ICSSR- NERC

AGEISM

Problems and Prospects

Edited By
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Ageism: Problems and Prospects

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Biomedical Aspects of Ageism

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The Science of Aging: Its Social Impact on India

Kalluri Subba Rao

Today's population statistics tell us that earth's population has gone beyond 6.5 billion and is expected to touch 9 billion mark by 2050. India can be proud that out of this 9 billion about 2 billion are from India. That is only one aspect of the demographic story. Out of the 9 billion people in 2050, about 10% of them would be above 60 years of age, the contribution from India to this "grandparent's boom" being 150 million. What is the reason for this global "grandparents boom" in spite of the apparently decreasing rate of population surge? The answer lies in the enormous increase in the medicare, decreased infant mortality coupled with health awareness of human population—all these emanating from the advances made in medical and health sciences research.

The impact of ever increasing population of elderly people has become a subject of great debate and consequences. The 'advanced' countries of the globe are, as usual, the first to realize and respond to this transforming demography. The science of Aging and associated debilities has become a thrust area of research. To keep elderly population in reasonable

health has become a social and economic priority for these nations in view of the medicare expenses for this section of society and the impending social problems.

However, India has lagged behind in implementing programs to control population and now lagging behind to take measures to covert its elderly population into a national asset. Improving the knowledge about the science of becoming old is intimately connected to keep the aging population young and convert them into a socially viable component of the society. This presentation is a small attempt to underscore the need to look into the changing demography as a composite problem involving both scientific as well as psycho-social aspects.

History has never witnessed so much information and knowledge about human body and the molecular mechanisms that dictate its miraculous function, as it is now. The two fundamental and awe inspiring natural phenomena, the birth and death had so much influence on human civilization and attracted the capabilities of the best minds to understand these phenomena. Man has gained some significant ground in the case of former. However, even though people are living longer and with the percentage of people above 60 on this planet is reaching the double digit 10, little is known about the precise mechanism behind why and how we become old and then die. According to an estimate by UN, nearly 20% of India's population will comprise people over the age of 60 years. Yes indeed, the ever-increasing population on this planet has crossed the 6.5 billion mark in the month of July 2005. Although the rate of increase of population has decreased from 2 percent in 60s to 1.2 percent to day, the nine billion mark is expected to reach around 2050. That is only one side of the story and the problem there off. Out of this 9 billion people in 2050, a large chunk of them would be from developing countries with India's share being close to 2

billion. Secondly the "grandparents boom" would become clearly visible and pose a major problem to the countries concerned and to the world at large. This means a significant percentage (according to my rough estimate-10%) of this 9 billion people would be in the age bracket of 60 and above. More than 150 million of this global aging population will be from India.

What are the reasons for this demographic change? It is but obvious that the reasons are scientific in nature. Because of the advances in medical and biological research during the last 100 years, infant mortality has grossly reduced and health care has vastly improved. People have become aware of the benefits of good nutritional habits. All these resulted in extended life span of people all over the globe. For example in India the life expectancy in 1970 was 49 years which has increased to 68.6 years today. The trend is the same in many other countries as well (Table 1) This demography is likely to bring up peculiar challenges including the national budgets for aged, health care problems, retirement policies, and utilization of the elderly and social management of the aged. It is a challenge that greets this millennium. It is a challenge whether the rapid advances in science and technology would enable maintenance of good health and the postponement or reversal of that type of old age marked by debilitating diseases and frailty. Would it be possible to preserve youthfulness for the later years in life? In other words, the problems of managing ever increasing elderly population must be based on science and technology as was the case in improved longevity of the human population. This means the science that has enabled us to live longer must also be used to see that proper health is maintained during the extended period of life span. The socio-psychological and economic problems would become easy to be tackled once the aging population is fit enough to basically manage themselves through the fruits of the scientific research. In fact a healthy elderly population

could be converted into a national asset through proper utilization and management.

Advanced countries have sensed this imminent "grandparents boom" almost 50 years ago and launched measures to alleviate the pressures that this demographic change could bring in. The reasons for the expected changes were looked into. It was obvious that reduction in the infant mortality coupled with improved nutrition and health care, resulting from the fruits of medical and biological research, are the reasons. It would be unwise and even uncivilized to make any effort to reverse these achievements. On the other hand emphasis was turned to see why we become "old" and what is the molecular mechanism(s) of this fascinating yet undesirable process. Would it be possible to modulate/control this process? The Science of getting "old" was born with a bang. Separate Institutes and centers were created both from philanthropic and Governmental initiatives to understand the science of aging and age associated debilities as well as to formulate innovative and humane management of elderly. Above all to examine how to prolong the "health span" of aging populations and convert them into a national asset. To day aging is one the thrust areas of research in almost all the developed nations and many others are following the suit.

For example, USA has created a new Institute for Aging Research, called National Institute on Aging (NIA) almost 40 years ago. Japan, European and many other countries have followed the suit. In fact, the European countries have got together and formed a European Research Area in Ageing (ERA-AGE, Gerda Geyer, *Experimental Gerontology*, 40, 759-762 2005). Apart from the State supported new Institutes, already existing centers, universities have created divisions and centers for gerontological research. These initiatives are yielding rich dividends. Tremendous progress is being made

in understanding the biological, clinical and behavioral aspects of the phenomenon of getting 'old'. To day about 250 genes are identified to be associated with the aging process and therefore the life span. Attempts are also being made to examine whether the process of 'aging' can be modulated at genetic, molecular and social levels. Extensive research is also going on to examine the possibility of attenuating the deleterious effects of age dependent disorders including neurodegenerative (Alzheimer, Parkinson, Huntington, Stroke etc.). It is no exaggeration to say that there is no university in USA, which not have a center or institute for gerontology researches (see Tables 2-5).

Independent India is just 60 years old. At the time of independence, the average life expectancy in India was around 40 years. Clearly old age was not a problem to worry about. On the other hand, the average life expectancy of an Indian to day is reported to be around 68 years and this figure is fast improving. Never before have had so many people lived for so many years- thanks to the amazing progress made in medical and biological research. As such to day India has nearly 80 million people over sixty and this number is suspected to go up to 117 million in 2010 and further up in the years to come (Registrar General of India and National Commission on Population, 1996; http://populationcommission.nic.in). As already mentioned above, it is projected that there will be more than 150 million people above 60 years of age by 2050. This changed demographic profile is likely to exert immense pressure on the Government and the people themselves in many ways that are being experienced by the nation to day as a result of mere increase in the population-not to talk about the bulging portion of the aged population.

Yet India does not seem to show any urgent concern about the fast changing demography. It has lagged behind in this aspect for obvious reasons. If the increasing 'aged' population

of the country is not taken care of and looked after well and maintained at reasonable health levels, then it would eventually become an extraordinary cost burden of no returns to the Government and the society at large. On the other hand, the 'ageing' population can also be converted into a national resource and asset with proper planning and imaginary inputs. Thus the older people in any country would pose a challenge as well as an opportunity. It is time that India takes an initiative to make it an opportunity because of the advantage it enjoys in mere numbers. This can be termed as Wisdom Resource (preservation and) Development (WRD) and through this the country can derive the *longevity dividend.* Thus it pays to keep the people with extended longevity in good health and spirits. It is encouraging that the Government of India has indeed started looking seriously at this problem (responsibility) in recent past and announced a policy for senior citizens as below.

The National Policy on Older Persons seeks to assure older persons that their concerns are national concerns and they will not live, unprotected, ignored and marginalized. The National Policy aims to strengthen their legitimate place in the society and to help older people to live the last phase of their life with purpose, dignity and peace. The National Policy on Older Persons inter alia visualizes support for financial security, health care and nutrition, shelter, emphasis upon education, training and information needs, provision of appropriate concessions, rebates and discounts etc. to Senior Citizens and special attention to protect and strengthen their legal rights such as to safeguard their life and property. The National Policy on Older Persons confers the status of senior citizen to a person who has attained the age of 60 years.

This above avowed policy has been capped very recently, in December 2007, by a bill passed by parliament. This bill

is named "The maintenance and welfare of parents and senior citizens bill-2007". I would like to describe this bill as an historical one in that the Government of India has perhaps for the first time taken the maintenance and welfare of the senior citizens rather seriously and mooted steps to be taken for dignified living of senior citizens. This bill provides a provision for judicial authority to jail children for three months if the parents complain their negligence by children. This may sound peculiar to Indian society, what is important is that the Govt. has taken cognizance of the plight of some parents and created a deterrent in the form of a law for such social offence. The bill also envisages establishing old age homes in every district and a tribunal to look into the difficulties of senior citizens in that district.

The above bill sounds so good as to raise suspicion about its implementation. Be as it may, this is only one way of tackling the problems of senior citizens and there is yet another and perhaps more important way to empower the aged population in terms of their health and quality living and make use of their expertise in different needs of the country. Concrete steps and inputs are necessary. One such step is to establish one or more (in view of the vastness and diversity of the country) Institutes or Centers for a multidisciplinary scientific study of the phenomenon of aging and the associated diseases/problems. Such Institutes would also prepare a database for the clinical and biological profiles of the populations around particularly of the senior citizens to begin with.

It is heartening to note that finally Government of India has decided to start two National Institutes of Aging research and some regional centers. Some budgetary provisions have also been made by the finance ministry but it is to be seen when the proposals will become a reality. Meanwhile it is the responsibility of all the intelligentsia of the country to see

that the public at large are engaged in realizing the fruits of aging research and then mould the life styles in a manner that is useful to them and the people around. The management of the elderly should not become a vested tool in the hands of some but it should grow on a scientific and sociological basis.

Table 1
A glimpse global life expectancy in 2008

Country	*Life Expectancy in Years*
India	68.6
USA	78.0
Australia	80.6
South Africa	42.5
China	72.9
Russia	65.9
Saudi Arabia	75.9
UK	78.8
France	80.6

Data Taken from World Life Expectancy.com

Table 2
Longevity & time taken for reproductive maturity

Spcies	*Longevity (Years)*	*Age of Puberty (Years)*
Human	100	12-14
Elephant	70	12-14
Chimpanzee	40	10
Dog	30	1
Rhesus Monkey	25	3
Cat	252	1.5
Rat	3	0.25
Mice	3	0.20

Table 3
Aging is genetically programed

- Hayflick's limit for in vitro grown cells
- Fixed Life Span of Species
- Aging Begins at discrete stage of Life
- Premature Aging Syndromes
- Gerontogenes (Genes affecting life span)
- Immortalization of cells in Laboratory

Table 4
The number of genes when mutated, known to either extend or shorten the life span in different species

Organism	*Total number of genes known to modulate life span*	*No of genes that shorten life span*	*No. of genes that extend life span*
C.elegans	116	12	104
S.cerevisiae	94	48	46
Drosophila	35	5	30
Mice	24	13	11
Humans	8	8	NIL

Information gathered largely from University of Washington, Seattle, WA. USA data base.

Table 5
A selection of Evolutionarily Conserved Longevity Determinants. A small number of genes or interventions are known to increase life span in different model organisms. Some are mentioned here

1. Antioxidant enzymes – Increased expression of antioxidant enzymes, such as superoxide dismutase and catalase increase life span in yeast, flies, and mice

   Resveratrol – Increases life span in fish, worms, and flies Resveratrol is a polyphenolic compound found in red wine and grapes that acts on several cellular proteins and acts as antioxidant.

2. Dietary restriction- (calorie/caloric restriction) – Dietary restriction increases life span in yeast, worms, flies, mice, rats, and other organisms. Increased activity of Sir2 orthologs increases life span in yeast, worms, and flies.

3. Insulin/IGF-1 – Mutations that decrease insulin/IGF-1-like signaling increase life span in worms, flies, and mice

4. Inhibition of all those pathways that promote growth and development (ribosomal proteins maturation, protein synthesis, fat synthesis etc.,) and promotion of maintenance pathways like DNA repair, reversal of oxidative damage leads to extended life span.

Ageing is a natural process. It is part and parcel of every human being. It is a natural phenomenon which affects each society, however, its magnitude and manifestation are not the same everywhere.

In order to address this issue, ICSSR North-Eastern Regional Centre organized a two-day National Seminar at Shillong and this book contains the outcome of the seminar.

The vital information, contributed by scholars of repute on ageism herein is organized under the three main themes:

- Biomedical Aspects
- Sociopsychological Aspects
- Socioeconomic Aspects.

This book calls for a wider readership, cutting across activists, policy-makers, academia as well as the general public.

Rs. 1200/-

Professor R. Sharma did his Ph.D. from Banaras Hindu University and has been teaching various disciplines of physiology and biochemistry for more than 27 years, mostly at post-graduate and research levels. He has done his post-doctoral from the University of California, Berkeley, USA (1986-88) under National Scholarship to study abroad from MHRD, GOI and has been a visiting professor at the Institute of Enzyme Research, Tokushima University, Japan (1989-90) and at the Department of Biochemistry, Toho University, Japan (2003-04). He has produced a number of Ph.D.s and has completed several research projects in the area of development and aging. Prof. Sharma is serving on the editorial board of the journals of International repute: Biogerontology, Okinawa Wellness & Longevity Journal, International Journal of Developmental Neurosciences, besides being referee for CSIR publications and for research projects from DST /CSIR/UGC in the area of aging research. His area of research is on enzymology and hormone action mechanisms during development and aging, with special reference to glucocorticoid action mechanisms, malate-aspartate shuttle, cross-talk in signal transduction, dietary restriction regulations. He has been the Head of the Biochemistry Department twice and is also vice-president of the Association of Gerontology (India). Prof. Sharma is an elected Fellow of the National Academy of Sciences, India.

Dr. C. Joshua Thomas is known for his pioneering researches in diverse fields of social sciences in North-East India and his recent work on Ageing in Megahlaya has been widely appreciated. Currently he is the Acting Director, ICSSR North-Eastern Regional Centre, Shillong.

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