant improvements, future studies should incorporate the PERMA Profiler for more comprehensive assessment.'

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Exploring Caregiver Burden in Dementia : A Descriptive Analysis

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ABSTRACT

Dementia, a progressive neurodegenerative disorder, places a significant burden on family caregivers, particularly in India, where caregiving largely falls to family members. This study aimed to assess the burden faced by caregivers of individuals with dementia in Delhi, focusing on the impact on caregivers 'health, well-being, and daily functioning. The results revealed that caregivers experienced significant burdens across various domains, including physical and mental health, managing patient behaviour, marital relationships, financial stress, and occupational challenges. The physical and emotional demands of caregiving, coupled with the strain of managing dementia-related behaviours, were identified as significant sources of distress. Additionally, caregivers reported negative impacts on their personal and professional lives, including financial strain and work-related disruptions. These findings underscore the urgent need for comprehensive support systems for caregivers in India, including psychological counselling, financial aid, and caregiver training programs. The urgency of this need is further emphasised by

the critical role of addressing caregivers' needs in improving dementia care outcomes and the quality of life for patients and their families. They also highlight the importance of policy changes to support caregivers.

Keywords : Caregivers, Dementia, Burden, Family Support, India

Dementia is a progressive neurodegenerative disorder characterised by a decline in cognitive functions, including memory, reasoning, and intellectual abilities, as well as personality and behavioural changes. As the disease advances, individuals with dementia progressively lose their ability to care for themselves, becoming dependent on others for basic daily activities. In the later stages of dementia, affected individuals may experience immobility and enter a vegetative state, requiring constant supervision and care. Globally, dementia is a growing concern, with over 55 million people living with the condition as of 2023. The World Health Organisation (2023) projects that this number will rise to 75.6 million by 2030 and 135.5 million by 2050. While the prevalence of dementia is high in developed countries, the majority of individuals with dementia now live in low- and middle-income countries.

In 2050, it is estimated that over 75 per cent of people with Alzheimer's disease and related dementias (ADRD) will reside in these countries (World Health Organisation, 2023). India, with its rapidly ageing population, is experiencing a significant rise in dementia cases. The prevalence of dementia is currently about 10 per cent among individuals aged 65 and older, and this figure increases to nearly 47 per cent among those over the age of 85 (Evans *et al.*, 1990).

The estimated dementia prevalence for adults ages 60+ in India is 7.4 per cent, with significant age and education gradients, sex and urban/rural differences, and cross-state variation (Lee *et al,* 2023). In India, as in many other countries, family caregivers are the primary source of care for individuals with dementia. This is particularly true in low-resource settings where formal

institutional care is limited and expensive. The burden on caregivers in India is considerable, as they not only manage the patient's physical care but also cope with the emotional, psychological, and financial demands associated with dementia care. While caregiving for any chronic illness can be challenging, caring for someone with dementia is particularly taxing due to the complex nature of the disease, which includes cognitive decline and behavioural changes such as aggression, agitation, delusions, and wandering (Draper *et al.*, 2004). The caregiver burden refers to the physical, emotional, financial, and social strain that caregivers experience as they provide care to individuals who are dependent on them due to illness or disability. In the case of dementia, the burdenis of tenintensified by the progressive nature of the disease, as caregivers must continuously adapt to the changing needs of the patient. Caregivers frequently report high levels of distress, with many experiencing significant physical exhaustion, social isolation, and psychological stress (Schulz & Sherwood,2008).A study by Draper *et al.* (2004) indicated that caring for a person with dementia can be more stressful than caring for someone with physical disabilities, as the behavioural and cognitive symptoms of dementia can create unpredictability and additional challenges for the caregiver.The global increase in dementia prevalence, coupled with the demographic changes in India, underscores the need for targeted research into the burden on caregivers in these regions, particularly in India, where caregiving often falls primarily on family members without adequate formal support structures. This research is not just necessary, but also highly relevant to the current healthcare landscape in India.

While the impact of caregiving on mental health and quality of life for caregivers has been extensively studied globally, there is a noticeable gap in the literature when it comes to comprehensive studies in India focusing specifically on caregivers of individuals with dementia. This study aims to fill this gap by assessing the physical, emotional, psychological, and financial burden

experienced by caregivers of individuals with dementia in Delhi, India. By focusing on the caregiving experience in an urban Indian context, this research will provide valuable insights into the specific challenges caregivers face in low-resource settings. The findings will be crucial for informing policies and interventions that support caregivers, including the development of caregiver training programs, psychological counselling, and financial support systems. As healthcare professionals, policymakers, and researchers, your role is vital in implementing these policies and interventions. Given the rapid growth in the number of individuals living with dementia in India and the associated rise in caregiving burdens, this study seeks to provide a foundation for improving caregiver support in India. Understanding the scope and nature of caregiver burden is crucial in developing effective interventions that enhance caregivers' quality of life and contribute to better outcomes for individuals with dementia.

Method

Sample

This descriptive study aimed to assess the burden experienced by informal caregivers of individualswithdementia. Sixty informal caregivers, primarily family members,were selected using a purposive sampling. The focus was on understanding the various aspects of caregiver burden, including the impact on caregivers' physical and mental health, their daily routines, social and financial well-being, and the challenges associated with managing the patient's behaviour. Specific areas of interest included the spouse's role in caregiving, external support systems, caregiving strategies, and the caregivers' perceptions of their responsibilities and relationship with other family members. The study was conducted at the Institute of Human Behaviour and Allied Sciences (IHBAS), under the Government National Capital Territory (NCT), Delhi. A recognised mental health and neurodevelopmental disorders centre. Data collection was done through structured interviews, which included the Burden Assessment.

Schedule (Thara *et al.*, 1998), a validated tool used to assess caregiver burden across multiple domains. Additionally, sociodemographic details of the caregivers, such as age, gender, relationship to the patient, and socioeconomic status, were recorded. The collected data provided a comprehensive understanding of the challenges caregivers facein caring for individuals with dementia, and the results were analysed to identify the key factors contributing to caregiver burden.

Results

Most of the patients were married, male and close relatives of the caregivers. Half of the patients were illiterate and dependent physically and financially on their family.Half of the patients belonged to a nuclear family, and the rest to an extended family. Most caregivers were young or middle-aged, facing the burden of providing all possible care to their patients. Almost half of the caregivers were spouses, nearly half were children, and very few caregivers fell into another category, such as brother, sister, son-in-law or daughter-in-law.

It has also been found that nearly half of the caregivers were involved in the care process for the last 3-4 years. Caregivers of persons with dementia feel a significant burden. In the spouse-related domain, most patients, 28, i.e., 80 per cent, did not assist with family responsibilities.

65.7 per cent of the caregivers had poor satisfaction with sexual need, whereas 63 per cent had poor affection towards each other, and 91 per cent had poor quality of marital relationship.

In most of the areas of physical and mental health, the caregivers felt a high burden; 66.7 per cent of caregivers reported feeling highly anxious and had a depressed affect, whereas 61.7 per cent reported feeling very tired. 75 per cent of the caregivers felt highly frustrated, 43.3 per cent had som time to look after their health, and the same percentage did not have time to look after themselves. 66.71 per cent of caregivers had disturbed sleep.

In contrast, only 55 per cent of the caregivers were able to relax to some extent, 46.7 per cent were not at all satisfied with patient looking after himself 65 per cent of the care givers felt that, there was no solution to their problems, 51.7 per cent caregivers felt that patients caused disturbance at home, 70 per cent felt the patient's unpredictable behaviour. 45 per cent of the caregivers felt they could not take the job because of the patient's illness. .46.7 per cent of caregivers felt that their financialsituation had worsened very much since the patient's,whereas 66.7 per cent of the caregivers felt their work efficiency had been greatly affected.

There was a strong correlation between the quality life (Qol) of people with dementia and that of their caregiver. Therefore, in managing dementia, clinicians should consider caregivers wellbeing as an essential part significantly affecting the quality of elderly care improvement (Martina *et al.*, 2021).

Table 1

Burden Scores Across Different Domains

Domain	Minimum	Maximum	Mean ± SD
Total Burden Score	69.00	102.00	86.6 ± 9.03
Spouse-Related Burden	5.00	12.00	8.06 ± 1.62
Physical and Mental Health	9.00	18.00	15.43 ± 2.70
Patient's Behaviour	6.00	12.00	9.38 ± 1.82
Financial Burden	2.00	6.00	4.90 ± 1.17
Caregiver's Routines	6.00	18.00	8.16 ± 2.03
External Support	8.00	17.00	12.95 ± 2.13
Taking Responsibility	6.00	12.00	9.88 ± 1.35
Support of Patient	3.00	9.00	5.41 ± 1.41

*P<0.001

The above table shows that all burden domains indicate a high burden in these areas.

Discussion

The current Study aimed to assess the burden experienced by informal caregivers of individuals with dementia, and the results

highlight significant challenges across multiple domains. Caregiver burden, often described as the physical, emotional, psychological, social, and financial strain faced by family members providing care to dependent individuals, is a well-documented issue in dementia care. The study found high burden levels in various areas, including spouse-related issues, physical and mental health, caregivers' routines, patient behaviour, and financial concerns. These findings align with previous research, which has consistently shown that caregiving for individuals with dementia profoundly affects caregivers' health and overall well-being (Pattanayak, 2010; Anantharamu, *et al.,* 2016; Srivastava, *et al.,* 2016; Martis *et al.*, 2024). Caregiver burden can be categorised into several domains, each affecting caregivers differently. The results of this study suggest that caregivers of individuals with dementia experience a high level of strain across multiple domains, includingpsychological, socialandfinancialaspects. As noted by Zarit *et al.* (1980),care givers of ten face significant stress, burden and depression due to the physical and cognitive decline of their loved ones. Similar findings were observed by Pruchno *et al.*(1989), who found that dementia caregivers suffer from increased emotional distress and depressive symptoms. In this study, caregivers reported higher levels of emotional distress, including feelings of isolation, frustration, and depression, which aligns with earlier findings in the literature.

One of the key areas identified in this study was the significant burden experienced by spouses of individuals with dementia. The results showed that spouses had low satisfaction with their marital relationship, exhibited in fulfilling poor affection toward each other, and lacked support family responsibilities. This domain was found to be one of the most heavily burdened, with most caregivers reporting poor quality in their marital relationship and emotional intimacy with their partners. Karlikaya *et al.* (2005) found that 90 per cent of caregivers experienced some degree of burden, with spousal caregivers particularly affected by higher stress levels.

Spouses, particularly female caregivers, have been consistently shown to experience greater levels of depression and stress than other family members (Robinson *et al.*, 2001). This is likely due to the multifaceted nature of caregiving, which often encompasses physical care, as well as emotional and social responsibilities. Another significant domain identified in this study is the impact of caregiving on the physical and mental health of caregivers. Caregivers reported high levels of anxiety, depression, and exhaustion due to the demanding nature of dementia care. Many caregivers also reported feeling isolated and overwhelmed by the increased workload and responsibilities associated with caregiving. These findings are consistent with the work of Pruchno *et al.* (1989b), who found a strong association between the behavioural disturbances in dementia patients and the development of depressive symptoms in caregivers. Similarly, Drinka *et al.* (1987) and Baungartel *et al.* (1994) reported that caregivers' mental health is adversely affected by the behavioural disturbances exhibited by dementia patients, leading to increased stress and burden.

This finding highlights the need for mental health support for caregivers, who often neglect their well-being while focusing on the needs of their loved ones. The chronic stress associated with caregiving can lead to burnout, which negatively affects both the caregiver and the person with dementia (Farran *et al.*, 1991). The lack of adequate support systems compounds this burden, as many caregivers feel they have nowhere to turn for respite.The study also revealed that caregivers experience significant disruption in their daily routines. Sleep disturbances, reduced ability to relax, and a lack of satisfaction with

Caregiving tasks were everyday among the participants. Similar findings were reported by Thommessen *et al.* (2002) in their study on caregivers of individuals with dementia, stroke, and Parkinson's disease. Caregivers in that study reported disturbed routines, social isolation, and difficulties taking time off for holidays. Disrupting caregivers' routines often increases

stress and reduces quality of life (Givens *et al.*, 2009). This finding underscores the importance of providing caregivers respite care and support services.Without regular breaks, caregivers are at risk of burnout, which can negatively impact the quality of care they provide to patients.

The study found that caregivers felt a significant sense of responsibility for the financial well-being of the person with dementia. Many caregivers reported feeling solely responsible for the patient's financial needs and expressed concern about managing the costs of caregiving. This finding aligns with the study by Ory *et al.* (1999), which reported that caregivers of dementia patients face financial strain due to the costs of care and the time they devote to caregiving. In this study, more than half of the caregivers reported that their financial situation had worsened significantly due to caregiving duties.The financial strain was compounded by a reduction in caregivers' work efficiency and career progression, as many had to reduce their working hours or leave their jobs to provide full-time care. This finding highlights the financial burden of caregiving, which goes unrecognised in policy discussions. Financial support for caregivers, including compensation for lost wages and assistance with caregiving expenses is crucial in alleviating this burden.

A significant factor contributing to caregiver burden in this study was the behaviour of the person with dementia. Caregivers reported increased stress due to behaviours such as aggression, agitation, and unpredictability. This finding is supported by previous studies, including those by Gillard *et al.* (1984), Deimling and Bass (1986), and Andrieun *et al.* (2003), who found that disruptive behaviours in dementia patients are strongly correlated with caregiver stress. Disruptive behaviours create a stressful home environment, contributing to feelings of helplessness and frustration among caregivers. In response to these challenges, many caregivers in this study reported using coping strategies such as seeking support from friends, compensating for the patient's limitations, and sometimes

seeking temporary separation to reduce stress. These findings align with Montgomery, *et. al.,* (1985), who noted that caregiving is a time-consuming responsibility that limits personal life and social engagement. Informal caregiving for people with disabilities (PwDs) living at home is a complex task. Caregivers' psychological well-being was associated with, among other things, less caregiver burden and higher Qol (Lethin, 2017). Behavioural problems or psychological symptoms were the primary factor of the person with dementia that is associated with caregiver burden. Caregiver socio-demographicand psychological factors were the primary factors contributing to caregiver burden (Chiao, 2015). The study also found that caregiving responsibilities significantly impacted caregivers' social lives and work efficiency. Many caregivers reported reduced leisure time, social isolation, and difficulty maintaining relationships with friends and family. Additionally, two-thirds of caregivers reported that their work efficiency had decreased significantly due to the demands of caregiving. These findings support Ory *et al.* (1999), who reported that dementia caregivers spend significantly more time providing care than non-dementia caregivers and experience more significant impacts in terms of employment complications and family conflicts. The disruption of social relationships and the negative impact on employment and career progression further exacerbate the burden experienced by caregivers.

Limitations of the Study

1. The study included a sample of 60 informal caregivers, which may not represent the larger population of caregivers of individuals with dementia. A larger, more diverse sample would provide more generalised findings across different populations and settings.
2. Prospective sampling, while effective for targeting specific individuals, limits the ability to generalise the results to other groups of caregivers. This non-random selection may introduce bias, as the caregivers chosen may not reflect the broader caregiver experience.

3. The study was conducted at a single institution, which may limit the diversity of caregiving experiences. Caregiver burden may vary across regions, cultures, and healthcare settings, making applying the findings to other areas challenging without further studies.
4. This study employed a cross-sectional design, which captures data at a single point in time. As a result, it cannot provide insights into how caregiver burden evolves or how interventions might influence caregivers' burden experiences.
5. The study did not include follow-up data on caregivers over time, which limits the ability to assess the long-term effects of caregiving on health and well-being.

Conclusion

The study confirms that caregiving for individuals with dementia places significant strain on caregivers across multiple domains. The emotional, physical, and financial burdens faced by caregivers are substantial, with particular emphasis on spouse-related issues, physical and mental health, patient behaviour, and disruption of daily routines. These findings underscore the necessity for targeted interventions and support services to alleviate caregiver burden, including respite care, financial aid, and mental health support. Future research should focus on developing comprehensive caregiver support programmes that address the multifaceted challenges faced by caregivers'.

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Exploring the Differentials in Life Spent in a Healthy State among the Elders in India – A State-wise Analysis

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ABSTRACT

Life expectancy and healthy life expectancy at age 60 reflect the health, well-being, and medical care a society offers its older population. The study examines the prevalence of major non-communicable diseases among the elderly in Indian states, focusing on gender and place of residence, and estimating healthy life expectancy at 60. Information was gathered from the Sample Registration System (SRS) 2018 and the first wave of the Longitudinal Ageing Study in India (LASI). Life expectancy reflects mortality trends throughout life and is positively linked to improvements in welfare and health. Healthy life expectancy measures a country's success in reducing significant disease incidence, duration, and severity. Gender-wise differentials in life expectancy consistently reveal that women, irrespective of state, have higher life expectancy than men. However, when examining the proportion of healthy life expectancy, most states in India indicate that men have a higher rate than women. This underscores the need for geriatric clinics and health programs that promote

healthy lifestyles among older populations, thereby boosting healthy life expectancy for men and women. It also highlights the importance of fostering community-driven health programs that engage men and women alike, emphasising collaborative efforts to improve health indicators across all demographics.

Keywords : Life expectancy, Ageing, Elders, Non-communicable diseases

Life expectancy is a widely used indicator and a key summary measure of population health and well-being. Life expectancy and healthy life expectancy at age 60 reflect the health, well-being, and medical care a society provides to its older population. Although life expectancy is rising, people are living longer, but also experiencing more illness and multiple chronic conditions. The global prevalence of chronic NCDS is also on the rise. The burden of NCDS is increasing quickly, and it is currently posing a serious threat to international development. Research indicates that India is facing a growing burden of non-communicable diseases (NCDS) (Arokiasamy, 2018). NCDS contribute to 63 per cent of all deaths in the country, with deaths attributed to cardiovascular diseases, chronic respiratory diseases, cancers, and other causes accounting for 27per cent, 11per cent, 9per cent, and 13 per cent, respectively (WHO, 2018). Non-communicable diseases (NCDS) have emerged as a global health priority due to their substantial impact on morbidity, disability, and mortality in older adults. This calls for immediate and concerted action to address this pressing issue.

The World Health Organisation (Callahan, 1973) defines health as physical, mental, and social well-being beyond simply being free from illness or disability. Given the uncertainties resulting from abrupt changes in the state of illness, diseases, and accidents, health is a stochastic variable.

While life expectancy at birth has been rising in almost all societies, differences in mortality rates exist within and between various population subgroups across national and regional

boundaries. Mortality variations across regions are influenced by socioeconomic conditions and healthcare accessibility (Saikia, 2016)

The WHO provides the most potent health estimate, which is HALE. The concept of HLE was introduced in the 1960s and was developed by Sullivan (Sullivan,1971). LE is an indicator of mortality in a population, whereas HLE is an indicator of mortality and morbidity. Given current mortality conditions, LE is the average number of years expected to be lived at a given age. Thus, HLE calculates how long a population can expect to live in good health if they survive the current mortality and health conditions.For example, if a person has a health-adjusted life expectancy (HALE) of 74 years and an LE of 80 years, then 6 of the 80 years are essentially "lost" because of poor health.

Female LE was higher than male LE at birth in the early 1980s (Borah, 2021). India's overall life expectancy has increased, reaching 70.79 years for total, 69.52 years for males, and 72.17 years for females, with HLE at 60.3, 60.3, and 60.4 years, respectively (WHO, 2019). According to the 2015–2019 Sample Registration System (SRS, 2015-19) abridged life table study, the LE for India's rural and urban populations was 68.3 and 73 years, respectively. Over the past fifty years, the number of LE at birth in India has doubled. While this achievement is admirable, it is crucial to understand that these extra years may not always be years of excellent health. However, with the right interventions and policies, we can significantly improve the quality of these additional years. Malnutrition, infectious diseases, the fast increase in non-communicable diseases, and age-related physical health changes that result in disability are still problems in India, but they are not insurmountable.

The demographic transition from high to low levels of mortality and fertility, along with a rise in life expectancy, has resulted in population ageing (Johnson, 2005, Natonal Institite on Aging 2007). This ageing process is a significant cause of the growing

social, economic, and healthcare strain. The entire quality of life for their ageing populations is threatened by the simultaneous challenges of dealing with illnesses and disabilities, which are particularly difficult to manage in developing countries. Estimating healthy life expectancy is urgently needed because India is the world's most populous country, and its elderly population is growing rapidly. This data can forecast a population's future needs, guide policy decisions about planning social and health services, and spot trends and disparities within the population.

Objectives

The objectives are to:

1. Analyse the prevalence of major non-communicable diseases among the elderly in Indian states, categorised by gender and place of residence.
2. Estimate the proportion of healthy life expectancy in each state, with distinctions by gender and place of residence.

Data

To estimate the prevalence of chronic conditions, we used data from the first wave of the Longitudinal Ageing Study in India (LASI) Wave 1, conducted in India. LASI is a nationally representative survey of India representing all its states and union territories. LASI investigated the health, economic, and social determinants and consequences of population ageing in India. Households with at least one member aged 45 and above were taken as the eventual observation unit. The Indian Council of Medical Research (ICMR) provided the essential guidance and approval for data collection in the LASI survey. Written informed consent was obtained from each household and every age-eligible individual. The LASI data provides valuable insights into India's prevalence and burden of chronic diseases. At the national level, the survey includes a sample of 72,250 individuals aged 45 years and above and their spouses with no age criterion. For the present study, we have considered older adults aged 60 and above from

central states in India. The age-specific death rate from the Sample Registration System (SRS), 2018, was utilised to construct the life table to find the life expectancy.

Methodology

Data from constructed life tables and morbidity data from the LASI were combined to estimate Healthy life expectancy (HLE). To estimate the HLE, we have followed the Sullivan Method (Sullivan, 1971), the most widely used method to estimate population health indicators. Total life expectancy is the sum of healthy and unhealthy years of life. The Sullivan method provides estimates of the general burden of chronic conditions in terms of years lived with and without chronic conditions.

Life Expectancy and Healthy Life Expectancy

Life expectancy alone does not serve the purpose of measuring health status anymore for the ageing population, with the increasing prevalence of chronic diseases. Healthy life expectancy combines information on mortality and morbidity to indicate the health of a particular population. Healthy life expectancy is analysed using the Sullivan method. (Sullivan, 1971)

Life tables with broader age groups, such as 5 or 10 years, called abridged life tables, are found to be adequate and proper for most of the situations confronted in demographic analysis. The steps in the construction of an abridged life table are the following:

While constructing an abridged life table, there are seven columns, which are as follows:

Column 1, $x$to$x+n$: The lifetime period between two exact ages between x *and* $x+n$.

Column 2, ${}_nq_x$: The probability that a person alive at the beginning of the indicated age interval at x will die before reaching the end $(x+n)$ of the age interval.

$$ {}_nq_x = \frac{2 * n * {}_nm_x}{2 + n * {}_nm_x} $$

Column 3, l_x: The number alive at the beginning of the indicated age interval. Constructing a life table usually starts with an arbitrary number of newborns, such as 100,000. This starting number is called the radix of the table.

Column 4, ${}_nd_x$: The number of persons who die within the indicated age interval x to x+n.

$$ {}_nd_x = l_x * \quad {}_nq_x $$

Column 5, ${}_nL_x$: The number of years of life a person lives within the indicated age interval x to x+n.

$$ {}_nL_x = n * \left(\frac{l_x + l_{x+n}}{2} \right) $$

Column 6, T_x: The total number of years remaining for a person after surviving till the beginning of the indicated age interval x to$x+n$.

$$ {}_nT_x = \quad {}_nL_x + T_{x+n} $$

Column 7, e^0_x: The average number of years of life remaining for a person after reaching the beginning of the age interval indicated.

To find a healthy life expectancy we need the nLx values of the ordinary life table. Then, the prevalence rate (PR) of chronic conditions is calculated using the LASI data.

HnLx = nLx.(1–PR)

In an ordinary life table, the Lx column is multiplied by (1–PR) to generate the H nLx column. Then, HnTx is calculated. The healthy life expectancy He_x is then obtained by dividing the cumulative healthy person-years (H nTx) by the lx column. That is,

HnTx = ΣH nLx

Then

$$ He_x = H\ nTx/lx $$

Findings

Prevalence of Chronic Issues

India is facing a significant burden of lifestyle-related illnesses and non-communicable diseases. Understanding the incidence of chronic diseases in both urban and rural India is crucial because these conditions are prevalent in the elderly and are influenced by lifestyle choices and environmental factors. The current study aimed to evaluate the spatial differences in the prevalence of chronic diseases among elders by gender and between rural and urban areas.

Table 1

Prevalence of Chronic Issues Among Elders in Major States by Gender and Place of Residence

States	Rural			Urban			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
India	44.7	48.9	46.9	62.7	68.1	65.6	50.7	55.6	53.3
Andhra Pradesh	58.5	63.9	61.1	75.4	68.4	71.5	62.3	65.2	63.7
Assam	41.3	47.4	44.5	60	63.6	62.1	43.8	49.9	47
Bihar	39.6	45.2	42.3	59.3	53.3	56.4	41.6	46	43.7
Gujarat	46.7	49.8	48.4	50.8	68.5	60.1	48.4	57.3	53.3
Haryana	48.6	56.6	53.2	68.6	67.6	68	54.4	59.8	57.5
Jharkhand	35.3	28.3	31.8	64.2	60.3	62.3	41.4	34.6	38
Karnataka	40.6	53.7	47.2	63.8	71.8	68.4	46.8	59.5	53.4
Kerala	70.9	79.4	75.6	74	79.1	76.9	72.3	79.3	76.2
Madhya Pradesh	30.6	33.8	32.2	47.2	62.1	54.8	34.8	41	37.9
Maharashtra	54.9	55.8	55.3	70.3	73.7	72.2	61.9	64.4	63.3
Odisha	40.8	42.5	41.7	59.8	67	63.5	43.7	46.4	45.1
Punjab	56.6	69.1	62.8	64.4	71.4	68	58.7	69.8	64.2
Rajasthan	51.6	47.4	49.4	69.8	53.8	61.4	55.5	48.7	51.9
Tamil Nadu	56.6	59.3	58.1	67.2	68.6	68	62.5	64.7	63.7
Telangana	53.8	63.1	58.6	72.2	80.2	76.5	59.4	68.6	64.2
Uttarakhand	48.7	46.9	47.8	58.9	69.7	64.4	51.2	52.1	51.6
Uttar Pradesh	34.4	36.9	35.6	51.1	50.2	50.7	37.7	39.5	38.6
West Bengal	56.7	60.2	58.5	69.3	79.2	74.5	62.9	69.9	66.5

Table 1 presents the prevalence of chronic diseases among aged people in India and significant states by gender and place of residence. The prevalence of self-reported chronic disease for total, rural, and urban was 53.3, 46.9, and 65.6, respectively. Here, it was observed that Kerala had the highest prevalence of chronic diseases (76.2%) among these states. There was a gender gap, but not much of a rural-urban difference in Kerala, with almost 76 per cent of the elderly living with chronic conditions in rural areas compared to 76.9 per cent in urban areas. In all states, the disease prevalence was higher in urban areas. Among these states, a distinct rural-urban differential was observed in Jharkhand. In Jharkhand, nearly 32 per cent of the elderly in rural areas are living with some chronic conditions, but in urban areas, this has doubled, which means 62.3 per cent of the elderly have chronic issues. Chronic issues were comparatively less prevalent in Jharkhand, Uttar Pradesh, and Madhya Pradesh.

Healthy Life Expectancy

By adding the number of years lived in less than full health or with a disability, healthy life expectancy calculates the average number of years that should be lived in good health. Sullivan created the idea of "healthy life expectancy" as an operational measure in the 1970s after it was first proposed in the 1960s. While life expectancy is a measure of population mortality, healthy life expectancy takes into account both morbidity and mortality.

Table 2

Life Expectancy and Healthy Life Expectancy of a Person Aged 60 years in India and Major States

States	Total			Male			Female			Pro(HLE/TLE)		
	LE	HLE	UHLE	LE	HLE	UHLE	LE	HLE	UHLE	Total	Male	Female
India	18	8	10	17	8	9	19	8	11	44.44	47.06	42.11
Andhra Pradesh	19	7	12	19	7	12	20	7	11	36.84	36.84	35
Assam	18	9	9	17	10	7	18	9	9	50	58.82	50
Bihar	16	9	5	16	9	7	15	8	7	56.25	56.25	53.33
Gujarat	19	9	10	17	9	8	21	9	12	47.37	52.94	42.86
Haryana	19	8	11	17	8	9	21	8	13	42.11	47.06	38.1
Jharkhand	17	10	7	18	10	8	16	11	5	58.82	55.56	68.75
Karnataka	17	8	9	16	9	8	18	7	11	47.06	56.25	38.89
Kerala	19	5	14	17	5	12	21	4	17	26.32	29.41	19.05
Madhya Pradesh	18	11	7	17	11	6	18	11	7	61.11	64.71	61.11
Maharashtra	20	7	13	19	7	12	20	7	13	35	36.84	35
Odisha	19	10	9	19	10	9	20	11	9	52.63	52.63	55
Punjab	20	7	13	20	8	12	21	7	14	35	40	33.33
Rajasthan	19	9	10	17	7	10	20	10	10	47.37	41.18	50
Tamil Nadu	20	7	13	19	7	12	21	8	13	35	36.84	38.1
Telangana	18	7	11	17	7	10	19	6	13	38.89	41.18	31.58
Uttarakhand	18	9	9	17	8	9	20	10	10	50	47.06	50
Uttar Pradesh	17	10	7	16	10	6	18	11	7	58.82	62.5	61.11
West Bengal	19	6	13	18	6	12	20	6	14	31.58	33.33	30

Table Figure 2 shows the life expectancy.The age distribution of a person at age 60 was 18, 17, and 19 years for total, male and female, respectively. During these years, the number of healthy lives was less than that of unhealthy life years at the national level. Among all these states, the life expectancy was high in Punjab, Tamil Nadu, and Maharashtra, and it is 20 years each. In these three states, in 20 years, only 7 years the elderly lived in a healthy state, and the remaining years they lived in an unhealthy state. Comparatively, the life expectancy was the lowest in Bihar (16 years). At the national and state levels (except Bihar and Jharkhand), female life expectancy is higher than male life expectancy. When comparing the healthy and unhealthy life expectancy of the elderly, it was found that the elderly in Bihar, Jharkhand, Madhya Pradesh, Odisha, and Uttar Pradesh had more years of healthy life. In contrast, the elderly in all other states had more years of unhealthy life.

The proportion of healthy life expectancy nationally for males and females was 44.4 per cent, 47.1 per cent and 42.1 per cent, respectively. Among these states, the proportion of healthy life expectancy for total and males is higher in Madhya Pradesh and lowest in Kerala. While considering the proportion of female life expectancy, it was the highest in Jharkhand (68.8%) and the lowest in Kerala (19.1%). Of these states, the proportion of healthy life expectancy was above 50 per cent in Madhya Pradesh, Jharkhand, Uttar Pradesh, Bihar, Odisha, and Assam.

Table 3

Life Expectancy and Healthy Life Expectancy of India and Major States (Rural)

States	Total			Male			Female			Pro(HLE/TLE)		
	LE	HLE	UHLE	LE	HLE	UHLE	LE	HLE	UHLE	Total	Male	Female
India	18	9	9	17	9	8	19	9	10	50.0	52.9	47.4
Andhra Pradesh	19	7	12	19	8	11	20	7	13	36.8	42.1	35.0
Assam	17	9	8	16	10	6	18	9	9	52.9	62.5	50.0
Bihar	15	9	6	16	9	7	15	8	7	60.0	56.3	53.3
Gujarat	19	10	9	17	9	8	22	11	11	52.6	52.9	50.0
Haryana	18	8	10	16	9	7	20	8	12	44.4	56.3	40.0
Jharkhand	16	11	5	17	11	6	15	11	4	68.8	64.7	73.3
Karnataka	17	9	8	16	9	7	18	8	10	52.9	56.3	44.4
Kerala	19	5	14	17	5	12	21	4	17	26.3	29.4	19.1
Madhya Pradesh	17	12	5	17	11	6	18	12	6	70.6	64.7	66.7
Maharashtra	20	9	11	18	8	10	21	9	12	45.0	44.4	42.9
Odisha	19	11	8	19	11	8	20	12	8	57.9	57.9	60.0
Punjab	20	7	13	19	8	11	21	7	14	35.0	42.1	33.3
Rajasthan	18	9	9	16	8	8	20	11	9	50.0	50.0	55.0
Tamil Nadu	18	7	11	17	7	10	18	8	10	38.9	41.2	44.4
Telangana	19	8	11	17	8	9	21	9	12	42.1	47.1	42.9
Uttarakhand	18	9	9	17	8	9	21	11	10	50.0	47.1	52.4
Uttar Pradesh	17	11	6	16	10	6	18	11	7	64.7	62.5	61.1
West Bengal	17	7	10	16	7	9	19	7	12	41.2	43.8	36.8

Table 3 presents the life expectancy, healthy life expectancy, and unhealthy life expectancy at age 60 in India and significant states in rural areas. In rural areas, the life expectancy of the elderly in India was the same as in the combined case. Here, it was observed that at the national level, the number of healthy life years in males was higher than in unhealthy life years, but in females, unhealthy life years were higher. Also, in Haryana and Karnataka, healthy life years are more in males and in females, unhealthy life years are more. Here, the highest life expectancy among the elderly was observed in Maharashtra and Punjab, and the lowest in Bihar. The proportion of healthy life expectancy was higher in Jharkhand and lower in Kerala.

Table 4

Life Expectancy and Healthy Life Expectancy of India and Major States (Urban)

States	Total	Male	Female	Pro(HLE/TLE)								
	LE	HLE	UHLE	LE	HLE	UHLE	LE	HLE	UHLE	Total	Male	Female
India	20	7	13	19	7	12	21	7	14	35.0	36.8	33.3
Andhra Pradesh	19	6	13	19	4	15	20	7	13	31.6	21.1	35.0
Assam	20	7	13	21	7	14	20	7	13	35.0	33.3	35.0
Bihar	18	8	10	19	8	11	18	9	9	44.4	42.1	50.0
Gujarat	19	6	13	17	8	9	21	6	15	31.6	47.1	28.6
Haryana	20	6	14	18	5	13	23	7	16	30.0	27.8	30.4
Jharkhand	19	7	12	19	7	12	20	7	13	36.8	36.8	35.0
Karnataka	19	6	13	17	6	11	21	6	15	31.6	35.3	28.6
Kerala	19	4	15	17	5	12	21	5	16	21.1	29.4	23.8
Madhya Pradesh	18	8	10	17	9	8	19	8	11	44.4	52.9	42.1
Maharashtra	20	5	15	19	5	14	20	5	15	25.0	26.3	25.0
Odisha	19	7	12	19	8	11	19	7	12	36.8	42.1	36.8
Punjab	21	7	14	20	7	13	23	6	17	33.3	35.0	26.1
Rajasthan	19	8	11	18	6	12	20	9	11	42.1	33.3	45.0
Tamil Nadu	23	8	15	22	7	15	24	8	16	34.8	31.8	33.3
Telangana	19	5	14	17	5	12	21	4	17	26.3	29.4	19.1
Uttarakhand	18	8	10	17	8	9	20	8	12	44.4	47.1	40.0
Uttar Pradesh	18	9	9	17	8	9	19	10	9	50.0	47.1	52.6
West Bengal	21	5	16	21	6	15	21	4	17	23.8	28.6	19.1

The life expectancy, healthy life expectancy, and unhealthy life expectancy at age 60 for India and its significant states in urban areas are shown in Table 4. Compared to rural areas, the life expectancy of the elderly at the national level was higher in urban areas (20). Among the states, the life expectancy was highest in Tamil Nadu and lowest in Madhya Pradesh and Uttar Pradesh. When comparing the healthy and unhealthy life expectancy of the elderly, it was observed that in all states (except Uttar Pradesh),the number of healthy life years of the elderly was less than that of unhealthy life years. At the national level, the proportion of healthy life expectancy at age 60 was 35 per cent, 36.8 per cent, and 33.3 per cent for the total population, males and females, respectively. When examining the proportion of healthy life expectancy by gender, males have a higher proportion than females, except in Andhra Pradesh, Assam, Bihar, Haryana, Rajasthan, Tamil Nadu, and Uttar Pradesh.

Discussion

The findings of this study highlight significant variations in life expectancy and the proportion of healthy versus unhealthy life expectancy across different states in India. India's life expectancy has increased due to healthcare, nutrition, and disease control advancements. However, the disparity between life expectancy and healthy life expectancy remains a pressing concern, as many individuals spend a substantial portion of their years in poor health. The figures show a concerning pattern that reflects a significant public health challenge.

Punjab, Tamil Nadu, and Maharashtra reported the highest life expectancy at 20 years each. However, even in these states, the elderly spent only 7 years in a healthy state, with the remaining years being unhealthy. This disparity between life expectancy and healthy life expectancy indicates a need for targeted healthcare policies that extend lifespan and improve the quality of life for older adults. On the other end of the spectrum, Bihar exhibited the lowest life expectancy at 16 years and had a higher proportion

of healthy life expectancy, highlighting the ongoing challenges faced by this state in improving elderly health outcomes. It is worth noting that the positive correlation between healthy life expectancy and states like Bihar and Jharkhand challenges the typical assumption that lower life expectancy is always associated with worse health outcomes.

Despite improvements in healthcare accessibility, significant regional disparities exist.Gender disparities also play a role, as women, despite having a higher overall life expectancy, often face more significant health challenges. Overall, the findings underscore the complexity of variations in life expectancies in the states of India. While some states report higher life expectancy, they highlight the crucial issue of unhealthy life years that must be addressed.

Conclusion

Life expectancy captures mortality throughout life, and its improvement is positively associated with welfare and health. Healthy life expectancy indicates how much a country has reduced significant disease incidence, duration, and severity. Gender-wise differentials in life expectancy show that, irrespective of state, women have higher life expectancy than men. However, when looking at the proportion of healthy life expectancy, most states in India show that men have a higher rate than their female counterparts.

Recommendations

Geriatric clinics must be established to serve the demands of the elderly population. Adopting healthy lifestyles, engaging in regular physical exercise, and making dietary modifications might help avoid the establishment of modifiable risk factors for obesity and hypertension. Programs are necessary to encourage regular exercise.

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