

# INTRODUCTION



***“Start by doing what is necessary, then what is possible, and suddenly you are doing the impossible”***

***-St. Francis of Assisi***

“The elderly, a rich resource of knowledge and experience, have often been excluded from the design process”.....although they are not a homogenous group they are..... “unique individuals with a common goal-living life with dignity”.

Age is the caress of time, but for some, it is less a caress & more of castigation. The period of senior citizenship should be a golden time, when one rests from a lifetime of labour, basking in the warmth of familial affection and social adulation. A period so clearly visualized in the Vedic scheme of existence as a time of rest, contemplation and the higher life-loved and cared for by the successors one has succored and brought up in life.

Ageing is a complex, multi-factoral, inevitable and natural phenomenon occurring in almost all biological species. It is a relentless process associated with a generalized and progressive accumulation of a variety of changes responsible for the impairment of physiological functions. This leads to a decreased ability of the organism to respond to a wide range of stresses and adapt to adverse situations.

Consequently, the organism is subjected to an increased risk of various old age diseases and disabilities (Thakur, 1993, 1996a, 1999a, 2000a, Kirkwood, 1995, Singh et, al, 1996) which in turn result in a rise in vulnerability and reduction in vitality and ultimately death of the individual.

According to Stewart and Senis (1967) “Ageing is a collective term for all representative organisms living under representative environmental conditions as they advance in chronological age”.

The world over, there has been a rapid increase in the number of elderly people. In mid 1995, the world’s elderly population (defined as persons 60 years and older) was estimated at 542.7 million, nearly, equaling Africa’s population in 1985. One in eleven of the world’s inhabitants are at least 60 years of age. Fifty-five percent of the world’s elderly are women, under scoring

their lower levels of mortality as compared men (Concepcion, 1996), also over half (52 percent) of the world's senior citizens dwell in Asia. However, it is population (60 years and older) is the second largest in the world. It was estimated that the proportion of elderly people would increase from 7.7% (76 million), in 2001 to about 11% (142 million) in 2020 (UN, 1999). With this demographic change and increase in the proportion of the elderly, societies in developed & developing countries have to learn how to deal with a new set of health challenges and needs.

The aging population has to cope with the associated progressive loss of physiological capabilities which may dramatically reduce the individual's ability to participate in everyday activities. There is an increased incidence with age of arthritis and other crippling diseases which restrict range of joint movements. Moreover, normal healthy individuals with advancing age, show physical changes which affects posture, stance and reach. The elderly people suffer from the dual medical problems of both communicable as well as degenerative disease. This is further compounded by impairments of special sensory function like vision and hearing. The elderly are highly vulnerable to infectious diseases because of a decline in their immune functions. UN projected in 1994 that Asia will have the majority of world's elderly population by the turn of the 20<sup>th</sup> century. The number of elderly was foreseen to rise from 280 million in 1995 to 426 million in the year 2000 which would swell further to 693 million by the year 2025.

Ageing is an universal phenomenon. However, not all old people are alike. There is considerable diversity among old people. Age, that is, whether a person is young-old, old, or old-old, does make difference to health and well being. Similarly, race, gender, social status, and marital status determine the quality of life in later years. It becomes necessary to differentiate between old men and women as gender is a powerful factor affecting quality of life at all stages of life. Women in the developing world experience low social status, poor reproductive health care, economic dependence, malnutrition and domestic violence which affect their well being adversely. Over the life cycle

such disadvantages accumulate leaving an older woman in a vulnerable condition.

The "aged" experienced atrophic changes in various parts of the body. The physiological changes in the old age lead to impaired cough reflex, impaired circulation and tissue perfusion. There is deficient collagen synthesis and poor wound healing. In India further, incidence of infection remains high because of poor nutrition and high intake of immunosuppressive drugs.

Maximal work is reached at a lower work load than in younger people (Astrand 1958), and at first, though there is little diminution in capacity for stationary work, when walking is also involved there is a marked lowering of efficiency (Durmin and Milkulici, 1956); to some extent however this decline in physical work capacity is due to decreased desire for spontaneous physical activity and hence to a lower state of muscular training. There tends to be increased fragility of bone and decreased elasticity of tissues (Ma and Cowdry, 1950), so that minor accidents which would produce more bruises in younger adults leads increasingly to fractures and strains. Hence activities which are normal for younger folk, involve an undue element risk for elderly.

Changes in the body as it ages result in a decreased ability to negotiate the environment both from a perceptual and musculo- skeletal stand point, but at the same time these changes cause an increased dependence on the immediate or 'micro' environment'. Thus an elderly person's home and the items used there assume greater importance than when the person was middle aged (Koncelik, 1982).

The elderly dealing with changed capacity, reduced ability and increased needs require the same accommodations and compensations in late life that they found in earlier years. Homes must provide solutions that address these distinctions in capacity, ability and need for daily living.

The quality of housing can enhance or diminish the well being of individual and families as that of the entire community. As we think about low a home could be improved for accessibility, remember that a "handicap" occurs when a task can't be performed because the environment presents barriers a person's

physical ability can't overcome. Handicapping situations can be reduced or eliminated by modifying the task, the individual's capabilities (with personal assistance/mechanical aids) or the environment. Hence, this is a major field where much improvement could be achieved by considering more fully the human factors involved. Therefore, home ergonomics is becoming very important amongst home scientist, ergonomists, industrialists, builders and interior designers (Varghese, et.al 1989).

Ergonomics is the study of human characteristics for the appropriate design of the living and working environment. Ergonomics researches strive to learn about, human characteristics (capabilities, limitations, motivations, and desires) so that this knowledge can be used to adopt a human made environment to the people involved. This knowledge may affect complex technical systems or work tasks, equipment, and workstations, or the tools and utensils used at work, at home, or during leisure times, Kroemer (2002). Hence, ergonomics is human-centered, trans-disciplinary, and applications oriented. The fundamental goal of ergonomics is to generate:

- “Tolerable” working conditions those are not hazardous to human health;
- “Acceptable” working conditions upon which the people involved can voluntarily agree according to current scientific knowledge and under given sociological, technological and organizational circumstances;
- “Optimal” working conditions in design and well adapted to human characteristics, capabilities and desires any physical, mental and social well- being achievable by majority of people.

Core of ergonomics knowledge consists of four major applied sciences:

1. Anthropometry – the measuring and description of the physical dimensions of the human body.
2. Biomechanics- describing the physical behavior of the body in mechanical terms.
3. Physiology- applying physiological knowledge measuring techniques of the body at work.

4. Industrial Psychology- observing worker's attitude and behaviour at work.

Ergonomics in health and safety terms has a vital role in any place, where the avoidance of sudden or cumulative musculo-skeletal damage is sought and where the consequences of a mismatch and the operational capabilities of equipment/machines may result in accidents. Ergonomics of the home is the science of analyzing the normal operation of human body under domestic conditions so that building rooms; structures and fitments can be designed to suit them (Grandjean, 1973).

Provision of the possibility to measure up the quality of human life and that of whatever in use to secure him comfort and safety is the most important issue to be considered in the design and production for human body. Therefore it is essential to offer effective and efficient designs, provide required conditions to secure comfort and make safe the products manufactured for the user.

In order to offer an efficient and effective design, various principles and criteria should be considered. The importance of applying ergonomic principles in designing for the elderly is therefore apparent. Roberts (1960) reported that the body size of surveyed elderly women were smaller than the younger female population of Britain, stature for instance being some 3-4 inch below that regarded as average for British women (63-64 inch). The elderly are recognized as a distinct population anthropometrically.

According to Health and Nutrition Examination survey (1971-73) the elderly males aged 65-74 years are on the average 2.4 inch (6.1cm) shorter, but only 1 lb (0.45 kg) lighter than the youngest age category of adults. Elderly female, on the other hand, are 2 inch (5 cm) shorter, but fully 14 lb (6.4kg) heavier, than their younger counterparts. Molenbroek (1987) reported that one of the reasons for anthropometric research on the elderly lies in the fact that design solutions for the elderly made in accordance with anthropometric guidelines are often also easier to use for others who do not have the physical capabilities of young and healthy people. Secondly, anthropometric data helps in

reducing high number of home accidents among elderly people, as products or environment difficult to use provide a frequent cause of accidents when the physical and psychological capacities of users are ignored. Varghese, et al (1989) found that many accidents and ailments are caused by awkward working heights and badly placed storage shelves in kitchen.

Knowledge about human body size is important, but not alone sufficient for the ergonomic design of home facilities for the elderly. Information about functional capabilities, mobility, abilities, limitations to perform certain tasks as a function of changes in biomechanical, physiological, psychological and mental characteristics and in attitudes and behaviours is also needed (Kelly and Kroemer, 1990). While considering the changes that must be undertaken in a home one needs to take into account that the older adults (1) exhibit a wide range of physical and psychological differences than any other age group; (2) have changing needs that require on-going assessment of the environment; (3) live in different housing structures with their own unique characteristics and (4) engage in learned behaviour that affects the ways they relate to their environments.

The decrease in capabilities and mobility tends to confine the elderly and most of their activities to their homes. The time spent at home is hence increasing, as are also the demands on home conditions. Analysis of the indoor environment shows the presence of various risk factors worsened by the psycho-physical condition of the elderly. The home should be fitted to the physical and psychological characteristics of the elderly person (Willcocks et.al, 1982) and it should be designed to promote familiarity and orientation with the environment (Caterina and Pinto, 1994). As inappropriate conditions of the environment brings about physical disabilities for the people, appropriation of living and working conditions for better utilization, and preventing the evolution of conditions that result into future disabilities, due to time and repetition is of special importance.

While performing the daily living activities elderly people deal with storage units frequently in the different areas such as kitchen and bedroom of

their home. Good storage facilities in the kitchen add to the efficiency of work and give maximum comfort to the worker. Storage systems are great triumphs of synergistic efficiency. Storage system should be both flexible and versatile. A house must have adequate provision to store various tools, equipment, food supplies and other essential amenities to lighten third ager's work load. Sometimes storages lack functionality as well as the fabrication is not up to the needs and requirements of the elderly due to which they face problems. The dimensions, placement, designing etc. of the existing storage units are not up to third ager's needs and requirements. These small problems, when looked in ergonomic terms may well be discovered that the storage units causing problems to the third ager's are really quite badly designed from functional and fabrication stand point. The faulty designs of storage unit leads to adoption of poor and awkward postures posture in order to perform tasks which could leads to postural stress fatigue and pain, which may in turn force the operator to stop work until the muscles recover (Corlett, 1981). With the faulty design of storage system, even normal person without primary anatomical or physiological defects develop degenerative tissue changes and functional defects on the musculo-skeletal system resulting in decreased output with maximum input.

Most people seem to tolerate these ergonomic deficiencies without any real difficulty because they get adapted to these storage units and are not able to identify that these storage units are the cause of these problems. The storage must be designed as per the needs of the third agers' to reduce physiological cost of work and fatigue to the minimum as well as which maintain a good working posture. As good working posture reduces the physiological cost of work to the minimum whereas, static muscular efforts and incorrect postures for longer period during daily living activities may cause tiredness and may increase the energy expenditure in proportion to physical efforts involved, leading to irreparable damage to the body.

Therefore, in order to accommodate the elderly as viable and productive members of house it becomes necessary to consider their capabilities,



limitations, needs and requirements for designing and modifying storage units for them.

### **Justification:**

Many people blame the ageing process for problems they encounter with daily activities, when instead quite often it is the design of the home itself that creates unnecessary disabilities. Even though there are more people over the age of 60 than there are under 25 years of age, the design of today's homes, including the products contained in them, is still based on the anthropometry of young healthy adults. Builders and manufacturers do not take into account age related conditions such as limited range of reach or reduced mobility when creating a home or household product. Consequently, most dwellings are hostile to the physical and sensory changes that older adults encounter as they live well into their 8<sup>th</sup>, or 9<sup>th</sup> or 10<sup>th</sup> decade.

In everyday life people frequently come in contact with storage units and elder people due to several causes as discussed earlier face problems while using storage units as they are not up-to their needs therefore, retrofitting the existing storage units and developing new guidelines for designing storage units for older adults <sup>has</sup> ~~is~~ become necessary. For any research program to be successful it is a three tier system which has to be followed and i.e. assessment-awareness-action. To impart awareness among elderly it is a must that the present status should be assessed, awareness should be created by most effective mode and actions should be taken to make the "life easy".

The above discussion justifies that designing of storage units requires standards based on anthropometric data of the third agers'. But there is inadequate information regarding this aspect for Indian elder women of various regions. There is a strongly felt need for such valuable information; hence it becomes necessary to study the anthropometric parameters of large section of elder women to provide a complete picture of diversity in size, shape, need and requirements of elder women than younger women which could be used as a reference data in planning ergonomically appropriate storage units. And also a

need was felt to study the existing storage units in selected areas of the house and the problems experienced as well as the satisfaction felt by the women in the third age so that modifications can be suggested for the storage designs which are most appropriate for the third agers. The present study with the following objectives will fill the existing lacuna in the planning of functional storage for the women in third age.

### **Statement of the problem**

Hence a study was undertaken to study storage design for the people in third age through an ergonomic approach.

### **Objectives of the study:**

1. To collect selected information of the women in third age from Ghaziabad city viz.
  - Demographic information
  - Health status of the respondents including frequency of activities performed by them
  - Anthropometric and Reach measurements
2. To study the existing storage facilities available in the selected areas of the residence viz. kitchen and bedroom of respondents.
3. To find out the extent of problems experienced by the respondents regarding existing storage facilities in selected areas of their residence.
4. To find out the level of satisfaction of respondents with the existing storage facilities.
5. To develop ergonomically appropriate guidelines for storage design in selected areas of the residence of people in third age.

### **Delimitations of the study:**

The study was limited to:

1. Ghaziabad city of Uttar Pradesh
2. Women in the third age i.e. who were above 60 years.

3. Storage units of selected areas of the house viz. kitchen and bedroom.

**Hypotheses:**

1. There exists a relationship between the extent of problems faced by the respondents with existing storage units and their personal, family and situational variables.
2. There exists a relationship between the level of satisfaction of the respondents with existing storage units and their personal, family and situational variables.
3. There exists an inter-relationship between the extent of problems of the respondents with existing storage units and their level of satisfaction with existing storage units.