Model for Successful Aging

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ABOUT ILSI-INDIA

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ILSI-India carries out its mission through sponsoring workshops, symposia, conferences, seminars training programs, research projects and publications. ILSI-India works closely with government, industry, research institutions, academia and international organizations.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

24h EE	24-Hour Energy Expenditure
AD	Alzheimer's
ADL	Activities of Daily Living
ALNA	Alpha Linolenic Acid
AP	Andhra Pradesh
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BP	Blood Pressure
CAD	Coronary Artery Disease
CBO	Community Based Organizations
CED	Chronic Energy Deficiency
CI	Confidence Interval
COPD	Chronic Obstructive Pulmonary Disease
CVD	Cardio Vascular Disease
DALYs	Disability Adjusted Life Years
FAO	Food and Agricultural Organization
HDL	High Density Lipoprotein
IADL	Instrumental Activities of Daily Living
ICMR	Indian Council of Medical Research
IDF	Insoluble Dietary Fiber
IDF	International Diabetes Federation
IGNOAPS	Indira Gandhi National Old Age Pension Scheme
IPOP	Integrated Program for Older Persons
LA	Linoleic Acid
LASI	Longitudinal Aging Study in India
Met	Metabolic Equivalent
MHA	Mental Health Act
MOSPI	Ministry of Statistics and Program Implementation
MUFA	Mono Unsaturated Fatty Acid
NCD	Non Communicable Diseases
NCOP	National Council for Older Persons
NCSrC	National Council of Senior Citizens
NFHS	National Family Health Survey
NGO	Non-Governmental Organization

NIN	National Institute of Nutrition
NNMB	National Nutrition Monitoring Bureau
NPOP	National Policy for Older Persons
NPHCE	National Program for the Health Care for the Elderly
NSSO	National Sample Survey Organization
PAL	Physical Activity Levels
PMW	Post-Menopausal Women
PRI	Panchayati Raj Institutions
PUFA	Polyunsaturated Fatty Acids
RDA	Recommended Dietary Allowance
RSBY	Rashtriya Swastha Bima Yojana
SAGE	Study on global Aging and adult health
SC	Scheduled Caste
SES	Socio- Economic Status
ST	Scheduled Tribe
SUBI	Subjective Well-Being Inventory
T2DM	Type 2 Diabetes Mellitus
TDF	Total Dietary Fiber
TFA	Trans Fatty Acid
UNFPA	United Nations Population Fund
UT	Union Territory
WHA	World Health Assembly
WHO	World Health Organization
WR	Women of Reproductive Age

PREFACE

Countries are aging rapidly. World Health Organization has estimated that by 2050 more than two billion people across the world will be over 60 years of age. In countries like Japan, Italy, Greece, already more than a quarter of the population would be elderly. The problem is not as acute in India. Thisoffers an opportunity to anticipate and provide for the future and take care of the relatively fewer elderly, though because of the size of the population, the number is large.

While there is an increase in life expectancy, largely due to advancements in medical science, it is not often accompanied by a disease free healthy life. It is critical that the importance of successful aging is recognized as a goal for everyone and action initiated to reduce the incidence of disease, enhance mental and physical functional capacity and promote active engagement with life.

The knowledge base about the elderly in India is inadequate.The few surveys/studies that have been undertaken indicate that a lot more will have to be done to ensure good quality life for the elderly, in spite of most of the elderly being in low income families in the rural sector, making provision of facilities for the elderly more difficult.

Most of the elderly do not have regular employment with proper retiree benefits. As such, even though they may, in most cases, be head of the household in extended families they become economically dependent on their children and relatives. With dependency they do not get adequate attention and sometimes are exposed to abuse.

The midlife factors that influence the ageing process are: the Asian Indian phenotype, intrauterine and perinatal nutrition, overweight/obesity, dyslipidemia, non- communicable diseases, poor nutrition and lack of physical activity. They are largely responsible for poor health status of the elderly. Most of them suffer locomotive disability, high level of chronic morbidities, high incidence of hypertension, diabetes, arthritis and asthma.

The Government has initiated a number of schemes to improve the socio-economic conditions of the elderly. It is however necessary that other agencies like NGOs, civil society networks and academia get involved and adopt appropriate policies and programs to improve living conditions of the elderly with adequate medical facilities and due attention to diet and physical activity. The present study, sponsored by ILSI-India, it is hoped, will initiate an informed discussion on problems of the elderly in India and identify and reinforce welfare measures.

The support and guidance received from ILSI GC is greatly appreciated.

D.H.Pai Panandiker
Chairman ILSI-India

EXECUTIVE SUMMARY

Population aging is a worldwide phenomenon, and India is no exception. Census reports indicate that while the Indian population has approximately tripled during the last 50 years, the number of elderly Indians has increased more than fourfold. Indian society is categorized as “mature” presently as the percentage of the older population has crossed the 7% mark. India will become an “aged” country when the older population crosses 10% which is predicted by 2021 (10.7%) and a further rise to 12.40% by 2026.

There is an increase in longevity from 32 years during 1945 to 68 years in 2014 and as a consequence the aged population in the country is increasing in numbers. A report by UNFPA and HelpAge International in 2012, reiterated that India is home to between 11,000 and 20,000 centenarians. Characteristics of elderly population in India which impact public policy include an increase in the number of the oldest-old (>80 years) with greater dependency needs and feminization of the elderly population with a greater proportion of widows many of them with no support whatsoever.

Indian societies are rapidly changing due to the process of urbanization and migration, higher aspirations among the youth and the increasing participation of women in the workforce. However, most of them are dependent on the younger generation for physical care and financial security. Various challenges arise on account of gradual erosion of the traditional joint family system and the inability of government to support the elderly.

As the UNFPA (2011) report succinctly states that that income insecurity, illiteracy, age related morbidity and physical and economic dependency are factors that tend to make the Indian elderly, and particularly elderly women, vulnerable. It is important that government and society understand the rights and needs of the elderly and frame suitable policies and legislations and effectively implement them.

For successful aging, senior citizens need to remain integrated and participate actively in society, be able to live with dignity and security and be able to pursue opportunities for self-development.

Unhealthy lifestyles have resulted in elderly Indians suffering from chronic degenerative diseases such as diabetes, cardiovascular problems etc, apart from other gerontological problems. Empirical evidences suggest that the disability and adverse consequences of these diseases can be prevented or postponed by investment in health and fitness promotion throughout life.

The approach needs to be holistic and multidimensional; at the individual, family, community, governmental and non-governmental levels. First and foremost, opportunities need to be provided for improving socio-economic status and access to health care. Also important is extending social pension and health insurance, especially to women. At the family level, stronger intergenerational bonding needs to be encouraged and at community level, greater participation of elderly has to be ensured by active involvement in decentralized bodies. Effective implementation of national policy and programs for older persons in line with the international instruments is imperative and government should ensure availability of physical, financial and human resources to do so. Further, government needs to enable civil society groups and engage the private sector in creating an elder friendly environment. Data and research gaps in understanding issues of the elderly within the cultural context need to be undertaken on a regular basis and appropriate monitoring systems have to be put in place.

1. DEMOGRAPHY OF AGING IN INDIA

There is an increase in longevity from 32 years during 1945 to 68 years in 2014 and as a consequence the aged population in the country is increasing in numbers.

According to the Population Census 2011, the elderly constitute 8% of the total population with 7.7% males and 8.4% females.

Characteristics of elderly population in India which impact public policy include an increase in the number of the oldest-old (>80 years) with greater dependency needs and feminization of the elderly population with a greater proportion of widows many of them with no support whatsoever.

1.1 INTRODUCTION

Aging is an inevitable, irreversible and progressive phenomenon and is the last phase of human life cycle. It is characterized by functional decline ultimately leading to death. Advancing age is accompanied by progressive physiological changes in the function of most organs. As people age, there also tends to be a concomitant increase in the presence and number of chronic conditions such as hypertension, cardiovascular disease, osteoporosis, diabetes and dementia among others. These further compromise the quality of life in old age.

Old age comprises of ages nearing or surpassing the average life span of human beings. The longest-living person whose dates of birth and death were verified to the modern norms of *Guinness World Records* was Jeanne Calment, a French woman who lived to 122 years. The boundary of old age cannot be defined exactly because it does not have the same meaning in all societies. People can be considered old because of certain changes in their activities or social roles (Jeyalakshmi et al, 2011). Declining health, reduced income, shrinking circle of friends, sudden break with a particular kind of professional life result in a range of socio-psychological problems for the retired (Siva Raju, 2002). Also old people have limited regenerative abilities and are more prone to disease, syndromes, and sickness as compared to other adults. The medical study of the aging process is called gerontology and the study of diseases that afflict the elderly is geriatrics (Jeyalakshmi et al, 2011).

The lowered level of physical activity and the growing number of chronic illnesses that follow with increasing age, frequently create a vicious circle. Illnesses, frailty and related disabilities reduce the level of physical activity, which in turn adverse by effect functional ability and exacerbate the disabilities caused by the illnesses finally leading to frailty among the elderly causing increased dependence on others for performance of their activities of daily living.

There is an increase in longevity from 32 years during 1945 to 68 years in 2014 and as a consequence the aged population in the country is increasing in numbers. The greying population faces a number of problems in varying degrees. These problems range from financial issues, ill health and absence of social security to loss of social role and recognition and the non-availability of opportunities for creative use of free time. The needs, problems and adjustment patterns of the elderly vary significantly according their age, socio-economic status, health, living status and such other background characteristics (Kammar et al, 2011).

Population aging is having profound effects on society. It is a quiet, almost unseen social revolution that is gradually gaining pace and will accelerate in the next 25 years. Its influence will be felt at every level, from family life and living arrangements, employment, the provision of health services and pension systems, to the state of economy.

Population aging is a worldwide phenomenon, and India is no exception. Census reports indicate that while the Indian population has approximately tripled during the last 50 years, the number of elderly Indians has increased more than fourfold. Indian society is categorized as "mature" presently as the percentage of the older population has crossed the 7% mark. India will become an "aged" country when the older population crosses 10% which is predicted by 2021 (10.7%) and a further rise to 12.40% by 2026.

Characteristics of elderly population in India which impact public policy include an increase in the number of the oldest-old (>80 years) with greater dependency needs and feminization of the elderly population with a greater proportion of widows many of them with no support whatsoever.

1.2 DEMOGRAPHIC PROFILE OF THE ELDERLY IN INDIA

The National Policy of Older Persons (1999) defines 'senior citizen' as a person who is 60 years old or above. According to the Population Census 2011, the elderly constitute 8% of the total population with 7.7% males and 8.4% females. In absolute numbers, there are nearly 104 million elderly persons in India; 53 million females and 51 million males. It is interesting to note that up to Population Census 1991, the number of elderly males exceeded the number of females. In the last two decades, however, the trend has been reversed and the elderly females outnumbered the elderly males. This is also a major concern for policy makers as elderly women are more vulnerable on all fronts compared to elderly men. As regards rural and urban areas, more than 73 million persons i.e. 71% of elderly population reside in rural areas while 31 million or 29% of elderly population are in urban areas (Census, 2011).

The growth in elderly population is due to the longevity of life achieved because of economic well-being, better medicines and medical facilities and reduction in fertility rates. In India, the decadal growth in general population has shown a declining trend since 1961 and so is the growth in elderly population till 2001. In the last one decade, however, that is between 2001 and 2011; the growth in elderly population has shot up to 36% while the same was 25% in the earlier decade. The general population has grown by merely 18% vis-à-vis 22% in earlier decade. It is observed that in India, the growth in elderly population has always been more than the growth in general population. (MOSPI, 2016).

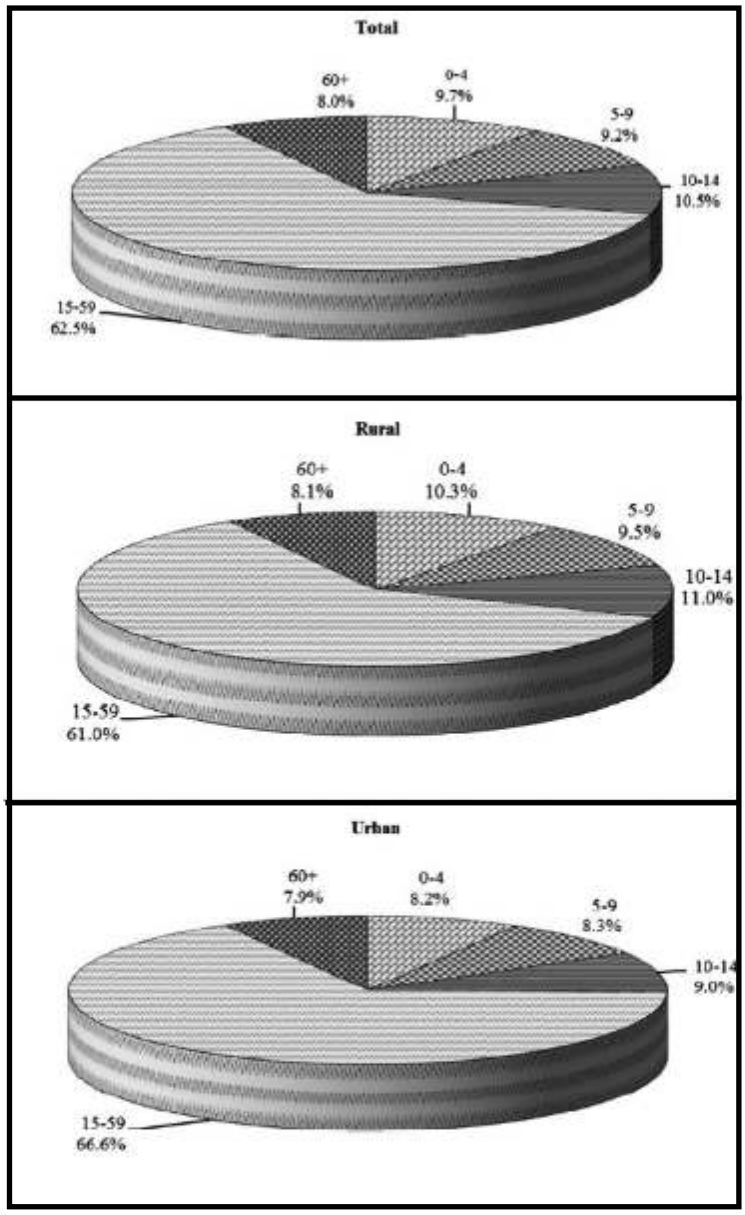
Percentage share of elderly persons in the population of India is ever increasing since 1961. While in 1961, 5.6% population was in the age bracket of 60 years or more, the proportion has increased to 8% in 2011. The trend is same in rural as well as in the urban areas. In rural areas, while the proportion of elderly persons has increased from 5.8% to 8.1%, in urban areas it has increased from 4.7% to 7.9% during 1961 to 2011 (Census, 2011).

Composition of population plays an important role in development of a country. More the workforce greater is the potential for economic development of the country. According to population census data that the proportion of children in the population (age 0-14 years) in 2011 was 29.5%. The working age population has reached 62.5% and the proportion of elder people has reached 8.0% in 2011 (Census, 2011).

State-wise population census (2011) data on elderly population reveal that Kerala has maximum proportion of elderly people in its population (12.6%) followed by Goa (11.2%) and Tamil Nadu (10.4%). This may be due to the lifestyle and better medical facilities in respective states. The least proportion is in Dadra & Nagar Haveli (4.0%) followed by Arunachal Pradesh (4.6%) and Daman & Diu and Meghalaya (both 4.7%) (MOSPI, 2016).

Nearly 69% of the households, 68% in rural areas and 71% in the urban areas do not have any aged person, i.e. a person of age 60 years or more, in the household. Around 22% have one aged person and 9% have 2 aged members in the household. In rural areas, the

Fig.1.1: Percentage Distribution of Population by Age Groups and Residence

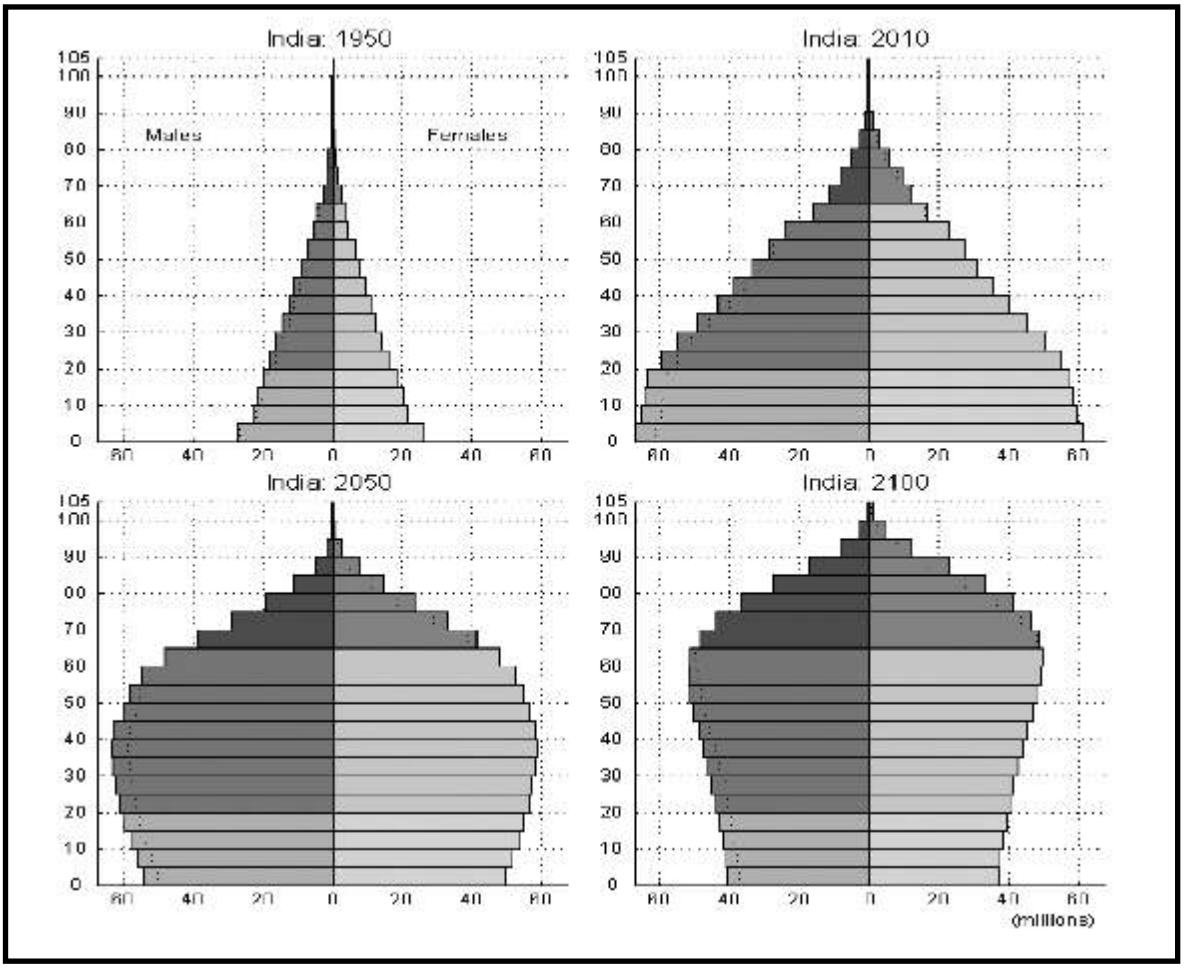


Source: Census, 2011

corresponding proportions are 22% and 10% and in urban areas 21% and 8% respectively. Only 0.5% households have 3 or more aged members (MOSPI, 2016).

As can be seen in Fig 1. 2, while the population of young children is increasing, the older age groups are also increasing, changing the shape of the population pyramid from a pyramid to a column. While earlier in 1950, the life expectancy being low, the numbers at the top of the pyramid were small; as access to better healthcare and nutrition improved, people started living longer and the numbers at the top of the pyramid expanded.

Figure 1.2: Age Pyramids, India

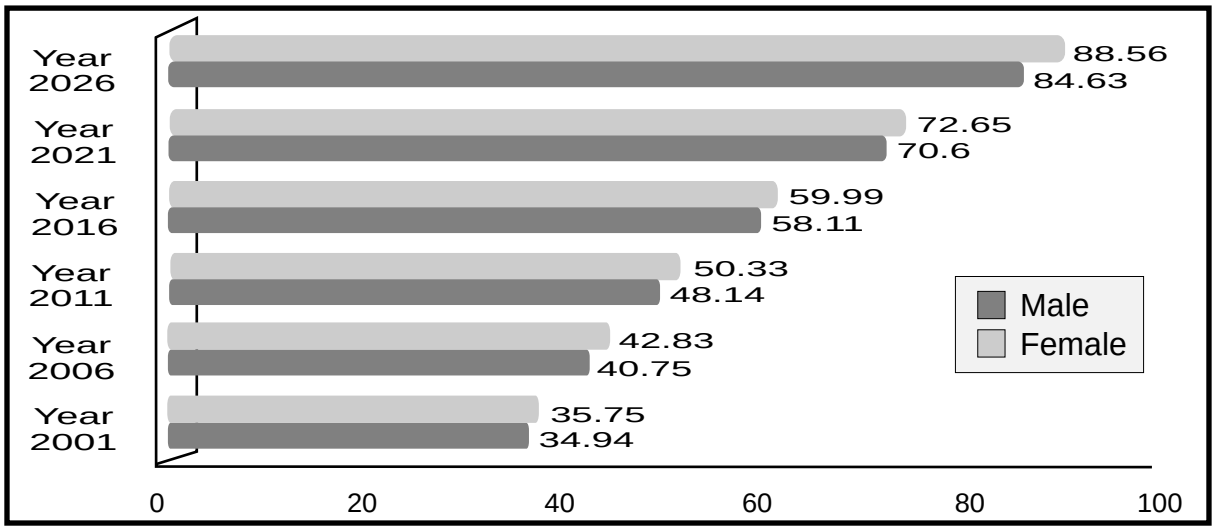


Source: United Nations, Department of Economic and Social Affairs, Population Division (2011): World Population Prospects: The 2010 Revision. New York

A Report by UNFPA and HelpAge International in 2012, reiterated that India is home to between 11,000 and 20,000 centenarians. But this number is all set to rocket to anywhere between 1.51 lakh and 6.2 lakh. The Census, 2011 reveals that Andhra Pradesh had the highest number of centenarians. The figures also show that population of the fairer sex in 100 and above age category is significantly higher than that of men. Researchers say that Andhra Pradesh's (AP) population growth rate, improved life expectancy and a historically large population are reasons behind the higher number of elderly people (UNFPA and HelpAge International, 2012).

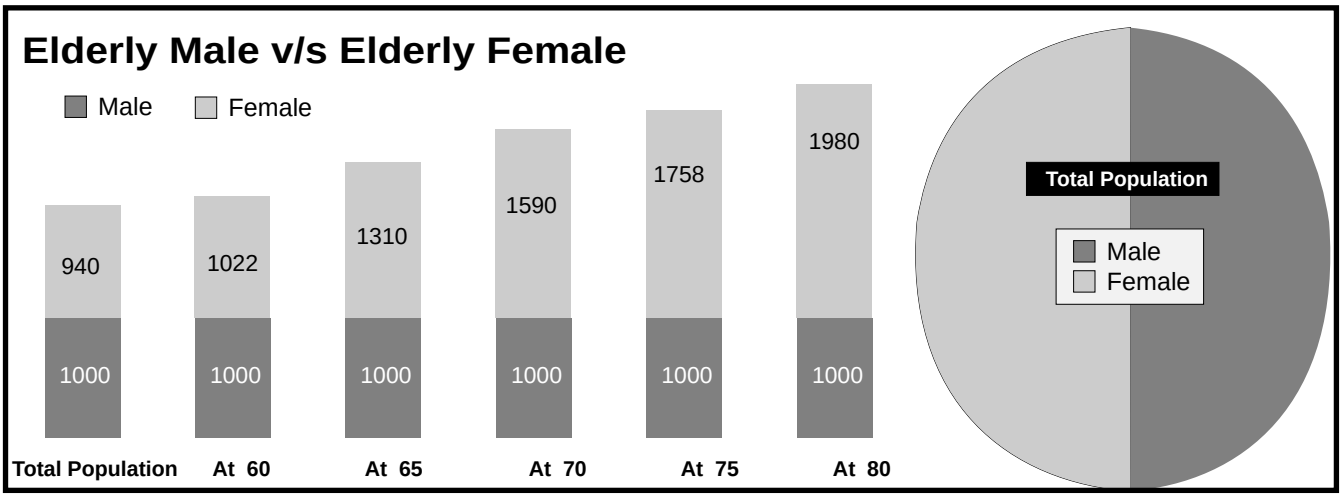
As evident in Figs 1.3 and 1.4, females tend to out number males among the elderly population in India, with the numbers increasing with advancing age. Correspondingly, the numbers of widows in old age are greater and their dependency needs are more.

Figure 1.3: Elderly Population in India (in millions)



Source: Agewell Foundation, 2012

Figure 1.4: Proportion of Elderly Males vs. Elderly Females in India



Source: Agewell Foundation, 2012

As per the 2011 report jointly brought out by United Nations Population Fund (UNFPA) and HelpAge International, the number of elders, who have attained 60 years of age, will shoot up by 360 per cent between 2000 and 2050. India has around 100 million elderly at present and the number is expected to increase to 323 million, constituting 20% of the total population, by 2050. The Registrar General of India forecasts the share of older persons (age 60 years and above) in the total population to rise from 6.9% in 2001 to 12.4% in 2026.

1.3 LIFE EXPECTANCY

According to latest WHO data published in 2015, life expectancy in India is 66.9 years for males and 69.9 years for females. The total life expectancy is 68.3 years which gives India a World Life Expectancy ranking of 123.

Life expectancy in the country has increased in rural as well as urban areas. At birth, in rural areas, it has increased from 48 years in 1970-75 to 66.3 years in 2009-13, while in urban areas it has increased from 58.9 years to 71.2 years. At the age of 60 years, during the same period, it has increased from 13.5 to 17.5 years in rural areas and from 15.7 to 19.1 years in urban areas (MOSPI, 2016).

Age-specific death rate (per 1000) of elderly population: For 2013, the age specific death rate per 1000 population for the age group 60-64 years was 19.7 for rural areas and 15.0 for urban areas. Altogether it was 18.4 for the age group 60-64 years. As regards, sex-wise, it was 20.7 for males and 16.1 for females (MOSPI, 2016).

1.4 OLD AGE DEPENDENCY RATIO

The Old Age Dependency Ratio shows an increasing trend. The ratio has risen from 10.9% in 1961 to 14.2% in 2011. The gap between female and male old-age dependency ratio also has an increasing trend and the two assumed the values 14.9 and 13.6 respectively in 2011 (MOSPI, 2016). Between rural and urban ratios there has been considerable difference in all the periods and this may be due to relatively higher concentration of working age population in urban areas. According to 2011 census, the old-age dependency ratios are 15.1 and 12.4 for rural and urban areas respectively (MOSPI, 2016).

The difference between rural and urban old-age dependency ratio is significantly high in States like Maharashtra, Andhra Pradesh, and Himachal Pradesh etc. whereas in the case of Assam, Delhi and Kerala the ratio remains almost the same in both rural and urban areas (MOSPI, 2016).

The Sample Survey conducted by National Sample Survey Office in 2004 reveals that 65% of the aged persons had to depend on others for their day-to-day maintenance. The situation was worse for elderly females with about only 14% and 17% being economically independent in rural and urban areas respectively while the remaining were dependent on others - either partially or fully. The elderly males were much better off as majority of them put 51% and 56% among them in rural and urban areas respectively did not depend on others for their livelihood (MOSPI, 2016).

Among economically dependent elderly men, in either rural or in urban part of the country about 6-7% were financially supported by their spouses, almost 85% by their own children, 2% by grand-children and 6% by others. For elderly women, there were minor differences between the rural and urban scenario. In rural areas, 16% depended on their spouses, 75% on their children, 3% on grand-children and 6% on others, while in urban areas 19% depended on their spouses, 71% on their children, 3% on grand-children and 7% on others including the non-relations (MOSPI, 2016).

Of the economically independent men, more than 90% were reported to be living with one or more dependents, while among economically independent women, about 65% were having one or more dependants. In this respect, gender differences were quite pronounced although rural-urban differences were minimal. Also the number of dependents was more in rural areas than in the urban (MOSPI, 2016).

As per the population census 2011 data, 66% of elderly men and 28% of elderly women in rural areas participated in economic activity in the capacity of main or marginal worker. In urban areas however, it was only 46% among elderly men and about 11% of elderly women who were economically active. The proportions increased for women as compared to 2001 population Census data in both rural and urban areas (MOSPI, 2016).

1.5 LITERACY LEVELS

Literacy levels among elderly males and females have improved over time in both rural and urban areas. But there is a huge gap between male and female literacy rates. The literacy rate among elderly females (28%) is less than half of the literacy rate among elderly males (59%). It is observed that improvement in literacy rates is relatively high in case of elderly women in urban areas vis- à-vis other categories (MOSPI, 2016).

It is evident that there is a huge gap between literacy rates among elderly persons in rural and urban parts of the country. Around 30% of elderly persons in urban areas were having educational qualification matric/secondary and above but the proportion was comparatively much less (7%) in rural areas (MOSPI, 2016).

The overall literacy rate among persons aged 60 years and above was least (20%) in Arunachal Pradesh. The maximum literacy rate was 84% in Mizoram followed by 79% in Kerala and 75% in Chandigarh (MOSPI, 2016).

1.6 DISABILITIES

Population Census 2011 data reveal that locomotor disability and visual disability were the most prevalent disabilities among elderly persons. Almost half of the elderly disabled population was reported to be suffering from these two types of disabilities (MOSPI, 2016). Percentage of elderly disabled persons was slightly higher in rural areas as compared to urban areas. Six per cent of elderly population was reported as disabled in rural areas whereas in urban areas, 4% of elderly population was disabled (MOSPI, 2016).

Prevalence of disability varies from about 60% for vision to about 7% for speech among the elderly (UNFPA, 2012). A quarter of the elderly were affected by other forms of disability. The notion of disability includes either partial or full (reported) difficulty in discharging the respective functions. These disabilities, however, did not seem to have a strong gender or rural-urban variations as these were perhaps the inevitable consequence of aging. Age undoubtedly was a strong predictor of all the disabilities, particularly in the case of hearing, walking and chewing. There was no connection between disabilities and socio-economic background, except perhaps for memory. Neither education level nor wealth quintile appeared to make any significant difference in the prevalence of other disabilities.

The NSSO study (2004) on the other hand, showed the prevalence of disability among the elderly to be 5%. Females appeared to suffer lower disability rates than males. The disability rates among the elderly was higher in rural areas than in urban areas. Approximately 5.4% of the elderly in rural areas reported single or multiple disabilities as against 4.0% in urban areas (NSSO, 2004). Further, reporting of disabilities among the older men was marginally higher than in women both in rural as well as urban areas.

1.7 MARITAL STATUS AND LIVING ARRANGEMENTS

According to population Census 2011 data the percentage of currently married elderly women was markedly lower than the percentage of currently married elderly men. After the age of 70 years, more than 60% of women became widows (MOSPI, 2016).

According to Census 2011 data, more than 56% of elderly persons lived with their spouse and 32% of aged persons lived with their children. About 5% of elderly persons lived alone while another 4% lived with other relations and non-relations (MOSPI, 2016).

An estimated population of 1,13,377 aged persons are living alone or with spouse only, as per NSSO 60th round report. Out of these, in 19% cases, their child/grandchild/sibling is residing within the same building and 37% cases are so in which their child/grand child/sibling reside within the same village/town (MOSPI, 2016).

Interestingly, the Census data (2011) shows that the joint family system is being revived. Between 2001 and 2011, the percentage of nuclear families as a percentage

of all families actually declined slightly, from 70.34% to 70.11%. The number of nuclear families increased in absolute terms, from 135 million in 2001 to 172 million in 2011, but at a slower pace than the overall population.

In another surprise, the share of nuclear families has declined by 1.84 percentage points in urban areas, but grew by 0.32 percentage points in rural areas. Besides such work-related arrangements, the decline in nuclear families can also be attributed to social changes. India is seeing a rising number of cases of divorce and separation, single parents, and people marrying late or opting to stay single.

Nuclear families have been consistently declining in developed economies. In the US, for example, the share of households that comprised married couples with children has dropped from 40% in 1970 to 19% in 2013. In that sense, Indian society might be beginning the third arc in the fragmentation of the family unit: from joint families to nuclear families to disparate set-ups. (http://scroll.in/article/669053/the-nuclear-family-is-on-the-decline-in-india).

1.8 FINANCIAL STATUS

Agewell Research and Advocacy Centre of Agewell Foundation (2016) conducted a study on the "Financial Status of Older People in India". A total of 15000 respondents were studied by 500 volunteers across all the five regions of Northern, Southern, Western, Eastern and Central India. The study revealed the extent of financial insecurity among the elderly;

- 65% undergo financial crisis and were dependent on others for their needs;
- Only 35% were financially secure. For 38%, pension is the main source of income.
- Only 35.77% had their financial rights/interest protected and
- About 31% did not have their financial interests/rights protected.
- Over 46% had increased their net-worth value.
- Their major problems faced by more than four-fifth respondents were related to seeking medical and health care.

1.9 CARE OF THE ELDERLY

In India, care of the elderly is still considered to be a family responsibility and not a Government problem. The children, particularly sons, are expected to look after their parents and grand parents. However with the socio-cultural transitions and associated stresses of modern day living, this is becoming more and more of a problem. in a joint family with 3-4 generations living together the elderly were always looked after. However, in urban areas with smaller family units and women going out to work, the elderly have no one to care for them currently. This problem becomes more acute when one partner dies leaving the other one alone. Illness or disability poses an additional strain both physical and financial. When the elderly couple is living alone and caring for each other, it needs to be realized that the caregivers themselves are elderly and need looking after.

There is an emerging need to pay greater attention to aging issues to promote policies and programs for dealing with a future aging society. Ministry of Social Justice and Empowerment, Government of India which is entrusted with the nodal responsibility for care of older persons has also been increasingly concerned with the issues of age and health as well as with income security during old age and its close links to mental and social wellbeing. It was in this context that the Ministry of Social Justice and Empowerment, Government of India had announced a “National Policy for Older Persons” in January 1999, which has been reviewed and restructured as the “National Policy for Senior Citizens” 2012. Besides the Government, the voluntary sector, community and each citizen has to contribute to ensure security in old age. Apex level organizations of older persons have special responsibilities in this regard so that they can function as a watchdog, energize continuing action, mobilize public opinion and generate pressure for implementation of policies and programs.

2. CONCEPTS OF AGING

Beyond demography, an aging society also has its economic, social, political, cultural, spiritual and other dimensions, as population and individual aging impact all spheres of societal structure and function. Aging is universal. Along with the infor-mation explosion, globalization and technological advancement, aging appears to be an essential component of the future.

2.1 DEFINITIONS OF AGING

Chengti (2007) has defined aging as consisting of at least three distinct processes; primary, secondary and tertiary aging. **Primary aging** refers to the normal disease-free movement across adulthood. Changes in biological, social or psychological processes in primary aging would be considered an inevitable part of the developmental processes. **Secondary aging** refers to developmental changes that are related to disease. **Tertiary aging** refers to the rapid losses that occur shortly before death.

Birren and Cunningham (1985) defined age in three perspectives: biological, social and psychological. Biological age represents a person's present position with respect to his/ her potential life span. It is assessed by measuring the functioning of the various vital or life limiting organ systems, such as cardiovascular system. Social age refers to an individual's roles and habits in relation to other members of the society. Psychological age refers to the behavioural capacities that people use to adapt to changing environmental demands. These abilities include memory, intelligence, feelings, motivation and other skills that foster and maintain self-esteem and personal control.

According to Bali (2003), individual aging refers not only to a person's interactions and inter-relationships but also involves performance in a sequence of socially prescribed roles, accumulation of experiences, and changes in the physiological systems as well as in perceptual, cognitive, emotional and other psychological processes.

Aging is not a singular process: we age biologically, psychologically and sociologically. The nature of aging among human beings as members of society is markedly affected by psychological, social and biological factors. These factors continue to differentiate individuals of any one chronological age within the lifespan. It is a normative process and not a fixed dimension of the lifecycle. As individuals grow older, changes are witnessed in the physical, cognitive and social realms. The 'aging experience' is determined by the unique interactions between these various clocks.

Old age is often determined by cultural norms prevailing in a society. Among a few communities of south India, especially the "Brahmans" of Karnataka and Tamil Nadu, a ceremony called 'shashtyabdhi purthi' is observed to celebrate the 60th birthday because it is customarily treated as second birth of an individual. In Indian society, marriage of one's children, particularly the eldest son, and bringing in of the daughter-in-law, marks the beginning of old age for women far more clearly than do a specified number of years. Accordingly, role expectations change for male and female members in a household.

In the modern- day socio-economic context, being old often means to be ill, non-productive, poor, weak, demented, unattractive, dependent and abused. In such a situation, it is no surprise that most people view old age with apprehension and trepidation.

2.2 INDIGENOUS DEFINITIONS OF AGING

Examining aging from an Indian perspective has caught the attention of Indian Gerontologists. **Sajjan Singh** (1996) applies a spirituo-physical-structural analysis to structure of human beings based on ancient Indian concept of *Koshas* (sheaths). According to this view, the divine spark of life is covered at the outermost point by the Food Sheath (*Annamaya Kosha*) which is the gross anatomical body visible to us. Next to this is the Vital Air Sheath (*Pranamaya Kosha*) which comprises the physiological functions. Inner to this is the Mental Sheath

(*Manomaya Kosha*) which is the seat of emotions. Still deeper is the more subtle Intellectual Sheath (*Vignanmaya Kosha*) which is the seat of our conscience. Still subtler is the fifth, Bliss Sheath (*Anandamaya Kosha*). This is the store house of traces of our past actions and thoughts called 'Vasanas'. All these are subservient to the "Om" or the life principle. It is identification of oneself with the gross body, mind or intellect that leads to stress. As one ages, one should move more and more towards pursuing the sublime and the supreme consciousness. One's identification should shift from body, mind and intellect to the self. Living life based on Vedantic principles with practice of Yoga, Meditation and spirit of Yagna are considered best ways of coping with aging (Jai Prakash, 2005).

In a similar vein, scholarly politician **Dr. Karan Singh** (2001) talks on five categories of aging- chronological, physiological, emotional, psychological and spiritual. He says in the spiritual level, we enter the *ageless*. In the realm of spirit there is no aging. The Christians emphasize the light that is in every human being that comes into the world. 'Ek Onkar' of the Sikh Gurus, 'Nur-e-Ilahi' of the Sufis, the light of the 'Aatman' of the Vedantas, is the creative centre within each one of us. One can contact the centre through the way of Wisdom- *Gyanayoga*, the way of Devotion- *Bhaktiyoga*, The way of Action- *Karmayoga* or the way of Spiritual Discipline- *Rajayoga*.

The views on life, lifestyle and aging emerged within the socio-historical setting over a long period. The course of the historical dialectic on aging in India runs parallel to the development of Hindu ideal views on life.

The **Vedic culture** was life affirming with a distinct emphasis on material prosperity, longevity and progeny. Primary desire and hope expressed in these early texts is to acquire and enjoy full life within the confines and bounds of a homestead economy in the company of sons and grandsons. The desire for one hundred years and the lust for life are variously expressed in Atharvan hymns. These prayers suggest that in Vedic society, death must have been more commonly associated with youth and vitality than with old age and decrepitude. At that time, life usually ended suddenly due to disease or war, rather than fading out by degrees in old age. There was therefore no compelling reason for the Vedic people to connect death and sickness with old age or to assume its inevitability (Jai Prakash, 2005).

Post-Vedic thinkers were then asking the ultimate metaphysical questions about the 'why' of aging. This resulted in the assumption that there is something or somebody responsible for aging. Since aging is something happening to people, one can do something about it. One need not remain helpless. One can actively try to eliminate the suffering and anxiety resulting from aging (Jai Prakash, 2005).

By the time, Upanishads were compiled; old age began to be seen as diminishing human strength and powers. Old age was projected as unavoidable and incurable. The desire to be free from old age accompanied the desire to be free from death. Both old age and death were seen as situations from which one should escape. The only resort was to seek liberation (moksa). The Upanishads recommend a life of meditation and contemplation on great truths in later years. The Upanishadic period in contrast, recognise two distinct phases in life. They are that of 'householder' who has to perform rituals and sacrifices, and that of 'hermit' practicing austerities in the forest. But the relation between the two is still ambiguous (Jai Prakash, 2005).

The views on human life were drastically affected by the Buddhist challenge. The ideal of Nirvana emerged as the competing ideal. As evident in Buddhist texts, there seemed to be a dread of aging and campaign against aging. The disgust with the perishable nature and the aging of the body is a reflection of the Buddhist view of worthlessness of the human body (Jai Prakash, 2005).

2.2.1. Hindu Concept of Stages of Life

By the time of the influential Manusmriti (100 BC), the ideal framework of organising life in terms of age and class specific duties was formalized. Manusmriti codified the rules for living, which influenced Hindu ideology for centuries to come. He gave the 'varnasrama dharma'- different stages of life for different castes. Four stages of life (Asrama) were identified as follows:

Brahmacharya : Student life or the life of a celibate
Grhastha : The life of a householder
Vanaprastha : The life of a hermit
Samnyasa : The life of a wandering ascetic (Yati)

Manu considered human life span to be one of hundred years. The first quarter was to be spent as a student. One had to learn, acquire education and prepare oneself for life. The second quarter was to be spent as a householder. A householder provided succour to old, infirm and orphaned, widowed and the disadvantaged in the society. When a man grew old and his sons were married, he was to give up mundane life, move to a forest and spend his time in philosophical pursuits. Finally, when he was spiritually ready, he was to renounce life and become a wandering ascetic. The goal of such a life was to pursue higher truth and liberation from the cycle of birth and death. The roles prescribed for various stages of life thus appeared to be normative and ideal (Jai Prakash, 2005).

2.2.2. Ayurvedic View of Old Age and Death

There is much literature in ancient texts on medicine regarding aging and attempts to retard the process of aging. Ayurveda is the indigenous system of medicine. Its origin dates back to the Vedic times. It is supposed to have been practiced in 800 BCE. 'Ayu' means life, Ayurveda is the science of knowledge of life. Ayurveda emphasizes on the relationship between mind and body. It has both curative and preventive aspects. It suggests a lifestyle that will help people remain healthy and vigorous. It takes a holistic approach by considering human existence as resting on three pillars- mind, body and soul. It believes in harmony and equilibrium. Imbalance between three humors in the body is considered as the root cause of all problems. The three humors are Kapha (derived from water element), Pitta (derived from fire element), and Vata (derived from wind). Humors are in continuous flux. They may become morbid by wrong kind of nutrition, behaviour, season or emotions. After the age of seventy, with each passing day, the bodily elements, sense organs, energy, vitality and enthusiasm become debilitated (Jai Prakash, 2005).

Two of the ancient Indian physicians, Charaka and Susruta considered aging a disease. The stages involved in the aging process were accumulation of the humor or wind; vitiation with abnormal increase in its proportion; diffusion- spreading of the deranged humor to all the parts of the body; localization- undermining the entire organs; manifestation- process of aging becoming visible; rupture- aging process mediating between life and death and culminating in death. Several factors such as force of time, inherent tendency, imprudence, volitional transgressions are considered responsible for aging (Jai Prakash, 2005).

Old age is seen as preparation for death. But death is not an end as there is rebirth. To cope with age related stress, Ayurveda suggested several remedies. The desire for both longevity and youthfulness is expressed in many forms in many contexts. One of the branches of Ayurveda as given in Charaka Samhita is "Rasayana Chikitsa"- rejuvenation. This is a branch dealing with gerontological treatment (Jai Prakash, 2005).

2.3 ACTIVE AGING

The World Health Organisation (WHO) defines "Active Aging" as the process of optimising opportunities for health, participation and security of older people in order to enhance quality of life as people age. The concept considers that if aging is to be a positive experience and longer life is to be accompanied by continuous opportunity for enjoyment and productivity, then aging must be seen not as a state of "disease and disability" but as a state of "health and fitness". It applies to both individuals and population groups. Active aging allows people to realize their potential for physical, social, and mental well-being throughout the life course and to participate in society, while providing them with adequate protection, security and care when they need (WHO, 2002).

This concept has been accepted by national organisations, as well as academicians, who support the idea of continued involvement of older people in socially productive and meaningful work. The phrase **"Active Aging"** implies continuous involvement of older people in social, economic, spiritual, cultural and civic activities, and not just the ability of physical movement and survival, thus, even older people with disease and disability can remain active and contribute to their families, communities and countries.

The word "active" refers to continuing participation in social, economic, cultural, spiritual and civic affairs, not just the ability to be physically active or to participate in

the labour force. Older people who retire from work, are ill or live with disabilities can remain active contributors to their families, peers, communities and nations. Active aging aims to extend healthy life expectancy and quality of life for all people as they age.

Maintaining autonomy and independence for the older people is a key goal in the policy framework for active aging. Aging takes place within the context of friends, work associates, neighbours and family members. This is why interdependence as well as intergenerational solidarity are important tenets of active aging.

The term “active aging” was adopted by the World Health Organization in the late 1990s. It is meant to convey a more inclusive message than "healthy aging" and to recognize the factors in addition to health care that affect how individuals and populations age (Kalache and Kickbusch, 1997).

The active aging approach is based on the recognition of the human rights of older people and the United Nations Principle of independence, participation, dignity, care and self-fulfilment. It shifts strategic planning away from a "needs-based" approach (which assumes that older people are passive targets) to a "rights- based" approach that recognizes the rights of people to equality of opportunity and treatment in all aspects of life as they grow older. It supports their responsibility to exercise their participation in the political process and other aspects of community life.

2.4 SUCCESSFUL AGING

There is no consensual definition of healthy and successful aging. A recent systematic review by Cosco et al (2013) reiterates that there is no acceptable consensus on the definition of successful aging.

Rowe & Kahn (1987) defined successful aging as an optimal situation with respects to physical, mental and wellbeing and not merely free from diseases which is in agreement of WHO concept of health. Other researchers defined successful aging as an individual’s success in adapting to changes that occur throughout aging process, including the success in achieving individual goal and wellbeing (Baltes and Baltes, 1990).

Rao (2002) states the concept of successful aging is to improve the health of the entrants into the age of sixty years. It is to enable them to pass through the final years in a state of "Eugeric", a term coined by Aristotle to indicate a state of elders free from disease, disability and dependence on others.

Successful aging has three main components:

a) Low probability of diseases and disease related disability
b) High cognitive and physical functional capacity
c) Active engagement with life.

Successful aging is an active process. The “rule of third” states that one third of decline is due to actual aging, one third is attributable to diseases and the remaining is due to disuse. **To bring an optimum outcome to aging, one can intervene successfully by reducing disease risk and encouraging active engagement with life.**

According to Krishnaswamy and Shanthi (2010), “Successful Aging” is used to describe individuals who do not exhibit age-related decline in physiologic and metabolic variables. "Normal Aging" is related to age associated decline in functional capacity. "Impaired Aging" is related to a diseased state.

3. HEALTH AND MORBIDITY STATUS OF INDIAN ELDERLY

Health is the single most important determinant of the quality of life among elderly.

Over a quarter of the oldest old persons and a third of women in this age group are physically immobile.

There are limited studies on the prevalence of frailty in old age in India. However, fall prevalence increases with age and is the highest in women and institutionalised older adults.

Fever, high blood pressure and cough and cold are the most common morbidities reported by the elderly.

Diabetes was the most commonly reported NCD, followed by arthritis, chronic respiratory disease and heart disease.

The self-rating of health is influenced largely by physical health conditions like chronic diseases, functional disability, sensory performance, the number of sick days, etc. Moreover, not only the objective health condition but also the psychological and social factors influence the self-rating of health (Jang et al, 2004). Contrary to the subjective nature of rating one's own health, the assessment of mental health cognitive ability and functionality can be done with more objectivity due to the methodology available for understanding the mental and functional health status. Cognitive ability not only provides information on the ability of the elderly to remain healthy but is also found to be a good predictor of their productivity (Skirbekk, 2003).

3.1 SELF-RATED HEALTH

Self-rated health is considered as a strong predictor to understand the health status of people in general and the elderly in particular. Both in rural and urban areas, the proportion of the aged who felt that they were in a good or fair health condition remains the same for men (75%) and women (73%) according to MOSPI (2016). Among the elderly persons it is observed that despite illness, more men seemed to be feeling that they were in a better health condition than the women. In urban areas, more elderly men and women perceived their health to be good/ fair as compared to their counterparts in the rural areas (MOSPI, 2016).

3.2 FUNCTIONALITY

The notion of functionality among elderly involves the ability to perform self-care, self-maintenance and physical activity. The Activities of Daily Living (ADL) is an umbrella term relating to self-care, comprising those activities that people undertake routinely in their everyday life. The activities can be subdivided into personal care or ADL and domestic and community activities or Instrumental ADL (IADL).

3.2.1. Activities of Daily Living and Instrumental Activities of Daily Living

According to UNFPA study altogether, only around 8% of the elderly require assistance to perform one of the activities. The percentage of elderly rating their health as poor is around 18%. The study also found that 1% of the elderly require assistance in all the ADL activities. Among activities, the highest percentage of the elderly face some difficulty in bathing. The next in order is toileting, dressing and mobility. Invariably, women perform more poorly than men in performing all the ADLs. Age appears to be a significant predictor in performing daily activities as anticipated. Around 22% of the elderly in the age group 80 years and above face difficulty in bathing and 7% in feeding. The rural elderly appear to be facing more difficulty with ADL activities than the urban elderly (UNFPA, 2012).

The same study by UNFPA (2012) showed that about 66% of the elderly have difficulty in preparing food and 60% is going for shopping. A quarter of the elderly reported having problems in using the telephone and 40% have difficulty in doing laundry themselves. Unlike ADLs, the IADL domains reveal that difficulty in carrying out the IADL tasks is significantly higher among elderly men than elderly women for all but the following three domains – laundry, housekeeping and food preparation.

3.2.2. Physical Immobility

The proportion of physically mobile elderly men and women has declined from 95% in the age- group 60 – 64 years to 72% for men and to 63% to 65% for women of age 80 years or more. Moreover, the proportion of elderly physically fit to move is invariably higher in urban areas as compared to rural area and higher among men than women in various age-groups (MOSPI, 2016).

Although physical immobility, i.e. confined to bed or home, may arise either because of morbidity or disability, the same may be a good indicator of the elderly population's health and their work-related disabilities. Classifying these responses by sex and age group clearly indicates that physical immobility among the oldest old (80 years and above) is as high as 22% under the 'confined to home' category, with an additional 6.4% bedridden. These percentages are higher for women aged 80 years and above. In other words, data shows that over a quarter of all the oldest old persons and a third of women in this age group are physically immobile (UNFPA, 2012).

3.2.3. Cognitive Ability

A number of measures have been developed to understand cognitive abilities among people. These include immediate and delayed recall of face-name associations, visuo-spatial memory, short term memory, paired associates, and immediate and delayed recall of words. The studies have shown that the cognitive abilities start declining at some stage during adulthood. It is also found that the cognitive abilities help in predicting a variety of outcomes, ranging from productivity levels, financial decision making to the risk of developing dementia in a population. Immediate recall has worked as a reliable test to measure cognitive ability among elderly in different studies (Skirbekk et al, 2012).

The mean number of words recalled by the elderly was 4.1 out of 10, as reported by UNFPA (2012). The number was slightly higher among men than women. The urban elderly performed better in recalling words than rural elderly. Only about one in every five elderly covered in the survey could recall more than half, i.e. six or more words. There was deterioration in cognitive ability among men and women with increase in age.

3.2.4. Frailty and Sarcopenia

Frailty is a commonly used term indicating older persons at increased risk for morbidity and mortality (Gillick, 2001). Brown and colleagues (1995) defined frailty as a state that "occurs when there is diminished ability to carry out the important practical and social activities of daily living." There is, in addition, growing agreement among experts that frailty is a distinct syndrome which occurs in a subset of highly vulnerable elderly individuals who are at increased risk of dependency and hospitalisation and decreased life expectancy (Boyd et al, 2005; Fried et al, 2004; Fried et al, 2001).

It is generally assumed that the prevalence of frailty increases with age, is higher in women than men, and is more prevalent in the presence of chronic disease (Fried et al, 2001; Rockwood et al, 2004). No consensus exists about the prevalence rates of frailty. There are limited studies that have studied the prevalence in the west and there is a dearth of information in the Indian setting. Khandelwal et al (2012) have shown the prevalence of frailty to be 33.2% in a sample of 250 older hospitalized patients. However, the data in the community settings is still lacking in India. A review by Collard et al (2012) showed that the prevalence rates of frailty vary from 4 to 59% in the Western countries.

3.2.5. Falls

Falls are one of the major problems in the elderly and are considered one of the "Geriatric Giants" - immobility, instability, incontinence and impaired intellect/memory. Falls are defined as inadvertently coming to rest on the ground, floor, or other lower level, excluding intentional change in position to rest (WHO, 2007). Falls are a leading cause of death in older adults (CDC, 2006). Falls lead to 20% to 30% of mild-to-severe injuries, and are the

underlying cause of 10% to 15% of all emergency department visits (Scuffham et al, 2003). The major clinical conditions for fall-related hospital admissions are hip fractures, traumatic brain injuries, and upper limb injuries. The duration of hospital stay after fall injuries ranges from 4 to 15 days (WHO, 2007) and may be longer when associated with hip fractures (The University of York, 2000), In a study an advancing age, and frailty. Between 30% to 50% of older adults fear a fall, and one-third report restricting their activities (Murphy and Ticke-Degnen, 2001).

In the US, 30% of individuals aged 65 years and older fall at least once a year (Tinetti, 2003). In India, the prevalence of falls among older adults aged 60 years and older was 14% to 53% (Dsouza et al, 2008; Krishnaswamy and Gnanasambandam, 2007; Johnson, 2006; Joshi et al, 2003). These studies vary in terms of sample size, geographical region, fall history criteria, and methods. Falls are highly under-reported, and the actual prevalence is likely to be higher. In India, fall prevalence increases with age and is the highest in women and institutionalised older adults (Dsouza et al, 2008; Johnson, 2006; Rubenstein, 2006).

In India, falls are associated with considerable mortality and morbidity (Jagnoor et al, 2011; Cardona et al, 2008; Dsouza et al, 2008; Kartik and Dsouza, 2008; Johnson, 2006; WHO, 2004; Joshi et al, 2003). Soft tissue injuries were most common, followed by fractures, especially hip fractures. In an unpublished study of 312 older adults admitted for fall-related injuries, 12% died and 68% required surgical management. Hip, femoral, and pelvic injuries were most common. The mean duration of hospital stay was 12 to 15 days. Documentation of the fall event, cause, and consequences was inadequate. There are psychosocial consequences of fall such as fear of fall, decreased balance confidence, and activity restriction that may affect quality of life. Mortality after falls was high (53-86%). Based on mortality surveillance methods, including verbal autopsy and accessing medical records of people reported to have died from unintentional falls, the actual prevalence of fall-related consequences may be higher due to under-reporting of fall events and inadequate documentation of fall-related injuries (Jagnoor et al, 2011; Cardona et al, 2008).

3.3 MORBIDITY PROFILE

Morbidity is a state of ill health caused by any disease. In India and several other Asian societies, the prevalence of short and long-standing morbidities is considerably high and, as available evidence indicates, the rate of prevalence increases significantly at higher ages (Alam and Karan, 2011). The morbidity load among the elderly consists of a mix of both communicable and non-communicable diseases. It appears that epidemiologically, India is in a transitional phase with both types of diseases currently playing an important role in the total disease burden. It may therefore be important that the health care system addresses them both (UNFPA, 2012).

3.3.1. Acute Morbidity

Acute morbidity is defined as any elderly person reporting any event of sickness or ill health during the 15 days prior to the survey. Overall, 13% of the elderly reported having some ailment during the 15 days prior to the survey conducted by UNFPA (2012). The prevalence rates were slightly higher for those living in rural areas as compared to urban areas. Sex differentials in the prevalence of acute morbidity reveal more women reporting any illness than their male counterparts, both in rural as well as urban areas. The incidence rate was found to be much lower than the prevalence rate. Around 4% of the elderly reported having new cases of illness during the reference period, while there were no marked differences observed between rural and urban areas. The mean number of episodes (more than one spell of illness during the reference period) was higher among elderly women.

As expected, both the prevalence and incidence rates increase with the advancing age. A higher morbidity burden was seen for widowed elderly than those who were currently married; and the prevalence and incidence rates were much higher among those in the 'Other' category (never married, separated or divorced) (UNFPA, 2012).

Fever was the most commonly reported illness (31%) by the elderly and the pattern observed was similar by gender and place of residence. High blood pressure was the next most commonly reported illness among women and urban residents, while it was cough and cold for elderly men and rural residents. Diarrhoea came next; around 5% of the elderly reported it as their last episode of acute morbidity, with a higher percentage in rural areas and among men. Asthma also appears to be a major illness both in rural and urban areas. Other diseases such as diabetes, gastric disorders, malaria and arthritis accounted for less than 3% of the last episode of acute morbidity (UNFPA, 2012).

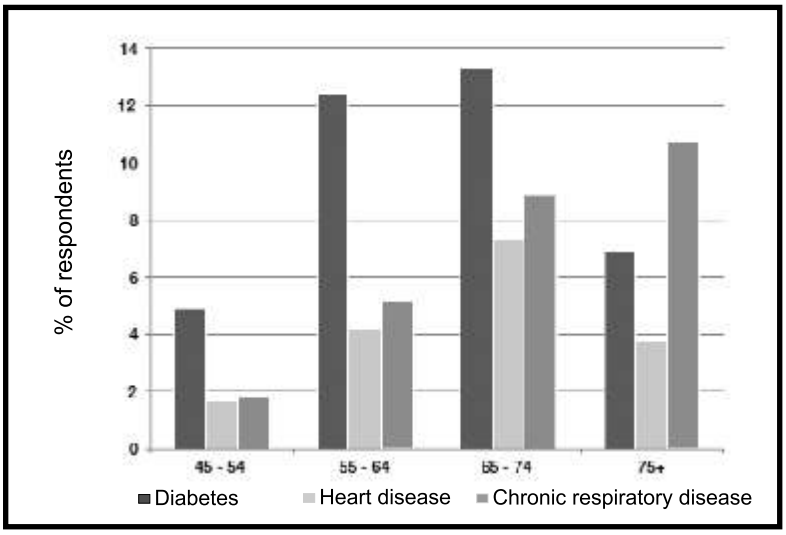
3.3.2. Chronic Morbidities

Non-communicable diseases (NCDs), including mental health, are being acknowledged as major contributors to the disease burden in India. The burden of chronic diseases has been rising in most states, keeping pace with the demographic transition and the increasing numbers of senior citizens. Accordingly, it is important to examine the prevalence of chronic ailments among the elderly, along with types of diseases, cost incurred and socio-economic differentials of the elderly with chronic ailments.

Recent data from the Longitudinal Aging Study in India (LASI) sheds further light on the interplay between aging and NCDs (Lee et al, 2012). A pilot survey, was carried out by LASI in four Indian states – Punjab, Rajasthan, Karnataka, and Kerala – and included nearly 1,500 respondents aged 45 and older. A full-scale, nationally representative survey is currently under development. Results from LASI reveal some important characteristics of this population segment: NCDs are a growing concern; NCD risk factors increase with age; and, overwhelmingly, Indians rely on family members to finance their healthcare (Bloom et al, 2014).

Diabetes was the most commonly reported NCD, with a prevalence of 9% (137 individuals). Because diagnoses were self-reported, this percentage most likely underestimates the true prevalence of diabetes. As it is, the high prevalence is alarming, particularly among somewhat younger respondents (aged 45-64). Arthritis prevalence, at a rate of 8%, came closely after diabetes and was followed by chronic respiratory disease (5%) and heart disease (4%) (Fig 3.1). Just over 100 survey respondents, or 7% of total, reported NCD co-morbidity (concurrent diagnosis of two or more conditions).

Fig 3.1. Prevalence of Heart Disease, Diabetes and Chronic Respiratory Disease by Age (LASI, Pilot)



Source: Harvard school of Public Health et al., 2011

Orthopaedic/musculoskeletal Ailments: involving arthritis (293/1000), rheumatism and osteoarthritis are the most common types of ailments reported among the Indian elderly (UNFPA, 2012). The self-reported prevalence of arthritis in the SAGE study conducted by Arokiasamy et al (2013) increased with age, from 3% at age 18-29 years to 17% at age 50-59 years. It was highest (21%) in the 70-79 year age group, decreasing to 18% in the oldest group aged 80-plus. Symptom-based prevalence also increased with age, rising from 4% in the 18-29 year age group to 25% in the 70-79 year age group, and then declining to 23% for those aged 80-plus. Rural respondents were more likely to have arthritis than their urban counterparts, although at age 50-plus, the self-reported prevalence was almost equal (18%) between urban and rural respondents.

Joint problems were reported by more aged women as compared to men both in rural and urban areas (40/1000 in rural; 45/1000 in urban) (MOSPI, 2016).

Osteoporosis: With increasing longevity of the Indian population, it is now being realized that, as in the West, osteoporotic fractures are a major cause of morbidity and mortality in the elderly. Mithal et al (2009) have stated that the number of hip osteoporosis fractures in India is estimated to climb to 600,000 per year by 2020 and to more than 1 million by 2050. The results of a 2001 national census reported almost 163 million Indians over age 50 with osteoporosis – a number expected to increase to 230 million by 2015 (Malhotra and Mithal, 2008).

Although reliable epidemiological data is lacking, hospital data suggest that hip fractures are common in India. Data from Sankaran (2000), involving 1393 patients of hip fractures from 3 large Delhi hospitals, also indicated that these fractures were common in both sexes, although the sex ratio in different sub-groups was variable, and not always in favour of men. The peak age at which these fractures occurred was 60- 70 years.

Hypertension: The prevalence of self-reported hypertension among younger and older respondents was 7% and 17% respectively (Arokiasamy et al, 2013). Based on the measurement of blood pressure, a much larger proportion of respondents had hypertension: 19% among younger and 36% in older adults. The reported prevalence rate of Hypertension was also high in the UNFPA (2012) study as well- 210/1000 persons.

From south India, Kutty et al carried out hypertension prevalence study (criteria: >=160/95 mm of Hg) in rural Kerala during 1991 in the 20 plus age group and the prevalence was found to be 18%. Later studies in Kerala (Criteria: JNC VI) reported 37% prevalence of hypertension among 30-64 age group in 1998 and 55% among 40- 60 age group during 2000. A higher prevalence of 69% and 55% was recorded among elderly populations aged sixty and above in the urban and rural areas respectively during 2000.

Cardio Vascular Disorders: The prevalence of heart diseases among elderly men and women was much higher in urban areas (164/1000 persons) than in rural areas (80/1000 persons) (MOSPI, 2016).

The symptom- based prevalence of angina (20%) was almost three times higher than the self-reported prevalence of diagnosis (6%) in the SAGE study. The self-reported prevalence was higher among men (7%) than women (4%), but the symptom-based prevalence was higher among women (23%) than men (16%). The self-reported prevalence was higher in urban areas (8%) than rural areas (5%), but the symptom-based prevalence was same in both rural areas and urban areas (almost 20%) (Arokiasamy et al, 2013).

Stroke: The prevalence of self- reported stroke was found to be 2%, whereas symptom-based prevalence was twice as high at 4% in a study by Arokiasamy et al (2013). The study by UNFPA (2012) on elderly population reported 10/1000 persons suffered from Cerebral Stroke.

Diabetes Mellitus: India is currently experiencing an epidemic of Type 2 diabetes mellitus (T2DM) and has the largest number of diabetic patients. It is often referred to as the diabetes capital of the world (IDF, 2006). International Diabetes Federation (IDF) 2009 report reveals that the total number of diabetic subjects in India is 50.8 million. Misra et al (2011) analyzed the secular trends of diabetes in rural India and documented an increase in diabetes prevalence among rural population at a rate of 2.02 per 1000 population per year. The rate of

increase was high in males (3.33 per 1000 per year) as compared to females (0.88 per 1000 per year).

The prevalence of diabetes among older adults was 7% at the national level (Arokiasamy et al, 2013). It was more prevalent among men (8%) than women (6%) and in urban areas (12%) compared with rural areas (5%). Similarly the UNFPA data (2012) showed a high prevalence of Diabetes i.e. 101/1000 persons.

Asthma: The prevalence of asthma among older adults, self-reported and symptom- based, was 7.2% and 11%, respectively (Arokiasamy et al, 2013). Both the self-reported and symptom-based prevalence of asthma increased with age. Among older respondents, the prevalence of asthma was higher among men than among women: one in seven men reported having symptoms of asthma, compared with one in 11 women. UNFPA (2012) reported Asthma in almost 77/1000 persons.

Chronic Lung Disease: The self-reported prevalence of lung diseases among older respondents was estimated at 4%. Self-reported and especially symptom-based prevalence of lung diseases increased with age. The symptom-based prevalence increased from 3% in the 18-29 year age group to 20% for those in the 70-79 year age group – although this declined to 16% at age 80 years and above. In the study by UNFPA (2012), ailments related to the respiratory system (COPD, bronchitis) had lower prevalence rates (16/1000 persons). Tobacco smoke is the most important cause for COPD, particularly among men. The smoke from combustion of solid fuels such as dried dung, wood and crop residue used for cooking and heating, is an important cause of indoor pollution which is responsible for a large number of COPD cases in the rural areas and women in particular. Air pollution due to exhausts from vehicles and industrial units; dusts, fumes and smoke from burning of crop residues in the field act as airborne allergens and irritants (for example, tobacco smoke) causing allergic responses triggering asthma and cause other chronic respiratory disease as well (Dandona et al, 2008).

Co-morbidities: Arokisamy et al (2013) showed that above one in four of the 50- plus age group (26%) reported a single morbidity and one in six of the 50- plus age group (16%) had multiple morbidities. The prevalence of morbidity rose sharply with age. The proportion with multiple morbidities also increased from just 1% at age 18-29 years to 22% at age 70-79 years.

Older respondents in urban areas were more likely than their rural counterparts to have multiple morbidities. In urban areas, almost half (48%) of respondents aged 50-plus were diagnosed with at least one chronic disease, compared with 39% in rural areas, while 20% in urban areas were diagnosed with two or more health conditions, compared with 14% in rural areas (Arokiasamy et al, 2013).

3.3.3. Oral Health and Cataracts

The prevalence of both of these problems was much higher among older respondents: about one in every seven older persons reported problems with their teeth/mouth, and one in six reported a cataract (Arokiasamy et al, 2013).

Both edentulism and cataracts show an increase with age, especially above the age of 50 years, with the prevalence of both edentulism and cataracts almost doubling after age 70 years and above as compared to the 60-69 year age bracket. The prevalence of edentulism and cataract was higher among elderly women than men (Arokiasamy et al, 2013).

3.3.4. Injuries (road traffic and all other)

Injuries are a growing burden for most countries. The SAGE study (Arokiasamy et al, 2013) showed that among older respondents, 2% and 9% had been injured in road traffic and other incidents respectively; a third (34%) of the former had developed a disability, and just under a quarter (22%) of the latter.

3.4 MENTAL HEALTH

Beyond focusing on the four main physical NCDs, India has included mental health in the definition of NCDs and is addressing mental health conditions at national and international levels. Further, India moved a resolution during the 65th World Health Assembly (WHA), calling on UN member states to develop an action plan on mental health which was subsequently presented and adopted during the 66th WHA in May 2013 (Bloom et al, 2014).

Domestically, India has made headway in reforming the legal framework that protects the rights of people with mental health conditions and in promoting mental health. In 2010, led by the Ministry of Health and Family Welfare and in consultation with many civil society organizations, a collaborative process to draft a new mental health act was initiated to replace the 1987 Mental Health legislation (MHA). The Mental Health Care Bill 2012, in stark contrast to the MHA, takes a rights-based perspective of mental health conditions, and is regarded as a change in attitude and approach to mental health in India (Bloom et al, 2014).

In the UNFPA report (2012) about half of the elderly were below the threshold level in General Health Questionnaire indicating sound mental health status. The mean score is around 14, close to the threshold level of 12. Thus, even going by the mean score it is clear that nearly half of the elderly have good mental health status.

Subjective Well-being Inventory (SUBI) measures well-being or ill-being depending upon the answers to the questions by the elderly. In the nine-item SUBI, a negative response to any of the items is a sign of ill-being. The mean score of SUBI was 19.0 in UNFPA report. Even in this case, the score of women was higher than that of men, indicating poor mental well-being among women. Similarly, the rural score was marginally higher than the urban score (UNFPA, 2012).

3.4.1. Depression

The SAGE study found a self-reported prevalence of depression of 3% among younger adults and 4% among those aged 50-plus. In both age groups, the symptom-based prevalence was much higher than the self-reported prevalence: among younger and older adults, 9% and 19% respectively met the criteria for a diagnosis of depression (Arokiasamy et al, 2013).

3.4.2. Alzheimer's Disease and Dementia

Alzheimer's Disease (AD) and other forms of dementia are a growing public health problem among the elderly in developing countries, whose aging population is increasing rapidly. The estimates of rate at which new disease develops can only be measured accurately in prospective incidence studies. The study by Mathuranath et al was initiated in 2001 as a longitudinal study to examine cognition in older adults in the southern Indian province of Kerala. This was a 10 year follow up study that consisted of 2466 subjects aged 55 and above who consented to participate in the study (Mathuranath et al, 2012).

The crude (i.e., unadjusted) overall incidence rate was 15.54 per 1000 person-years (95% CI: 14.6–16.5) for AD in those aged ≥65 years. Age-specific incidence rates in COAT cohort were lower for men than women and expectedly showed a rising trend with increasing age, being highest for those aged ≥ 85 years. On Cox regression analysis, incidence of dementia showed a significant risk of incidence of AD with increasing age (Hazard coefficient 1.09 (95% CI: 1.06–1.13), $P < 0.001$), female gender (Hazard coefficient 0.51 (95% CI: 0.31–0.82), $P < 0.006$) and lower education (Hazard coefficient 0.90 (95% CI: 0.86–0.95), $P < 0.001$). These are the first AD incidence rates to be reported from southern India. The incidence rates appear to be much higher than that reported from rural north India, comparable with that reported from China, and marginally lower than that reported from the western world (Mathuranath et al, 2012).

A review by Das et al (2012) attempted to highlight the existing state of the medical and social issues of dementia. The prevalence of dementia of rural population in South India and that in North India showed a widely varying rate from 3.39 to 0.84%, respectively (Chandra et al, 1998; Shaji et al 1996). There are few urban studies from several regions of India showing similar rates: From 2.44 to 4.1% in West India (Vas et al, 2001; Saldanha et al, 2010), 1.83% in North India (Raina et al, 2010), 0.8-1.28% in East India (Das et al, 2008; Banerjee et al, 2008), and 3.6% in South India (Shaji et al, 2005). The differences may be true considering the multi-ethnic, multicultural, and environmental differences.

A survey was conducted in subjects aged 60 years and above to identify the cases of psychiatric morbidity in rural population from randomly selected two revenue blocks of Lucknow district, Uttar Pradesh, India (Tiwari et al, 2014). The overall prevalence of psychiatric morbidity in rural older adults was found to be 23.7 % (95% CI=21.89-25.53). Mood (affective) disorders were the commonest (7.6%, 95% CI=6.51-8.80), followed by mild cognitive impairment (4.6%, 95% CI=3.72-5.53), mental and behavioural disorders due to substance use (4.0%, 95% CI=3.17-4.87) and dementia (2.8%) [Alzheimer's disease (2.4%, 95% CI=1.81-3.16) and vascular problems (0.4%, 95% CI=0.16-0.73)] (Tiwari et al, 2014).

Overall prevalence of psychiatric morbidity amongst rural elderly in this study was found to be less in comparison to those reported in earlier studies from India (Tiwari et al, 2014).

4. NUTRITIONAL STATUS, PHYSICAL ACTIVITY AND LIFESTYLE OF INDIAN ELDERLY

Intake of various food groups among the elderly varies greatly in different regions as well as different socio economic groups.

Nutrient intake data of the elderly by NIN (2011) reveals that the intakes of elderly men were higher than women for all the nutrients. However, intakes were much lower than the RDAs for nearly all nutrients, the deficits being greater in women.

Various studies have reported that over 60% of the elderly are malnourished or at risk of malnutrition.

Anaemia and vitamin D deficienies are important nutritional problems among the elderly population.

Most of the elderly are physically active; however, proportion of persons with insufficient activity increases with age.

Chewing tobacco is more common than smoking or alcohol consumption.

Longevity seems to be an outcome of several lifestyle factors - physical activity, disciplined dietary habits and a positive outlook.

Information on dietary habits and their changing patterns are important for planning and improving nutrition-related health policies and programs.

4.1 FOOD INTAKES

A recent report by National Institute of Nutrition (NIN, 2011) has reported extensively on the dietary intakes of Indians. This study covered 2900 rural and 1459 urban households in 5 different regions of the country. The food and nutrient intakes varied greatly in the different regions as well as different socio economic groups. As evident in Table 4.1, there is also a wide diversity in the daily intake of various foods among elderly men and women and also among rural and urban elderly. While the average intake of cereals and millets was 400 g/day among rural and 306 g/day among urban elderly men, in women it was 322 g/day among rural elderly women and 260 g/day among urban elderly women. Intakes of pulses, fruits, other vegetables, flesh foods and milk and milk products and fats and oils were higher among the urban elderly, both men and women as compared to the rural elderly. On the other hand, the intakes of green leafy vegetables and roots and tubers were higher among the rural elderly, the difference being greater among men. The mean intakes of sugar and jaggery did not differ among the groups.

Table 4. 1: Daily Intakes of Various Food Groups by the Indian Elderly

Food group	Daily Intake (g/day)			
	Urban Men	Rural Men	Urban women	Rural women
Cereals and Millets	400	306	260	322
Pulses	44	33	38	27
Green leafy vegetables	29	37	25	26
Roots and tubers	75	83	65	69
Other vegetables	106	71	73	60
Fruits	53	25	49	21
Fish and flesh foods	50	37	52	29
Milk and milk products	146	96	130	97
Fats and oils	24	18	24	16
Sugar and jaggery	15	15	15	14

Source: National Institute of Nutrition, 2011

The dietary intake recorded by the SAGE group for older respondents by background characteristics shows that sufficient intake of fruit/vegetables among older adults decreased with age. The proportion of respondents with sufficient intake of fruit/vegetables was slightly higher in urban areas, among those from castes other than scheduled castes/tribes, the better educated and those with higher incomes. For all background characteristics, compared with men, a lower proportion of female older adults were eating enough fruit/vegetables (Arokiasamy et al, 2013).

4.2 NUTRIENT INTAKES

ICMR has revised the RDAs for Indians in 2010, as given in Table 4.2. No separate RDAs have been given for the elderly by ICMR except for energy.

Table 4.2: RDAs for Indian Adult Men and Women (ICMR, 2010)

Group	Particulars	Body Wt. kg	Net energy kcal/d	Protein g/d	Visible Fat g/d	Calcium mg/d	Iron mg/d	Vit. A µg/d	Thiamine mg/d	Ribo-flavin mg/d	Niacin equiva-lent mg/d	Ascor-bic Acid mg/d	Dietary folate µg/d	Vit.B^{12} µg/d	Zinc mg/d	
								Retinol	β - caro-tene							
Man	Seden-tary work	60	2320	60	25	600	17	600	4800	1.2	1.4	16	40	200	1.0	12
	Moder-ate Work		2730		30					1.4	1.6	18				
	Heavy Work		3490		40					1.7	2.1	21				
Woman	Seden-tary Work	55	1900	55	20	600	21	600	4800	1.0	1.1	12	40	200	1.0	10
	Moder-ate Work		2230		25					1.1	1.3	14				
	Heavy Work		2850		30					1.4	1.7	16				

For the elderly, aged 60 years and above, the energy requirements for males and females with different body weights, engaged in sedentary activity as given by ICMR (1990) are as follows:

Table 4.3: **Energy requirement of Elderly Males and Females with Different Body Weights (Kcal/24 hr) (ICMR, 1990)**

Body Weight (kg)	Age 60 years and above (Sedentary Activity)	
	Males	Females
40	-	1544
45	1664	1624
50	1768	1704
55	1872	1784
60	1976	1864
65	2072	1944
70	2176	2024
75	2280	-

Nutrient intake data of the elderly studied by NIN (2011) reveals that the intakes of men were higher than women for all the nutrients, possibly because of the greater quantum of food was eaten. However, intakes were much lower than the RDAs for nearly all nutrients, the deficits being greater in women (Table 4.4).

A study by Shobha et al (2011) on 175 urban elderly in South India, found that median values for daily dietary intake of vitamin B12 and folate were 2.4 and 349.2 µg/day respectively, when 35% participants consumed multivitamin supplements.

4.3 NUTRITIONAL STATUS

4.3.1. Risk of Malnutrition

A study by Shivraj et al (2014) revealed that 11.6% elderly were malnourished while 46% were at risk of malnutrition and only 42.4% were well nourished. Malnutrition and risk of malnutrition were more common among the rural and the illiterate elderly. Another study done on 360 elderly persons by Aggarwalla et al (2015) found that out of a total of 360 elderly persons, 15% were malnourished and 55% were at risk of malnutrition.

Table 4.4: Daily Nutrient Intakes of Elderly Indians

Nutrient	Daily Intake			
	Urban Men	**Rural Men**	**Urban women**	**Rural women**
Energy (kcals)	1871	1986	1552	1603
Protein (g)	57	55	49	43
Total Fat (g)	44	30	34	26
Calcium (mg)	558	421	515	351
Iron (mg)	16.3	14.9	12.9	12.2
Vitamin A (ug)	135	230	160	123
Thiamine (mg)	1.3	1.1	1.0	0.9
Riboflavin (mg)	0.8	0.7	0.7	0.6
Niacin (mg)	13.6	13.8	10.5	11.2
Total folic Acid (ug)	136	119	108	92
Vitamin C (mg)	45	37	38	28
Zinc (mg)	6.2	7.5	5.7	4.8

Source: National Institute of Nutrition, 2011

4.3.2. Chronic Energy Deficiency (CED)

Shivraj et al (2014) have reported a CED (BMI<19kg/m2) prevalence of 47.11% among the elderly. The nutritional status of the rural elderly was assessed based on Body Mass Index (BMI) by NNMB (2000). The prevalence of Chronic Energy Deficiency (CED) (BMI <18.5) was relatively more among rural males (53.5%) than in rural females (49.4%). It was observed that the proportion of CED increased with increasing age among males, while it was the lowest among the females of 80 years and above. The mean BMI was higher in the younger age group of males, while in the case of females it was higher in the older age group.

A study by Arlappa et al (2006) on tribal elderly in India showed that the prevalence of Chronic Energy Deficiency (CED = BMI < 18.5) was relatively higher (65.4%) in females compared to their male counterparts (61.8%). The prevalence of CED was significantly higher among the elderly living in *kutcha* (temporary) and landless households. The tribal elderly were subsisting on inadequate diets, which were reflected in the poor intakes of all nutrients and the higher prevalence of undernutrition. Significantly higher proportions of tribal elderly were undernourished compared to their rural counterparts.

A comparison of the prevalence of CED (BMI <18.5) among rural elderly males and females between the two periods indicates that there was evidence of reduction in the prevalence in 1996-97 as compared to 1975-79 among elderly belonging to SC + ST

communities, illiterates, those living in *kutcha* houses and among landless. The proportion of CED was much higher among the elderly belonging to SC+ST communities (64.6%), than other communities (36.5%). There was no difference in grade III CED between nuclear and joint families (16.6%). CED was significantly higher in illiterates (57.3%) than among the literates (41%). The extent of CED was higher among the elderly living in *kutcha* houses (60.0%) as compared to those residing in *pucca* (permanent) houses (35%) (NNMB, 2000).

There was an association between BMI and family size, though the differences were small. The prevalence of CED with III degree was significantly more among the larger families (18.1%), where the mean family size was seven and above, than in smaller families (15.4%) (NNMB, 2000). As expected, the elderly of the labourers' families were at a disadvantage with significantly higher prevalence of CED as compared to agriculturist's (52%) and others (47%). The prevalence of CED was highest among the elderly belonging to the households who had no land and lowest among individuals who had owned more than 10 acres (NNMB, 2000).

4.3.3. Obesity

Singh, Kapil and Dey (2004) conducted a hospital-based pilot study on 206 elderly persons. Majority (62.6%) of the subjects were males and belonged to upper lower and upper middle socio- economic status. The distribution of subjects according to their Body Mass Index showed that 34% of men and 40.3% of women were overweight and obese, respectively. The prevalence of obesity was higher in females as compared to males. The study revealed that overweight and obesity highlight an emerging health problem amongst elderly in Delhi.

A study by Gopalan (2004) on the older persons found that over 44% of men and nearly 40% of women had a BMI less than 18.5kg/m2. Nearly 14% of the elderly women were in the overweight category as compared to the 1.3% of men.

On the other hand, the prevalence of obesity (BMI > 25.0) in rural areas was much lower at 4.2% in males and 7.7% in females as reported by NNMB surveys (2000) on rural elderly. The extent of overweight was much lower among the SC+ST (2.6%) as compared to others (7.1%).

4.3.4. Anaemia

Anaemia is a common concern in the geriatric age group and can have significantly more severe complications than anaemia in younger adults. All types of anaemia are known to occur in this age group. Anaemia in the elderly is an extremely common problem that is associated with mortality and poorer health-related quality of life, regardless of the underlined cause of the low haemoglobin. Studies indicate that the prevalence of anaemia increases with advancing age. Anaemia is more common in females under 75 years, but over 75 years it is more common in males. Multiple pathophysiologic abnormalities in a single elderly patient with anaemia are well known. Micronutrient deficiencies as cause of anaemia have been repeatedly documented in the elderly. They are thought to be due, among other factors, to lower energy requirements of the elderly which lead to reduced food intake (Kaur et al, 2014).

Anaemia in the elderly is a public health problem and 23.9% of the elderly population are suffering from anaemia globally (Benoist et al, 2008). It is a crisis because it increases the risk of death by 40%. Anaemia as defined by WHO is a haemoglobin concentration of less than 13g/dl for men and less than 12g/dl for non-pregnant women (Benoist et al, 2008).

In a geriatric clinic, 71% of the 2540 elderly patients screened were anaemic with the prevalence being highest in the 60-69 year age group (41%). Normocytic anaemia was the most prevalent anaemia accounting for 56% of all the cases. Nearly one third (31%) of anaemic subjects had iron deficiency. Seven out of eight patients with macrocytic/dimorphic anaemia had Vitamin B12 or folate deficiency (Kaur et al, 2014).

Ramachandra and Kasthuri (2010) studied 4965 geriatric persons in a rural area in Karnataka state of South India and found the prevalence of Geriatric Anaemia to be 17.7%. A community based study of the

morbidity profile among the elderly in the urban and rural areas of Chandigarh by Swami et al (2002) revealed a very high prevalence (68.2%) of anaemia among elderly. The prevalence of Geriatric Anaemia in India varies from 17.7% to as high as 89%. (Tilak and Tilak, 2012).

A hospital based study from Bangalore by Bhasin and Rao (2011) in 100 patients revealed the anaemia prevalence to be 52% in males and 42% in females. The most common cause of anaemia was found to be anaemia of chronic disease, followed by iron deficiency anaemia and anaemia due to blood loss. This study highlighted the fact that most of the anaemic elderly had an underlying treatable cause for anaemia.

Gopalan (2004) carried out a study in two urban slums and 96 males and 111 female elderly subjects were recruited for the study by the purposive sampling method. Over 40% males and 67% females were found to suffer from moderate anaemia (haemoglobin <10.0g/dl).

4.3.5. Vitamin D Deficiency

Vitamin D deficiency is common in elderly people (Gloth et al, 1995). Older people are prone to develop Vitamin D deficiency because of various risk factors like decreased dietary intake, diminished sunlight exposure, reduced skin thickness, impaired intestinal absorption and impaired hydroxylation in liver and kidneys (Holick, 1995; McKenna, 1992).

Another study carried out amongst elderly with the mean age of 58.0 ± 9.5 years showed a high prevalence of VDD amongst them. It was also reported that vitamin D deficiency [serum 25(OH) D levels < 20 ng/ml) was present in 91.2% and Vitamin D insufficiency [serum 25(OH) D levels 20-<30 ng/ml] in 6.8% subjects (Marwaha et al, 2011).

4.4 PHYSICAL ACTIVITY

Physical activity refers to activity undertaken at work, around the home and garden, to get to and from places, and for recreation, fitness and sport. Regular physical activity has a significant positive effect in preventing ischemic heart diseases, ischemic stroke, type two diabetes mellitus, and breast and colon cancers. Physical activity is also important in preserving the residual fraction once peripheral arterial disease and chronic airways disease have developed. It also increases sensitivity to insulin, raises HDL cholesterol levels and reduces blood pressure. In addition, recreational physical activity has been shown to reduce minor anxiety, depression and weight (Arokiasamy et al, 2013).

The SAGE India survey on physical activity assessed the frequency (days), intensity (low, moderate, high) and duration (minutes and/or hours) of activity over the preceding seven days. SAGE India included questions on three types of activities:

1. Vigorous-intensity activity, such as lifting heavy weights, digging or chopping wood;
2. Moderate-intensity activity, such as brisk walking, carrying light loads, cleaning, cooking, or washing clothes; and
3. Light-intensity activity, such as walking or riding a bicycle.

Respondents were asked whether they had performed such activity continuously for at least 10 minutes, the number of days they performed the activity in a typical week, and the average time spent per day for the activity. For this study, any activity – vigorous, moderate or light – for more than 150 minutes over the seven days preceding the interview was considered sufficient (Arokiasamy et al, 2013).

The activity levels of older respondents were divided into four categories:

4. Those who engaged in vigorous activity;
5. Those who engaged in moderate activity;
6. Those who engaged in light activity; and
7. Those who engaged in no activity of any kind.

Overall, the study's older respondents were quite active: only just over one-quarter (26%) reported no activity. This level was similar for men and women, though a higher proportion of older men than older women engaged in vigorous activity. Among both sexes, the proportion of persons with insufficient activity increased with age: among the oldest age group (80-plus), 53% of

men and 60% of women were insufficiently active. Notably, however, more than one-third of the oldest men and women engaged in vigorous or moderate physical activity. A higher proportion of both men and women from rural areas undertook sufficient physical activity, and also more vigorous activity than their urban counterparts. The proportion of men and women who were insufficiently active bore little relationship with either educational attainment or income (Arokiasamy et al, 2013).

4.5 LIFESTYLE

The WHO SAGE survey posed questions to both elderly men and women about ever-use of any substance related to smoking, consumption of alcohol and chewing of tobacco. Those elderly who responded 'yes' to ever-use of any substance were asked whether they were currently using any of these substances. If the answer was yes to current use, the frequency of use and the amount spent per day or each time was found out (Arokiasamy et al, 2013).

Chewing tobacco was more common than smoking or alcohol consumption;

- over one-fifth of the elderly respondents had chewed tobacco,
- about one-sixth smoked cigarettes/bidis and
- about one-tenth had consumed alcohol in the past.

Ever-use of all the three substances was found to be higher among rural elderly in comparison to their urban counterparts (Arokiasamy et al, 2013).

A majority (59%) of the elderly chewed tobacco two to five times every day and about a quarter of them chewed more than six times. Although no differential was seen between rural and urban elderly, the frequency of chewing tobacco more than six times was slightly higher in rural areas (Arokiasamy et al, 2013).

Furthermore, substance use was found to be more among men than women and ever-use of all the three substances was higher among rural women than urban women. Nearly 29% of the elderly indulged in risky behaviour by consuming all the three substances and, expectedly, conformed to the overall trends (Arokiasamy et al, 2013).

Most of the elderly respondents who had ever-used one of the aforementioned substances were continuing to chew tobacco and smoke, while their alcohol consumption had reduced by more than half. With regard to smoking of cigarettes and *bidis*, nearly half of the elderly smoked more than six per day and about two out of five smoked three to five per day (Arokiasamy et al, 2013). In other words, nearly nine out of 10 elderly smoked more than three cigarettes/*bidis* per day; the percentage of such elderly was slightly higher in rural areas than in urban areas. Among women, an insignificant proportion was smoking and hence had not been interpreted. Generally a person spent in the range of Rs. 11-15 per day for meeting their smoking requirements (Arokiasamy et al, 2013).

As far as consumption of alcohol is concerned, over a quarter of the elderly consumed it daily and the remaining either consumed it once or twice in a week or occasionally (37% each); the pattern was more or less similar between rural and urban areas. The mean expenditure incurred ranged between Rs. 72 and 92 on each sitting (Arokiasamy et al, 2013). Thus, on the whole, substance abuse and its frequency of use seem to be high among elderly. With a higher proportion of rural elderly using one or the other substance, there is a need to work on preventive aspects of health care and educate them about in adverse consequences.

A study conducted by Shali and Puri (2004) on 90+ elderly reiterated that longevity seems to be an outcome of several lifestyle factors. The oldest old subjects, in the study, had maintained a good quality of life, were functionally independent, physically active, in fairly good health, with cognitive abilities well preserved, had disciplined dietary habits and a more positive outlook. These lifestyle factors may have contributed to their longevity.

5. MIDLIFE FACTORS THAT INFLUENCE THE AGING PROCESS

The exposure to various environmental factors can contribute to accelerating the aging process.

The nutrition transition in India has resulted in a decreasing intake of coarse cereals, pulses, fruits and vegetables, an increasing intake of meat products and salt, coupled with declining levels of physical activity due to rapid urbanization. This has resulted in escalating levels of obesity, atherogenic dyslipidemia, subclinical inflammation, metabolic syndrome, type 2 diabetes mellitus, and coronary heart disease in Indians.

Adverse perinatal events due to maternal nutritional deprivation may cause low-birth weight infants, which, coupled with early childhood "catch-up growth", leads to obesity in early childhood, thus predisposing to NCDs later in life.

Most NCDs have shared risk factors (tobacco use, unhealthy diet, physical inactivity, alcohol use) and integrated interventions targeting these risks from the cornerstone of the effort to prevent and control NCDs.

Prevention against NCDs has to start early. The "elderly of tomorrow" or the middle aged particularly need to adopt healthy lifestyles to be able to maintain good quality of life in their advancing years.

Increasing number of oldest old worldwide has made human longevity a major area of scientific research. It is a well established fact that the health of an individual and the population in general is the result of interactions between genetics and a number of environmental factors; nutrition being of major importance. Our genetic profile has not changed over the past 10,000 years, whereas major changes have taken place in our food supply and in energy expenditure and physical activity. Concomitantly, a sharp rise in the prevalence of noncommunicable diseases (NCDs) like diabetes, hypertension, cardiovascular diseases and cancers has been observed (Puri, 2011).

In order to live longer, it would therefore not only be necessary to delay the process of physiological aging but also to prevent/ delay the imposition of pathological aging (in the form of NCDs) on an individual. Although some of the physiological changes experienced by older adults occur primarily as a result of the biological process of aging, lifestyle factors – such as diet and physical activity – are important modulators of the risk factors associated with chronic disease and even age related decline (Puri, 2011). There is a growing body of evidence on the role of diet both in the prevention and treatment of many chronic diseases, for example obesity, cardiovascular disorders, some forms of cancer, diabetes and osteoporosis (Stanner and Denny, 2009).

The physiological aging process starts once one reaches adulthood. While every individual ages at a different rate, the exposure to various environmental factors can contribute to accelerating the aging process. These exposures not only influence the aging process but may also influence the onset of chronic degenerative diseases which when superimposed on the aging process lead to further deterioration in the quality of life of the elderly. Some of these risk factors are modifiable e.g. diet while others are non- modifiable such as gender, race, genetic predisposition etc.

In Indian urban middle-SES subjects there is high prevalence of cardiovascular risk factors. Based on five cross-sectional studies performed in middle-SES urban locations in Jaipur, India from years 1992 to 2010, it was reported that over a 20-year period, BMI and overweight increased, smoking and systolic BP decreased, and truncal obesity, hypercholesterolemia, and diabetes remained stable. Increasing educational status attenuated trends for systolic BP, glucose and HDL cholesterol, and BMI (Gupta, 2012).

Gupta et al (2009) have reported a low prevalence of multiple cardiovascular risk factors (smoking, hypertension, dyslipidemias, diabetes and metabolic syndrome) in adolescents and rapid escalation of these risk factors by age of 30-39 years among urban Asian

Indians. Hence, prevention against NCDs has to start early. The "elderly of tomorrow" or the middle aged particularly need to adopt healthy lifestyles to be able to maintain a good quality of life in their advancing years.

Non-communicable diseases, when combined with certain risk factors such as smoking, lack of physical activity, hypertension, hypercholesterolemia, glucose intolerance, diet and obesity, lead to the onset of CVD and cancer. All these diseases which were characteristics of westernized societies in the past, are now emerging as major health threats in developing and middle-income countries like India. One of the leading risk factors for these diseases is obesity caused by nutrition transition. The increase of obesity prevalence has been well documented in the developed countries; however, with nutrition transition it is also increasing in developing countries (Belahasen, 2014).

Besides CVD, metabolic syndrome is also emerging as a major health concern in these countries. This syndrome was also characteristic of Western societies in the past and its high prevalence has been documented in developed countries. The majority of factors causing metabolic syndrome components are also reported to be related independently to lifestyle factors namely diet, weight control and physical activity that are also accompanying the nutrition transition (Belahasen, 2014).

5.1 THE ASIAN INDIAN PHENOTYPE

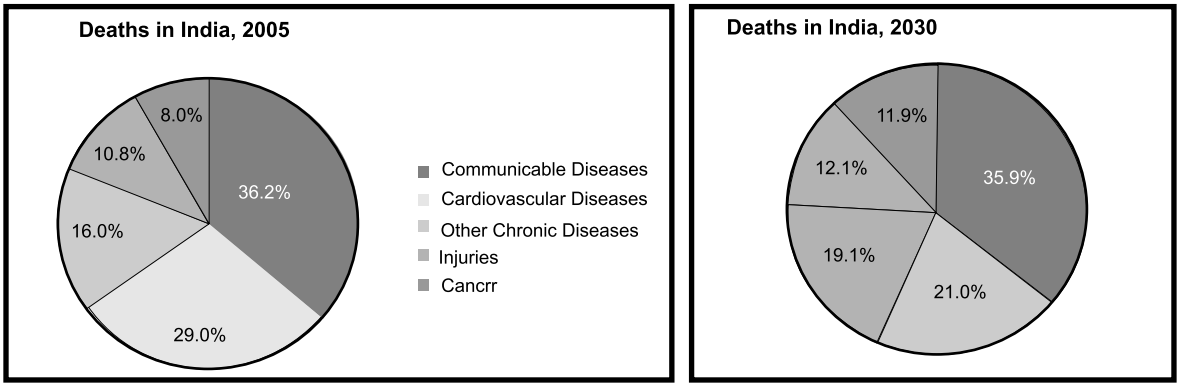
At any Body Mass Index level and age, Asian Indians have higher body fat, visceral fat and waist circumference ; lower skeletal muscle mass; thinner hips; short legs; profoundly higher rates of insulin resistance, metabolic syndrome, diabetes, dyslipidemia, hypoadiponectinemia, and increased cardiovascular risk than Europeans (Deepa et al, 2006). These unique clinical and biochemical characteristics that are commonly found among Asian Indians in general and South Asians in particular are collectively referred to as the "Asian Indian Phenotype" or thin –fat phenotype. At comparable levels of total body fat, intra abdominal fat and subcutaneous abdominal fat, Asian Indians have significantly larger adipocytes compared to Europeans and is correlated with insulin resistance and adiponectin levels. Hence, not only is the prevalence of NCDs is greater among Indians but also the onset is at a much younger age.

5.2 NON- COMMUNICABLE DISEASES

Non-communicable diseases (NCDs) are defined as diseases of long duration, and are generally slow in progression. NCDs are replacing communicable diseases, maternal and child health as well as malnutrition as the leading cause of death. The four leading chronic diseases in India, as measured by their prevalence, are in descending order: cardiovascular diseases (CVDs), diabetes mellitus, chronic obstructive pulmonary disease (COPD) and cancer. All four of these diseases are projected to continue to increase in prevalence in the near future (Taylor, 2010).

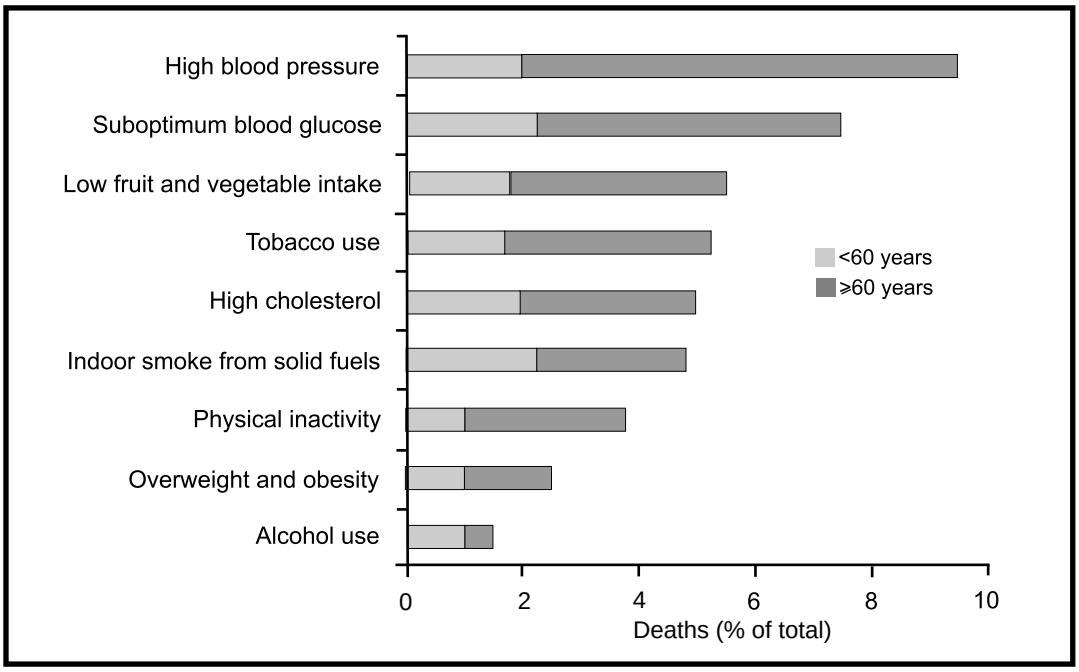
According to World Health Report (2002), cardiovascular diseases (CVDs) will be the largest cause of death and disability by 2020 in India. In 2020 AD, 2.6 million Indians are predicted to die due to coronary heart disease which constitutes 54.1 % of all CVD deaths. Nearly half of these deaths are likely to occur in young and middle aged individuals (30-69 years).

Fig 5.1. Cause of Specific Mortality in India



Source: Prabhakaran and Ajay, 2011

Fig 5.2. Deaths caused by 9 Leading NCDs Risk Factors in India



Source: Mohan, Reddy and Prabhakaran, 2011.

5.3 NUTRITION TRANSITION

The entire process of nutrition transition in India has occurred in three stages. **In stage 1**, consumers moved away from traditional staple items to consumption of food products more prevalent in "westernized" diets, such as wheat in the form of bread, cakes and cookies. **In stage 2**, the influences of globalization were much more marked and the consumers had access to a variety of convenience foods (processed, ready-to-eat, deep fried, and with added preservatives). Most Indians are currently in the second stage of nutrition transition. **In stage 3,** some people (especially those belonging to the high socioeconomic stratum) tend to realize adverse eating habits and try to adapt a healthy lifestyle. These people also have economic resources to buy costly healthy foods, and also avail themselves of exercise facilities, including expensive equipment and gymnasium visits (Misra et al, 2011).

According to Misra et al (2011), the nutrition transition in India over the past 30 years (1973–2004), has resulted in a 7% decrease in energy derived from carbohydrates and a 6% increase in energy derived from fats. A decreasing intake of coarse cereals, pulses, fruits and vegetables, an increasing intake of meat products and salt, coupled with declining levels of physical activity due to rapid urbanization have resulted in escalating levels of obesity, atherogenic dyslipidemia, subclinical inflammation, metabolic syndrome, type 2 diabetes mellitus, and coronary heart disease in Indians. Studies also suggest that adverse perinatal events due to maternal nutritional deprivation may cause low-birth weight infants, which, coupled with early childhood "catch-up growth", leads to obesity in early childhood, thus predisposing to NCDs later in life.

5.3.1. Carbohydrate Consumption

Energy intake from carbohydrates (particularly cereals) is higher in Asian Indians as compared to other ethnic groups (Misra and Vikram, 2004) Cereals are the staple diet in India, and carbohydrate consumption constitutes the bulk of the total calorie intake. North Indians are predominantly wheat eaters, while those in south India prefer rice. According to NSSO data, intake of cereals has declined in both rural and urban areas over the past two decades (1993–2005). Currently, the intake is higher in the rural areas (404 g/day) compared to the

urban areas (331 g/day). The decreasing consumption of cereals may indicate a shift towards (more) energy-dense "fast" foods (highly processed, deep-fried, unhealthy foods, devoid of adequate nutrients) as a source of energy in the diets. Although the consumption of carbohydrates has declined by about 7% over the past three decades (1973–2005) in both urban and rural areas parallel to the decline in total energy intake (Misra et al, 2011) it still contributes approximately 73% of the energy intake in rural areas and 68% in urban areas. It is known that a high intake of carbohydrate (>55% of energy), even with a low fat intake, may lead to high serum triglyceride levels, hyperinsulinemia, and low levels of high density lipoprotein-cholesterol (HDL-C) (Misra et al, 2005).

Cereal fiber intake has been found to be inversely associated with the risk of Type 2 Diabetes Mellitus (T2DM) in both men and women. (Salmeron, 1997). The low intake of coarse cereals, such as bajra (pearl millet), jowar (sorghum), and maize in urban areas and decreasing intake over the last decade in rural areas has important implications for increasing insulin resistance and T2DM in Indians. Prospective and randomized clinical trials have provided evidence that replacement of refined grains with whole grains results in reduction of T2DM and cardiovascular risk factors (Misra et al, 2011; Pereira et al, 2002).

Sugar and jaggery also contribute towards dietary refined carbohydrates. NIN (2011) data reveals that the mean intake of sugar and jaggery in adult men was 13 g/day, which ranged from a very low 4 g/day in Eastern region to a high of 23 g/day in the Western region. The mean intake of sugar and jiggery among adult women was 13 g/day, which ranged from a very low 4 g/day in Eastern region to a high of 25 g/day in the Western region. Further, excessive consumption of sugar in the form of sweetened beverages may have some relationship with rising childhood obesity in India (Misra et al, 2011).

5.3.2 Dietary Fats

ICMR has recommended a total fat intake between 20en% and 30en% for Indian adults (ICMR, 2010). Further, they have proposed that of the 20en%, 10% should come from invisible sources (from food sources such as fish) and 10% from visible sources (fats and oils).

Indian diets are primarily vegetarian, and plant foods being low in "invisible" fat content, do not contribute significantly to total fat intake. The "visible fats" are derived from animal sources such as ghee (clarified butter having a high content of saturated fat), butter, and vegetable oils (Misra et al, 2010; Ghafoorunisa, 1994). The fat intake in India is both invisible and visible. Visible fat intake appears to be higher in south India than compared with other regions (Gupta et al, 2006). Importantly, total fat intake has increased over the last three decades (1973–2005) in both rural (24– 35.5 g/day) and urban (36–47.5 g/day) populations in India (Misra et al, 2011; NSSO, 2004-05). This increase in fat intake in India can be attributed to an increase in the supply of fats and oils as well as an increase in the availability and consumption of energy-dense, high-fat diets (Misra et al 2011).

A positive association has been observed between total fat intake and metabolic syndrome after adjusting for sex, age, and multiple other confounders in other ethnic groups. A recent report by NIN (2011) has shown that the average intake of fats and oils among adult men is 20 ml/day, ranging from a low of 6ml/day in North East to a high of 27 ml/day in West. The average intake of fats and oils for adult women was 17 ml/day, which ranged from a low of 6 ml/day in North East to a high of 21 ml/day in North, South and West. While these are well within the recommended limits, they are concurrent with reduced physical activity in the Indian population as a result of rapid urbanization and globalization. Increasing levels of total fat intake, particularly the unhealthy saturated fats and trans-fats, by the Indian population, concurrent with decreasing levels of physical activity due to rapid urbanization are important contributors to the increasing prevalence of obesity and related NCDs (Misra et al, 2011)

5.3.2.1. Saturated Fatty Acids

In the Indian diets, saturated fatty acids (SFAs) are mostly derived from butter and ghee (clarified butter having a high content of saturated fat, mostly

consumed by rural-based Indians) in north, middle, and west India, and coconut oil in south India. The SFA intake is increasing in the middle SES. Indian foods such as parantha (Indian bread prepared on a griddle using fat), bhatura (Indian bread prepared by deep frying), samosa (snack prepared by stuffing potato in refined wheat flour dough cones and deep frying), and suji halwa (dessert prepared using refined wheat flour [semolina] and fried in oil are prime sources of SFAs in Indian diets, particularly when ghee or vanaspati, (obtained from partially hydrogenated vegetable oil), are used in their preparation (Misra et al, 2011; Misra et al, 2009).

Coconut fat accounts for 80% of the fat intake among Indians residing in south India. Kerala has not only the highest level of blood cholesterol, but also the highest rate of CHD in India (Mohan et al, 2001). Based on these and some anecdotal evidence, consumption of coconut and coconut oil, which contain high amounts of SFAs, is believed to be one of the main reasons for the high incidence of CHD in Kerala. However, before recommending strict SFA intake for Indians, further research is warranted (Misra et al, 2011).

5.3.2.2. Polyunsaturated Fatty Acids

The polyunsaturated fatty acids (PUFAs), primarily linoleic acid (LA) (n–6) and a-linolenic acid (ALNA) (n–3) cannot be synthesized in the body, but have structural and functional roles in all cells and are essential dietary components. The n–6 PUFA in the diet lowers low-density lipoprotein-cholesterol (LDL-C), but very high intakes are not desirable as they can decrease HDL-C. High intakes of n–6 PUFA can also produce an imbalance between n–6 and n–3 PUFAs (Harris 1994; Indu and Ghafoorunisa, 1992).

Isharwal et al (2008) showed that a high intake of n–6 PUFA was associated with fasting hyperinsulinemia in Indian adolescents and young adults. The n–3 PUFAs, on the other hand, lower total cholesterol and LDL-C levels, while a high intake of long chain n–3 PUFAs (obtained from fish and fish oils) lower fasting and post-prandial triglycerides and may raise HDL-C levels. (Harris 1994; Indu and Ghafoorunisa, 1992).

Intake of n–3 PUFAs and long chain n–3 PUFAs is low in some South Asian populations, particularly among vegetarians (Misra et al, 2011). Common dietary sources of n–3 PUFAs include fish, seafood, chicken, eggs, green leafy vegetables, and some oils (canola, soybean, peanut, and mustard); pulses have more n–3 PUFAs than cereals. The n–6 PUFAs are present in oils such as safflower, sunflower, sesame, corn and cottonseed, as well as in cereals, except ragi (finger millet) and pulses (except black gram).

It is opined that optimum ratio of n–6: n–3 PUFAs (between 5 and 10) in Indian diets may have a beneficial role in the prevention of diet related chronic diseases (Ghafoorunisa and Krishnaswamy, 1994). However, longitudinal cohort studies are needed in Indians to assess whether the ratio of n–6: n–3 or their absolute amounts play a role for the prevention and management of atherosclerosis (Misra, 2011).

5.3.2.3. Monounsaturated Fatty Acids

Monounsaturated fatty acid (MUFA)-rich diets in healthy adults have been reported to have beneficial effects on diastolic blood pressure (Rasmussen et al, 2006) and lipid metabolism; (Rivellese et al, 2003), however, the favorable effect of MUFA intake disappeares at a total fat intake above the median (>37% of energy) indicating that the beneficial effect of MUFAs is negated by a high intake of fat in the diet (Rasmussen et al, 2006).

MUFAs are present in the following oils: mustard, palm, olive, groundnut, rice bran, and soybean, and some seeds (coriander, groundnut, sesame, and mustard). Data show that Indians belonging to low SES consume low amounts of MUFAs: males 4.7% and females 5.7% (Misra et al, 2001). Low MUFA intake has also been reported from study of urban adult males from three different states in India (Udipi et al, 2006).

In an important study, the association between diet and CHD risk was assessed from among 350 cases of acute myocardial infarction and 700 controls (Rastogi et al, 2004). Compared with persons consuming sunflower oil, those using mustard oil (the traditional cooking oil used in India, containing 70% MUFA, 10% ALNA and 12% LA) for cooking and frying were found to have significant by

lower risk for CVD after adjustment for age, sex, and smoking; however, dietary intervention to study the effects of MUFA-rich diets has not been attempted with Indians and needs investigation.

5.3.2.4. Trans-Fatty Acids

A high intake of trans-fatty acids (TFAs) has been associated with dyslipidemia and an increased risk of T2DM and CHD (Salmeron 2001; Misra et al, 2011). Indian diets mostly derive TFAs from partially hydrogenated vegetable oil, vanaspati, which is popularly used in home cooking in India in low and middle SESs due to its convenience of handling, low cost, and long shelf life. In addition, TFA-rich vanaspati is extensively used in the preparation of commercially fried, processed, baked, ready-to eat foods, and foods made by street vendors in India . A TFA intake (percent energy) of 1.13 and 1.11 amongst adolescent and young adults in north India, respectively, has been reported (Misra et al, 2009).

According to the recommendations of the WHO in 2003, TFAs should be limited to <1% of total daily energy in human diets (WHO/FAO, 2003). Thereafter, studies have observed adverse effects of dietary TFAs at intakes as low as 1–3% energy (2–7 g/person/day), and have lead to advocacy of <0.5% energy from TFAs to minimize health risks (Mozaffarian et al, 2006).

5.3.3. Protein

Protein intake among Indians is influenced by the vegetarian status of the majority of Indians whose protein is derived, apart from milk, from a combination of cereals and pulses, such as pulses and rice and pulse and whole wheat unleavened bread.

An NIN report (2011) revealed that the average intake of protein was around 60 g/day among 18-60 year old rural and urban men in India, while the average intake of protein was approximately 50 g/day among 18-60 year of rural and urban women in India. Protein intake across different states in India varied widely. According to the NSSO report (2004–2005), the protein intake was 57 g/person/day in both rural and urban areas, contributing to around 11% energy.

According to the NNMB data, over the last three decades (1975–2001), the intake of pulses and legumes has remained lower than RDA in rural areas and slightly higher in urban areas. The consumption pattern of meat and related products is linked to the SES of the family. As Indians are becoming more affluent, animal foods are increasingly being consumed, both among rural and urban areas. Such trends may have important implications for increasing diet related NCDs in Indians (Misra et al, 2011).

5.3.4. Dietary Fiber, Fruits and Vegetables

The intake of coarse cereals and millets, such as whole wheat flour, pearl millet, barley, sorghum, and maize (corn), along with husked pulses, fruits and vegetables have been the most important contributors towards the dietary fiber in India. It has been reported that people who eat three or more servings of high-fiber cereals are less likely to develop insulin resistance and metabolic syndrome (Misra et al, 2009).

There is heterogeneity in the intake of dietary fiber in India. Data show that rice has the lowest (4.1%) and wheat the highest (12.5%) amount of total dietary fiber (TDF). The cooking of cereals decreases their TDF and insoluble dietary fiber (IDF) contents, with the exception of ragi, where a significant increase in TDF and IDF occur. The TDF content of whole pulses has been analyzed to range from 15.8% in lentils to 28.3% in chickpeas. The IDF constituted 85–89% of TDF in whole pulses. De-husking of pulses into dals (pulses without the husk) decreases TDF and IDF contents significantly (Ramulu, 1997).

A high intake of fruits and vegetables has shown to lower the risk of metabolic syndrome (Esmaillzadeh, 2006). Nationally representative surveys in India, however, indicate a very low per capita consumption of fruits and vegetables both among rural and urban adults (NIN, 2011).

In a study in south India, a higher intake of fruits and vegetables explained 48% of the protective effect against cardiovascular risk factors (Radhika et al, 2008). Rastogi et al (2004) observed a significant, dose-dependent inverse association between vegetable

intake and CHD in the metropolitan cities of Delhi and Bangalore in India: those consuming a median of 3.5 servings/week had a 67% lower relative risk (RR: 0.33; P < 0.0001) than those consuming 0.5 servings/week. A nationwide study showed that overweight was positively associated with dietary intake of fats, sugars and jaggery, and negatively associated with fruit and vegetable intake (Gupta, 2006).

5.3.5. Indian Spices and Dietary Salt

Spices have been an integral part of the Indian diets since ancient times. Some Indian spices have been reported to possess antioxidant and antimicrobial properties. Turmeric is well known for its anti inflammatory properties. Consumption of 25 g fenugreek seed powder in the daily diet has been shown to decrease blood glucose levels and has potential as an adjunctive therapy in the management of diabetes (Krishnaswamy, 2008). Garlic, ginger, cloves and mustard may also have some antioxidant, antimicrobial, anti-thrombotic, anti-inflammatory, and anti-cancer activities, as reported in (in vivo and in vitro) animal models in anecdotal studies (Tapsell, 2006). Interestingly, 40 days of consumption of as low as 1 g of cinnamon per day (even 3 g or as high as 6g/day) has been shown to reduce blood glucose (18– 29%), triglycerides (23–30%), LDL–C (7–27%), and total cholesterol (12–26%) levels in patients with T2DM (Khan et al, 2003).

Importantly, salt consumption has been found to be a significant predictor of hypertension in urban as well as in rural communities in north India (Goel and Kaur, 1996). Population salt consumption, a strong determinant of high blood pressure and associated CVD, is very high across different regions with the average intake ranging between 9-12 grams/day, with the intake being higher in urban compared to rural areas. This is very high compared to the WHO recommended intake of 5 grams/day as well as the National Institute of Nutrition's Recommended Dietary Allowances (RDA) for Indians that recommends an intake of 6 grams/day. Most salt in India is added in cooking and/or at table in contrast to the developed world where processed foods contribute the most to overall population salt intake (WHO, 2007, ICMR, 2010). However, with rapidly increasing urbanization, proliferation of multinational food outlets/fast food centers, increasing availability of prepared foods, and increasing frequency of eating out of home, processed foods are anticipated to have become a major source of salt intake, making it imperative to initiate appropriate preventive public health action (Mohan, 2011).

5.3.6. Nuts and Oilseeds

Nuts and oilseeds are complex plant foods that are not only rich sources of unsaturated fat but also contain several non-fat constituents, such as protein, fiber, micronutrients (e.g. copper and magnesium), plant sterols, and phytochemicals. Nut consumption has been found to be inversely related to CHD and all cause mortality. Long-term nut consumption has been associated with lower body weight and lower risk of obesity (Sabate and Ang, 2009). The frequency and quantity of nut consumption has been documented to be higher in vegetarian than in non-vegetarian populations. There is a need to encourage consumption of nuts (e.g. pistachio nuts, almonds and walnuts) in Indian diets (Misra et al, 2011).

5.3.7. Other Dietary Components

Vitamins and Micronutrients: A study by Kumar et al (2009) studied the association of ***Vitamin B12 deficiency*** with coronary artery disease in an Indian population recruited from a tertiary care center in New Delhi, India. It was found that vitamin B12 levels were significantly lower in CAD patients than in controls ($p<0.0001$). Also, vegetarians were found to have significantly lower vitamin B12 concentrations ($p=0.0001$) and higher incidence of CAD ($p=0.01$). Interestingly, elevated homocysteine levels, a hallmark of vitamin B12 deficiency, was not associated with CAD. In contrast, cysteine levels were significantly higher in CAD patients than in controls ($p=0.004$).

An observational study was carried out by Chahal, Raina and Kaur (2014) to asses deficiency of Vitamin B12 among healthy adults from a medical college in rural area of North-West India. Mean serum vitamin B12 in both the groups of employees as well as students, was low (group I N 69: 241.56 ± 101.88 pg/ml; group II N 84: 217.98 ± 92.78 pg/ml). Using 200 pg/ml as threshold,

53.6% of total participants fell below the normal vitamin B12 concentration (66.6% of female students and 70.6% of female employees), while 16.3% of study population was severely deficient having serum vitamin B12 level below150 pg/ml.

It has been estimated that 1 billion people worldwide have ***Vitamin D deficiency*** or insufficiency (Hollick, 2007). There is widespread prevalence of varying degrees (50- 90%) of Vitamin D deficiency with low dietary calcium intake in Indian population according to various studies published earlier (Marwaha et al, 2011; Harinarayan and Joshi, 2009; Goswami et al, 2000; Tandon et al, 2003). Apart from low dietary intake, people suffering from hepatic, renal, dermatological disorders, alcoholics and inflammatory rheumatologic conditions also have Vitamin D deficiency. Harinarayan et al (2011) have studied 25(OH)D and BMD in women of reproductive (WR) age group and post-menopausal women (PMW) in south India. They have reported Vitamin D deficiency in 76% in WR, 70% in PMW, insufficiency in 16.5% in WR and 23% in PMW.

A systematic review of vitamin D and diabetes by Mitri et al (2011) revealed that vitamin D may play a role in type 2 diabetes; however, to better define the role of vitamin D in the development and progression of type 2 diabetes, high-quality observational studies and RCTs that measure blood 25-hydroxy vitamin D concentration and clinically relevant glycemic outcomes are needed. While vitamin D deficiency has been implicated in several other diseases like hypertension, CVD and even certain cancers, more definitive evidence is needed to establish such relationships.

5.4 INTRAUTERINE AND PERINATAL NUTRITION

Poor maternal nutrition may have implications for fetal growth and development of NCDs in early adulthood. There is evidence that low birth weight is associated with an increased risk of hypertension, insulin resistance, T2DM, and CHD in adults (Godfrey and Barker, 2000). A longitudinal, cohort study by Bhargava et al (2004) in New Delhi showed that "catch-up growth" early in childhood could make the subjects vulnerable to obesity and glucose intolerance. Furthermore, an association between low vitamin B12 (<150 pmol/L) in mothers and adiposity in children has been shown, but needs confirmation (Yajnik et al, 2008). Importantly, children who were born with low birth weight and did not receive any daily supplements (balanced protein-calorie supplementation [515 Kcal, 20 g protein]) as infants and children showed greater risk of insulin resistance in the adolescent age as compared to children who received supplements (Kinra et al, 2008) .

The relationship of over- and undernutrition vis-a- vis macro- and micronutrients in fetal and perinatal life and subsequent chronic diseases appears to be complex and inconclusive at present. It is likely that perinatal adverse milieu may result in DR-NCDs in adult life only when amplifying factors including inappropriate diets and sedentary lifestyle are present (Misra et al, 2011).

5.5 PHYSICAL ACTIVITY

Few studies have estimated the physical activity levels in Indian population so far. Vaz and Bharathi (2004) assessed the total and occupational physical activity status of school and college teachers in Bangalore, south India using a validated physical activity questionnaire among a convenient sample of 198 school and college teachers (females =173). The physical activity questionnaire provided information on estimated 24-hour energy expenditure (kJ/day) and Physical activity levels (PALs): a composite index of physical activity computed as estimated 24-hour energy expenditure (24h EE)/estimated basal metabolic rate (BMR). Majority of the individuals indulged in either a sedentary or mild activity (PAL <1.55) and discretionary exercise was lower among women.

The sentinel surveillance on CVD in Indian industrial population assessed the physical activity levels among the employees based on their perceived daily physical

activity in the past five years. There was a broad heterogeneity in the levels of physical activity depending on the location of the industry. Physical activity levels were generally lower in Industries that were located in highly urbanized metropolitan cities such as Delhi, Hyderabad and Bangalore and were higher in predominantly semi-urban settings such as Assam and Nagpur and was intermediate in other areas.

A study by Ramachandran et al on temporal changes associated with pattern of life style (1989-2003) showed had been a decline in levels of physical activity. The regular use of motorized vehicles increased from 86.6% to 93.4% whereas the percentage of people watching television regularly increased to 70.1% from the baseline value of 57.2% in 1989. Moreover, fewer subjects were engaged in manual work (22.8% in 2003 vs. 80% in 1989) (Ramachandran et al, 2004).

Rastogi et al (2004) conducted a hospital-based case-control study and collected data from 350 cases of acute myocardial infarction and 700 controls matched on age, gender, and hospital in New Delhi and Bangaluru. Of the controls, 48% participated in some form of leisure-time exercise compared with 38% of cases. In age- and sex-adjusted analyses, people in the highest level of leisure-time exercise (>145 metabolic equivalents [MET]-minutes per day, equivalent to 36 minutes of brisk walking per day) had a relative risk of 0.45 (95% CI: 0.31, 0.66) compared with non-exercisers. Multivariate adjustment for other risk factors did not substantially alter the association. They observed a positive association between non-work sedentary activity and CHD risk; people with >3.6 hours per day of sedentary activity (for example, television viewing) had an elevated risk of 1.88 (95% CI: 1.09, 3.20) compared with <70 minutes per day in multivariate analysis. Hence, leisure-time exercise, including as much as 35-40 minutes per day of brisk walking, was protective for CHD risk and sedentary lifestyles were positively associated with risk of CHD.

Rapid urbanization, increased motorization, mechanization and sedentarism at workplaces are likely to read, further decreases in physical activity, particularly among the working age groups, thus predisposing this segment of society to premature NCDs (Mohan et al, 2011).

5.6 OVERWEIGHT / OBESITY

Although tremendous progress has been made in reducing undernutrition, India currently faces the twin burden of both under and over nutrition, underlining the need for nutritional policies that promote not only adequate but appropriate nutrition.

Large national surveys provide an indication of the time trends, particularly among women. The NFHS-3 reported that 35.6% women in reproductive age group (15-49 years) had a body mass index (BMI) of <18.5 kg/m2 indicating undernutrition, a slight improvement over NFHS-2(35.8%). In contrast, 12.6% were overweight and 2.8% obese - a marginal increase compared to that in the NFHS-2. Among men, 8% were overweight and 1% obese. In general, women in urban areas with higher educational and income levels were more likely to be overweight or obese (Mohan et al, 2011). The highest rates of overweight and obesity have been observed in the epidemiologically and nutritionally advanced states of Punjab, Kerala and Delhi, which, incidentally, also have higher rates of NCD risk and disease burden (Mohan et al, 2011).

One of the earliest studies was carried out by Gopinath and Chadha et al in Delhi during 1984-87. They reported 27% prevalence of overweight/obesity in the urban areas and 10% in rural areas. In 1994, ICMR task force carried out a study involving more than 5000 individuals (3050 urban residents and 2487 rural residents). This study demonstrated 43% prevalence of overweight in urban Delhi and 12% in rural Haryana.

Two other studies from north India published during 1994 and 2000 showed a prevalence of 17% (Ludhiana) and 15 % (Kashmir) respectively. Further, Gupta from

Jaipur, through three epidemiological studies carried out during 1994, 2001 and 2003 demonstrated rising trend rates of 20%, 36%, and 62% respectively.

Similar trends are observed in other parts of the country. The earliest study on the south Indian population reported a prevalence of 27% during 1989 (Ramachandran et al, 1992), and 30% during 2000 (Ramachandran et al, 2001). Prevalence in the rural areas of Tamil Nadu rose sharply from 2% in 1989 to 17% in 2003 (Ramachandran et al, 2004). Kutty et al carried out a study in rural Kerala during 1991 using the criteria (BMI>27) and the prevalence was found to be 5.8%. Later studies in Kerala reported 49% prevalence of overweight among 30-64 age group (Kutty et al, 2002) in 1998 and 41% among 40- 60 age group during 2000 (Zachariah et al, 2003). A higher prevalence of 54% (criteria: BMI>22.25) was recorded among elderly populations (age group: >=60) during 2000 (WHO, 2001).

The "Sentinel Surveillance Systems for CVD in Indian Industrial Populations" involved ten centres from different parts of the country (survey period 2001-2003). The population studied included industrial employees and their family members aged 10-69 years. Overall prevalence of overweight/obesity from 10 regions of the country using the criteria (BMI>=25) in the age group 20-69 was 31%. South Indian populations from Bangalore in Karnataka, Trivandrum in Kerala and Coimbatore in Tamil Nadu had a prevalence of 47%, 38% and 27% respectively. Another study (Prabhakaran et al, 2005) carried out in 1998 illustrated a prevalence of 35% among males. The prevalence of overweight/obesity had risen from 35% to 41% over a period of five years.

The urban cities in the country are facing high prevalence of obesity. In 2000, a multi centric study (Snehlata et al, 2003) involving seven urban cities (Chennai, Bangalore, Hyderabad, Mumbai, Calcutta and New Delhi) in India among the age group of 20-40 and >=40 age group showed a prevalence of 31% and 38% respectively (sample size: 5288 men; 5928 women). Similarly, Shukla et al conducted a large study in Mumbai, Maharashtra during 1994 and reported a prevalence of 26% among above 35 year age group.

Few studies were carried out comparing different socio economic groups. In urban Chennai, Mohan et al (2001) reported 20% prevalence of overweight/ obesity among men and women aged 20 years and above and belonging to the low socio economic group (based on household income, occupation and dietary pattern) while, the middle socio economic group had a higher prevalence (35%) during 1996-97. A study conducted in the urban areas of Chennai during 2000 (age group>=40) reported a higher prevalence of 33% among low income group (monthly income < Rs 30000/annum and 44% prevalence among high-income group (monthly income > Rs 60000/annum) (Ramachandran et al, 2002).

Some studies addressed the gradients of obesity among slum /non-slum groups. ICMR Task force study among dwellers of urban slum in Delhi showed a prevalence of 20%, as compared to urban and rural prevalence of 48% and 12% respectively. Misra et al (2001) reported 25% prevalence of obesity in the slums of Delhi.

Further, Indians have a lesser BMI than Caucasian populations and increase in body weight, even within the 'normal' range of BMI, confers a higher risk of CVD and diabetes. At equivalent BM I, they also have significantly higher levels of visceral obesity and higher percent of body fat than Caucasians (Mohan, 2011). Based on these facts, lower BM I cut-off value for overweight (>23 kg/m2) and obesity (>27.5 kg/m2) have been suggested for identification of individuals at risk (WHO, 2004; Ramachandran et al, 2010).

5.6.1. Central Obesity

Given the increased propensity of Indians for central obesity, and its importance as a measure of obesity and as a cardio metabolic risk factor, the optimal BMI cut-off values have been defined by various studies in India. For identifying any two cardio metabolic risk factors (diabetes mellitus, pre-diabetes, hypertension, hypertrigly-ceridemia, hypercholesterolemia, or low high density lipoprotein cholesterol) the optimal cut-off value has been determined by Mohan et al to be 23 kg/m2 in

both genders, whereas that of waist circumference was reported to be 87 cm for men and 82 cm for women (Mohan et al, 2007). Another analysis by Snehalatha et al reported the healthy BMI for an urban Indian to be 23 kg/m2, and cut-off values for WC to be 85 cm for men and 80 cm for women Snehalatha et al, 2003).

5.7 DYSLIPIDAEMIA

High serum lipid levels are major risk factors of coronary heart diseases that are influenced by lifestyle transition and urbanization. Limited information exists regarding the changing time-trends in lipid levels and the prevalence of dyslipidaemia in Indian subjects. In 1961, Padmavati et al reported mean levels of total cholesterol levels across different socio economic groups in Delhi. Later Chadha et al (1997) reported 44% prevalence of hypercholesterolemia among men and 50% prevalence among women in urban Delhi during 1984-87. ICMR study reported 36.8% and 39.8% prevalence of hypercholesterolemia in the urban Delhi and rural Haryana respectively during 1991-94. Repeat cross-sectional surveys among urban subjects in Jaipur showed 37% vs. 43% prevalence among men and women during 2001 and 33% vs. 29% during 2002-03 (Gupta et al, 1997; Gupta et al, 2004). Mohan et al carried out a study in the urban population of Chennai in south India during 1996-97 and the prevalence of hypercholesterolemia among low-income group was 14.2% while middle income group had a prevalence of 24.2%. A study in urban Kerala (Joseph et al, 2000) reported 32% prevalence (criteria: >239mg %) during 1999. Two studies from Andhra Pradesh published in 2002 reported 18.5% (Reddy et al, 2002) and 31% (Reddy et al, 2002) prevalence of hypercholesterolemia respectively.

5.8 TOBACCO USE

Tobacco use is also a leading risk factor for premature NCD associated death and disability and accounts for more than two-third of all new cases of NCDs. Tobacco use alone accounts for one in six of all deaths resulting from NCDs. Every day more than 1 billion people chew or smoke tobacco because of their addiction to nicotine and about 15,000 die from tobacco related disease. Tobacco use accounts for half the health inequalities, as assessed by education, in male mortality (Srivastav et al, 2011).

Projections indicate that nearly 13% of all deaths in India are tobacco-related. Notably, 50% of cancers among men, 20% of cancers among women and 90% of oral cancers are attributable to tobacco use. Further, over 80% of COPD among men, 60% of heart diseases in those less than 40 years of age and 53% of myocardial infarctions among urban men are also attributed to tobacco use. In addition, smoking contributes to nearly half of tuberculosis deaths among men (Reddy, Gupta , 2004; Global Adult Tobacco Survey, GATS India 2009-10; Jha et al, 2008; Rastogi et al, 2005)

In India tobacco is consumed in many forms, both smoking and smokeless, e.g. bidi, gutka, khaini, paan masala, hukka, cigarettes, cigars, chillum, chutta, gul, mawa, misri etc. India is also the second largest consumer and second largest producer of tobacco in the world, second only to China.

Population-based surveys conducted in order to study risk factors for various diseases and mortality have reported information on tobacco use. Three major national surveys have collected limited tobacco use information. Occupational groups studied for tobacco use have included skilled and unskilled industrial workers, policemen, educational personnel, doctors, and white-collar workers/professionals. Recent NFHS 3 (2005-06) data suggests that tobacco use is much more prevalent among men than among women. More than half of men use one or more forms of tobacco, compared with only 11 % of women. One-third of men in the age group 15-49 years smoke cigarettes or bidis. Paan masala, gutkha, or other chewed tobaccos are consumed by 37 % of men in the age group 15-49 years.

While only 1 % of women in the age group 15-49 years smoke cigarettes or bidis, 8 % chew paan masala, gutkha, or other tobacco products.

More recent national data from the Global Adult Tobacco Survey (2010) indicates the overall prevalence of tobacco used to be 35%, with increases noted in women compared to earlier surveys (48% in men and 20% in women). . Nearly two in five (38%) adults in rural areas and one in four (25%) adults in urban areas use tobacco in some form (Mohan et al, 2011; Srivastav et al, 2011). Furthermore, over half of all adults reported being exposed to second-hand smoke, underlining the importance of further strengthening and effectively implementing smoke-free polices currently mandated by the Cigarettes and Other Tobacco Products Act throughout the country.

The National Household Survey of Drug and Alcohol Abuse in India conducted in 2002 among males, covered over 40,000 individuals aged 12.60 years in nearly 20,000 households in 25 states and reported the overall prevalence of current tobacco use as 55.8%.

5.9 ALCOHOLISM

Alcohol consumption has both health and social consequences via intoxication and alcohol dependence. Overall there is a causal relationship between alcohol consumption and more than 60 types of diseases and injury. Alcohol is a risk factor for oesophageal cancer, liver cancer, cirrhosis of the liver, homicide, stroke, psychiatric illness and motor vehicle accidents worldwide (Gutjahr et al, 2001).

Pattern of alcohol consumption varies with geographical location. Punjab, Andhra Pradesh, Goa and north-eastern states have a much higher proportion of male alcohol consumers than the rest of the country. Women tend to drink more in the states of Arunachal Pradesh, Assam and Sikkim (NFHS 3). In India, the estimated numbers of alcohol users in 2005 were 62.5 million, with around 17% of them, which translates into 10.6 million, being dependant users (Ray, 2004). Usually 20- 30% of hospital admissions are due to alcohol- related problems (Benegal et al, 2002). According to NFHS-3, 35 % of ever married males report consumption of alcohol. In Arunachal Pradesh, Mizoram, Meghalaya, Chhattisgarh, and Tripura one-third or more young men consume alcohol. Alcohol consumption among male youth is highest in Chennai, at 29 % and lowest in Indore, at 13 %. Alcohol consumption is much higher in slum areas of Meerut, Indore, Mumbai, Nagpur, and Chennai (Parasuraman et al, 2009).

Although moderate consumption of alcohol appears to be protective for heart attacks in western populations it appears to be either neutral or conferring higher risk among South Asians (Joshi et al, 2007). The results from a large sentinel surveillance study on CVD risk factors in the Industrial population also shows higher risk associated with alcohol consumption and CVDs (http://www.whoindia.org/LinkFiles/Non-communicable_Diseases_and_Mental_Health_NCD_risk_CVD_surveillance_for_industrial_ settings pdf 2009).This is possibly related to the binge drinking practices in India.

6. BEST PRACTICES THAT PROMOTE HEALTHY AND SUCCESSFUL AGING

Case studies of 90+ elderly have revealed that a good health status, adjustment and adaptability to old age, a positive outlook, strong social support and disciplined eating habits are the factors that ensure a good quality of life in old age. Their longevity is significantly related to factors such as increased physical activity, ability to live independently and greater senses of control as well as higher intakes of foods like pulses, vegetables and fats.

Older adults who are physically active have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, colon cancer and breast cancer, a higher level of cardio respiratory and muscular fitness and healthier body mass.

In India, the Government is proactive in supporting the cause of elderly care, but the onus of caring for the elderly clearly lies with the family. Focus of policies and programs of the Government should be on of supporting the family to enable then taking case of elderly.

6.1 INTRODUCTION

Old age is the last stage in the life span and with the change from middle age to old age it envisages a series of adjustments, in behavior and thinking to meet the demands of a waning existence punctuated by disease, disability and disbelief. Central to coping with personal aging is the acceptance of its reality. Happy aging consists of adjusting to the demands of this stage and using the time and resource available beneficially to oneself and others. The role of maintaining good physical and mental health and cultivating appropriate attitudes towards it is a requirement that can hardly be overstressed. Empirical studies have shown the significant contribution of several variables to successful aging (Ramamurti, 1997).

Increased human life span as witnessed in the preceding decades has not been accompanied by good quality of life for majority of older Indians. Of the many determinants of the quality of life: financial security, emotional security and health and wellbeing, the last one occupies the prime position, as all other issues become irrelevant in poor health (Dey, 2006). The provision of an enabling, supportive and inclusive environment will ensure that all members of the society enjoy the benefit of development as they age.

6.2 BEST PRACTICES

An exploratory study on the oldest old, including centenarians, in Delhi conducted by Shali and Puri (2004) brought to light some interesting findings. Case studies of these 90+ elderly revealed that a good health status, adjustment and adaptability to old age, a positive outlook, strong social support and disciplined eating habits were the factors that ensured a good quality of life in old age. Their longevity was significantly related to factors such as increased physical activity, ability to live independently and greater senses of control as well as higher intakes of foods like pulses, vegetables and fats.

Successful aging can never be based on the denial of real losses as regards the quality of functioning in the last stage of life. Rather, the idea of successful aging involves graceful acceptance of reality as it is, adopting a generativity-glimmered orientation towards life in general. Successful aging means growing old with good health and functional capacity, self-acceptance, autonomy, and forgiveness, engaging in learning and activities promoting personal growth, pro-social behavior, healthy interactions with the family, deriving a sense of purpose or meaning in life and being satisfied with life. As such, the discourse may end with the notion

that elderly individuals need to be accepted, respected, and provided with their requisite self-respect. It is important that society should alter its thinking and recognizes the beauty and usefulness of old age. Old age is synonymous with wisdom, values and a host of positive things that are desirable in a community. Older adults are more likely than other generations to articulate values that have a social tilt and are geared towards maintaining a balanced social order. Thus, the elderly can be the role models in terms of values and practiced behavior patterns. This is likely to facilitate the elderly individuals to glance at life through the lenses of "experientially-rimmed wisdom" and accept factual realities gracefully, thereby helping them to bask in the "rays" of successful aging (Bothra and Dasgupta, 2011).

6.2.1. Physical Activity

According to WHO'S Global Strategy on Diet, Physical Activity and Health, in adults aged 65 years and above, physical activity includes leisure time physical activity (for example: walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities.

In order to improve cardio respiratory and muscular fitness, bone and functional health, reduce the risk of NCDs, depression and cognitive decline it is essential that :

1. Older adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, older adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous-intensity activity.
4. Older adults, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week.
5. Muscle-strengthening activities, involving major muscle groups, should be done on 2 or more days a week.
6. When older adults cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

There are a number of ways older adults can accumulate the total of 150 minutes per week. The concept of accumulation refers to meeting the goal of 150 minutes per week by performing activities in multiple shorter bouts, of at least 10 minutes each, spread throughout the week then adding together the time spent during each of these bouts: e.g. 30 minutes of moderate-intensity activity 5 times per week.

Overall, strong evidence demonstrates that compared to less active men and women, older adults who are physically active have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, colon cancer and breast cancer, a higher level of cardio respiratory and muscular fitness, and healthier body mass composition. They also have a biomarker profile that is more favorable for the prevention of cardiovascular disease, type 2 diabetes and the enhancement of bone health; and exhibit higher levels of functional health, a lower risk of falling, and better cognitive function; have reduced risk of moderate and severe functional limitations and role limitations.

6.2.2. Food Based Dietary Guidelines for Older Persons (WHO, 2002)

India does not have a set of dietary guidelines for the elderly; however, WHO has outlined principle of food based dietary guidelines for older persons. These include:

- Emphasison healthy traditional vegetable and legumebased dishes where meat and nuts are used as condiments.

- Limited consumption of traditional dishes/foods that are heavily preserved/pickled in salt and greater use of herbs and spices.
- Inclusion of healthy traditional foods or dishes from cuisines of other countries (e.g. tofu in Europe and the tomato in Asia) to increase the variety of foods consumed.
- Selection of nutrient-dense foods such as fish, lean meat, liver, eggs, soy products (e.g. tofu and tempeh) and low-fat dairy products, yeast-based products (e.g. spreads), fruits and vegetables, herbs and spices, whole-grain cereals, nuts and seeds.
- Consumption of fat from whole foods such as nuts, seeds, beans, olives and fatty fish. Wherever refined fats are necessary for cooking, these should be selected from a variety of liquid oils, including those high in n-3 and n-6 fats. Fatty spreads should be avoided.
- Food should be eaten in the company of others for enjoying it more.
- Regular use of celebratory foods (e.g. ice cream, cakes and pastries, mithai and confectioneries) should be avoided.
- Processed food industry and fast-food chains should produce ready-made meals that are low in animal fats and high in nutrients and phytochemicals.
- Several (5–6) small non-fatty meals should be eaten, as this pattern appears to be associated with greater food variety and lower body fat and blood glucose and lipid levels, especially if larger meals are eaten early in the day.
- Transfer as much as possible one's food culture, health knowledge and related skills to one's children, grandchildren and the wider community.
- Elderly should be physically active on a regular basis and include exercises that strengthen muscles and improve balance.
- Dehydrationshould be avoidedby regularly consuming, especially in warm climates, fluids and foods with high water content (WHO, 2002).

The traditional nutrient based approach to eating is limited in that it does not take into account the environmental, socioeconomic and lifestyle context of eating. Nor does it adequately addresses the chemical complexity of foods and the interactions and synergies, whether between different foods or individual food components. On the other hand, the food based approach extends beyond nutrients and food groups; they include the way foods are produced, prepared, processed and developed. They are therefore culture sensitive. Moreover, the food based approach is likely to result in fewer risks and greater benefits since many cultural food patterns have stood the test of time and have been successfully established over many generations.

6.3 ROLE OF THE GOVERNMENT

While in India, the Government is proactive in supporting the cause of elderly care, the onus of caring for the elderly clearly lies with the family. The focus of policies and programs of Government should be on supporting the family to care for the elderly. This section highlights the various government initiatives in care of the aged. Since most of these have not been evaluated for their effectiveness, they may not be termed as best practices.

6.3.1. Nodal Ministry

The Ministry of Social Justice and Empowerment is the nodal Ministry for the welfare of senior citizens. The Aging Division in the National Institute of Social Defence of the Ministry of Social Justice and Empowerment develops and implements programs and policies for the senior citizens in close collaboration with State Governments, Non- Governmental Organisations and civil society. The programs for senior citizens aim at their welfare and maintenance, especially for indigent senior citizens, by supporting old age homes, day care centres, mobile medicare units, etc. These programs are implemented through providing support for capacity building of Government /Non-Governmental Organizations (NGOs) /Panchayati Raj Institutions (PRIS) /local bodies and the Community at large.

6.4 POLICIES AND PROGRAMS

6.4.1. The National Policy on Older Persons (NPOP)

The National Policy on Older Persons (NPOP) was announced in January 1999 to reaffirm the commitment of the State to ensure the well-being of the older persons. The Policy envisages State support to ensure financial and food security, health care, shelter and other needs of older persons, equitable share in development, protection against abuse and exploitation, and availability of services to improve the quality of their lives including welfare and institutional care. Training of human resource for taking care for older persons, media and education initiatives are also included in the policy.

Keeping in view the changing demography of the senior citizens in the country over the last decade, the Ministry of Social Justice and Empowerment constituted a Committee to:

(I) Assess the present status on various issues concerning senior citizens, in general, and implementation of NPOP, 1999, in particular, and

(ii) Draft a new NPOP keeping in view the emerging trends in demographic, socio-economic, technological and other relevant fields. The new National Policy for Senior Citizens is under finalisation and is expected to be released later this year.

6.4.2. Integrated Program for Older Persons (IPOP)

The Ministry of Social Justice and Empowerment is implementing a Central Sector Scheme of Integrated Program for Older Persons (IPOP) since 1992 with the objective of improving the quality of life of senior citizens by providing basic amenities like shelter, food, medical care and entertainment opportunities etc. through providing support for capacity building of Government/ Non-Governmental Organizations/Panchayati Raj Institutions/ local bodies etc.

The Scheme has been revised twice in April 2008 and April 2009. Besides revising cost norms of financial assistance for existing projects, several innovative projects were added as being eligible for assistance under the Scheme during the 2008 revision. The following projects are being assisted under the IPOP Scheme:

i. Maintenance of Old Age Homes.
ii. Maintenance of Respite Care Homes.
iii. Running of Multi Service Centres for Older Persons.
iv. Mobile Medicare Unit.
v. Day Care Centre for Care of Old Persons with Dementia.
vi. Multi Facility Care Centre for Older Widows.
vii. Physiotherapy Clinics.
viii. Regional Resource and Training Centres.
ix. Help lines and Counselling for Older Persons.
x. Program for Sensitization Schools/College Student.
xi. Awareness Projects for Older Persons.
xii. Volunteers Bureau for Older Persons.
xiii. Formation of Vridha Sanghas/Senior Citizen Associations/Self Help Groups.
xiv. Any other activity, which is considered suitable to meet the objective of the Scheme.

6.4.3. The Maintenance and Welfare of Parents And Senior Citizens Act, 2007

The Maintenance and Welfare of Parents and Senior Citizens Act, 2007 was enacted in December 2007, inter alia, to ensure need based maintenance for parents and senior citizens and their welfare. All the States and UTs have notified the Act. The Act does not extend to the state of Jammu and Kashmir. Himachal Pradesh has its own Act for welfare of parents and senior citizens.

Salient feature of this Act are:

i. Maintenance of Parents/ senior citizens by children/ relatives has been made obligatory and justifiable through Tribunals.
ii. Revocation of transfer of property by senior citizens in case of negligence by relatives .
iii. Penal provision for abandonment of senior citizens.
iv. Establishment of Old Age Homes for Indigent Senior Citizens.
v. Protection of life and property of senior citizens.
vi. Adequate medical facilities for Senior Citizens.

6.4.4. National Council for Older Persons (NCOP)/ National Council of Senior Citizens (NCSrC)

In pursuance of the National Policy for Older Persons (NPOP), a National Council for Older Persons (NCOP) was constituted in 1999 under the Chairpersonship of the Minister for Social Justice and Empowerment to oversee implementation of the Policy. The NCOP is the highest body to advise the Government in the formulation and implementation of policy and programs for the aged.

In order to have a definite structure as well as regional balancing, National Council for Older Persons (NCOP) has been reconstituted and renamed in February 2012as National Council for Senior Citizens (NCSrC) . The NCSrC advises Central and State Governments on the entire gamut of issues related to welfare of senior citizens and enhancement of their quality of life. The NCSrc will is required meet at least twice a year.

6.4.5. International Day for Older Persons And National Awards: Vayoshreshtha Samman

The Ministry of Social Justice and Empowerment observes the International Day for Older Persons on 1st October every year in a befitting manner by organizing a series of events and programs dedicated to the senior citizens. The day is dedicated to acknowledge the contribution of senior citizens to the society and to sensitize the public at large about their problems and needs and to make our society more elderly friendly. An Inter-generational walkathon is organized at the India Gate, New Delhi and National Awards are given on the occasion.

In order to recognize the efforts made by eminent senior citizens and Institutions involved in rendering distinguished services for the cause of elderly persons, especially indigent senior citizens, the Ministry of Social Justice and Empowerment (Department of Social Justice and Empowerment) has prepared a new Scheme of National Awards for senior citizens (Vayoshreshtha Samman) to showcase the Government's concern for senior citizens and its commitment towards senior citizens with the aim of strengthening their legitimate place in the society. The National Awards for Senior Citizens was given for the first time in 2013. The Award is conferred every year in thirteen categories to eminent and outstanding institutions or organizations and individuals.

6.4.6. Benefits Extended by Other Central Ministries For The Welfare of Senior Citizens

Ministry of Rural Development

The Ministry of Rural Development is implementing the Indira Gandhi National Old Age Pension Scheme (IGNOAPS) under which Central assistance is given towards pension @ Rs. 200/- per month to persons above 60 years and @ Rs. 500/- per month to persons above 80 years belonging to a household below poverty line, which is meant to be supplemented by at least an equal contribution by the States.

Ministry of Health & Family Welfare

National Program for the Health Care for the Elderly (NPHCE): The Ministry of Health and Family Welfare implements the National Program for the Health Care for the Elderly (NPHCE) since 2010-2011.

Objectives of the National Program for the Health Care for the Elderly are to:

- Provide preventive, curative and rehabilitative services to the elderly persons at various level of health care delivery system of the country.
- Strengthen referral system.
- Develop specialized man power.
- Promote research in the field of diseases related to old age.

Major Components

- To establish geriatric department in all the existing 8 Regional Geriatrics Centres.
- Strengthening healthcare facilities for elderly at various levels of 100 identified districts in 21 States of the country.
- Provision of technical support by regional institutions to geriatric units at district hospitals whereas district hospitals will supervise and coordinate the activities down below at CHC, PHC and sub-centres.

The Ministry also provides the following facilities for senior citizens:

- Separate queues for older persons in government hospitals.
- Geriatric clinic in several government hospitals.

Ministry of Finance

Health Insurance: Insurance Regulatory Development Authority vide letter dated 25.5.2009 has issued instructions on health insurance for senior citizens to all General Health Insurance Companies which, inter-alia, includes:

- Allowing entry into health insurance scheme till 65 years of age,
- Transparency in the premium charged
- Reasons to be recorded for denial of any proposals etc. on all health insurance products catering to the needs of senior citizens. Likewise the insurance companies cannot deny renewability without specific reasons.

Tax Benefits: The Ministry provides tax exemption for Medical treatment to senior citizens as also to the individuals who pay for parents medical treatment. Income tax exemption is also allowed if an individual pays premium for medical insurance of parents.

Ministry of Home Affairs

Protection of Life and Property: Chapter V of the Maintenance and Welfare of Parents and Senior Citizens Act, 2007 provides for protection of life and property of senior citizens. State Governments are required to prescribe a comprehensive Action Plan for providing protection of life and property of senior citizens. The Ministry of Home Affairs, Government of India has also issued detailed advisories dated 27.3.2008 and 30.08.2013 to all the State Government/UTs, who are primarily responsible for prevention, detection, registration, investigation and prosecution of crime including crime against senior citizens as "Police" and "Public order" are state subjects. The Ministry of Home Affairs in its advisories has advised the States/UTs to take immediate measures to ensure safety and security and for elimination of all forms of neglect, abuse and violence against old persons through initiatives such as identification of senior citizens; sensitization of police personnel regarding safety and security of older persons; regular visit of the beat staff; setting up of toll free senior citizens help lines; setting up of senior citizen security cell; verification of domestic helps, drivers, etc.

Ministry of Railways

The Ministry of Railways provides the following facilities to senior citizens:

- Separate ticket counters for senior citizens of age 60 years and above at various Passenger Reservation System (PRS) centres if the average demand per shift is more than 120 tickets.
- Provision of lower berth in trains to male passengers of 60 years and above and female passengers of 45 years and above.
- Concession 40% - 50% in basic rail fare for male (60 years) and female (58 years) senior citizen respectively.
- Wheel chairs at stations for old age passengers.

Ministry of Civil Aviation

The National Carrier, Air India under the Ministry of Civil Aviation provides air fare concession in up to 50% of basic fare of normal economy class for senior citizens who have completed 63 years of age on the date of commencement of journey and on production of proof of age (Photo-ID) and nationality.

7. GAPS, RESEARCH AND POLICY NEEDS FOR INDIA TO ACHIEVE HEALTHY AND SUCCESSFUL AGING

The approach for achieving healthy and successful aging needs to be holistic and multidimensional; at the individual, family, community, governmental and non-governmental levels.

Opportunities must be provided for improving socio-economic status and access to health care.

At the family level, stronger intergenerational bonding needs to be encouraged and at community level, greater participation of elderly has to be ensured by active involvement in decentralized bodies.

Effective implementation of national policy and programs for older persons in line with the international instruments is imperative.

Government needs to enable civil society groups and engage the private sector in creating an elder friendly environment.

Data and research gaps in understanding issues of the elderly within the cultural context need to be undertaken on a regular basis and appropriate monitoring systems have to be put in place.

7.1 INTRODUCTION

Population aging is an important emerging demographic phenomenon in India, warranting a strong multi-sectoral policy and program response to deal with many significant implications for the elderly in particular and society at large. Longevity by itself is to be celebrated but for the increasing vulnerabilities of the elderly arising out of poverty, rural living, income insecurity, illiteracy, age related morbidity, feminization, dependency and decreasing support base. In most of the western countries, advanced stages of development preceded population aging but the same is not true for many developing and middle-income countries, including India. Further, India is presently going through a phase of demographic paradox wherein it has to capitalize on the demographic window of opportunity by investing in youth and at the same time focus on an increasing elderly population (UNFPA, 2011).

As the UNFPA (2011) report succinctly states that income insecurity, illiteracy, age related morbidity and physical and economic dependency are factors that tend to make the Indian elderly, and particularly elderly women, vulnerable. This has important policy and programmatic implications for improving the well-being and quality of life of the elderly.

The approach needs to be holistic and multi-dimensional; at the individual, family, community, governmental and non-governmental levels. First and foremost, opportunities need to be provided for improving socio-economic status and access to health care. Also important is extending social pension and health insurance, especially to women. At the family level, stronger intergenerational bonding needs to be encouraged and at community level, greater participation of elderly has to be ensured by active involvement in decentralized bodies. Effective implementation of national policy and programs for older persons in line with the international instruments is imperative and Government should ensure availability of physical, financial and human resources to do so. Further, Government needs to enable civil society groups and engage the private sector in creating an elder friendly environment. Data and research gaps in understanding issues of the elderly within the cultural context need to be undertaken on a regular basis and appropriate monitoring systems have to be put in place .

7.2 DATABASE TO UNDERSTAND EPIDEMIOLOGY OF AGING

Epidemiology, in general, studies the distribution of a particular health condition and examines factors that influence this distribution. Grundy (1998) suggests focusing on the following broad issues to understand the epidemiology of aging:

- Risk factors affecting the health outcomes of the aged.
- Prevention of diseases, therapeutic interventions and their evaluation in elderly populations.
- Studies on self-perceived or objectively assessed general health status of the old.
- Studies on age-related changes in indicators of health status, both general and disease specific.

Despite attempts in recent years to examine the health status and health risks of the elderly in India (Sathyanarayana et al., 2010; Alam, 2006, 2009; Siva Raju, 2002, 2000; Gupta et al. 2001), studying the aetiology of major old age diseases or disabilities remains an uphill task in India. Besides the lack of proper understanding about several dynamic factors in population sub-groups, including physiological, environmental and behavioural changes, there are major conceptual and data limitations, which may be better resolved by holding detailed longitudinal health surveys. This will facilitate policy formulation and creation of risk averting financial tools to meet the demand for long-term care.

With a rich tradition of Ayurveda and other traditional forms of medicine, it would be worthwhile to explore the realms of such forms in prevention and treatment of disease and also in the aging process. It is essential to substantiate the benefits of traditional dietaries/ document on traditional wisdom.

7.3 ELDERLY CARE: ROLE OF GOVERNMENT, NGOs AND FAMILIES

Traditionally, the responsibility for care of the elderly lies with the extended family. However, with the changing socio economic milieu, with migration of the younger population, increasing women workforce, smaller residential units and other complexities of modern day living, families are feeling the pressure of caring for the elderly in their homes. However, due to social pressures, old age homes are not considered a desirable option. Social conventions dictating the duty of adult children to care for their aging parents in their own home must relax. Efforts to support the families to care for their seniors are needed.

While old age homes may not be the best solution, they are a viable alternative. While the Government plans to open one in every district in the country, the need maybe much more. Alternate models of care such as old age community setups, assisted living, and day care centers also need to explored and established. Associated facilities like recreational facilities, meals on wheels, memory clinics also need to be created. Alternative models of home based supportive care like respite care, day care facilities, trained geriatric care givers should be established.

With no social security programs in place at present, the Government cannot entail the responsibility of caring for the elderly population entirely. It therefore focuses on planning, communication and conceptualization of the challenges faced by the aging population and it provides some amount of fiscal support to the Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs) involved in the delivery of specific services.

While, earlier, the role of CBOs was limited to care of destitute, abandoned or poor sections of society, religious and philanthropic organizations have been involved in providing food, shelter and clothing, setting up "dharamshalas", old age homes, shelters, training centers etc for many decades. In recent years, an expanding group of NGOs and CBOs including religious organizations has developed into major provider of services for older people. CBOs like the Panchayats in rural areas and the Resident Welfare Associations in urban areas act as a powerful pressure group on families to look after their elderly.

In the coming years, while the Government must address the macro issues of health care costs, social security etc, the CBOs and NGOs also private enterprise will play a pivotal role in supporting families in caring for their elderly. Special focus needs to be given to rural areas where 75% of the elderly reside, elderly from the unorganized sector and elderly women.

In the Indian context, the family will continue to remain the primary care giver of the elderly. The need is to strengthen the family's capability to care for the elderly by providing supportive services.

7.4 HEALTH CARE OF ELDERLY

Two concerns have often been expressed in the debate on planning for old-age health in India and other developing countries. These are:

- First, life course management, behavioural improvement and supportive socio-economic environment to ensure healthy aging; and
- Second, creation of physical, financial and human infrastructure to meet the health-related needs of older persons.

The former signifies the public health viewpoint and may help in postponing diseases (or disabilities), while the latter focuses on the creation of a chain of medical infrastructure to treat old age diseases, meet rehabilitation requirements and bring financial institutions to cover the risks of palliative and long-term care.

Life course management for healthy aging has to start young, particularly among Indians who are known to have a genetic predisposition to NCDs. Hence health promotion initiatives on healthy eating and physical activity need to be introduced as early as in school. Use of various forms of media should help to generate awareness on healthy lifestyles among all ages. The Government must launch nationwide campaigns to create awareness about NCDs and their prevention. While some small steps have been taken in this direction, a lot needs to be done.

There is a need for health planners to recognise the special health care needs of older persons. Geriatric clinics and wards have been set up in Government hospitals, but the numbers are not enough. NGOs and CBOs also have been active in this area for some time. They have organized mobile medical vans, cataract camps, charitable dispensaries etc. Often, access to healthcare facilities is also a hindrance to the elderly for accessing these services, which needs to be addressed. Long term care facilities, affordable home health care are other concerns which affect the elderly.

Frequent health screenings have also been suggested along with recommendations that primary health centers provide mineral supplements to the old to forestall deterioration in bone mass. As a public health measure, older persons in rural and urban areas may also be provided with prophylactic medicines to reduce the risk of sudden death.

A long standing issue of concern among the elderly is that of health insurance. With elderly not being covered under the ambit of health insurance, the financial costs of medical treatment are often difficult to bear. The Government needs to focus on developing a plan to cover the elderly under such schemes particularly the destitute, older women and the oldest old.

With the provision of special services for the elderly, it is imperative to have a trained workforce behind it. Therefore, training needs of health workers in care of elderly – home care to specialists have to be addressed.

In addition, services from voluntary and community-based organisations may also be used to complement the public health-care system. All this may however need a large data base, preferably longitudinal, with considerable understanding about geriatric health; in particular, how it moves from one stage to another and under what circumstances.

7.5 SOCIAL SECURITY

The pathway to poor health in old age due to an unsupportive family environment is another critical factor and needs serious consideration. Understanding the social context of aging may therefore prove helpful in devising ways to creating a more positive environment for the old.

Aging is an important emerging challenge in the country, particularly among the poor. A large majority of them are also economically dependent. Older women are found to be mostly deprived due to many socio-economic disadvantages, including those arising due to widowhood. Tobacco consumption is also significant among the aged, particularly in rural areas. In this scenario, health implications of population aging are clearly emerging as a major challenge for the planners and providers of health services in the country.

Socio-economic factors do have a role in shaping old age health. In particular, gender, economic status, living arrangements, caste, and income security are likely to contribute significantly to health outcomes. Growing age, widowhood, low educational levels and economic dependence do not augur well and bring significant health risks to people in later ages.

It is suggested that a scheme on the lines of the Rashtriya Swastha Bima Yojana (RSBY) may exclusively be designed for men and women covered under the National Old Age Pension Scheme. Currently, the RSBY is available to the entire BPL family irrespective of age. This may in many cases invite age-related biases. Following the RSBY health card, an 'old age health card' may also be considered by the State, especially for the poor and underprivileged elderly.

The country may soon be reaching a situation where a universal old age health security scheme would be essential.

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