



# Indian Urban Kitchens: Space Analysis For Elderly Users Of Pune City, India

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## ARTICLE INFO

## ABSTRACT

The kitchen is an important area in the home serving both functional and social requirements. The kitchen environment needs to be usable and comfortable. The favorite place of most of women in their house is kitchen. Indian women spend about 3-4 hours a day in kitchen. [1]

Thus the kitchen environment need to be designed well to support independent living for older people. Doing daily cooking related activities in Kitchen becomes a part of life for this elderly population of women in India and especially for home makers it also continues in their old age. Making the kitchen space accessible, comfortable for independent activities by these elderly women in urban context is important. In India, elderly population is growing and because of migration of younger generations to different locations, these people prefer to continue living independently in urban apartments. [3] With changing requirements and restricted physical abilities elderly Indian women still prefer to perform cooking related activities in their homes independently or with little help.

This paper aims at the study and analysis of kitchen space in urban homes and exploring ways to enable active ageing. The planning of the kitchen area in the house needs to be considered of prime importance in order to facilitate the carrying out of activity by reducing the effects of fatigue and accidents in the kitchen.

It is appropriate to regard the domestic kitchen used by an elderly woman as her workplace, requiring application of the ergonomics principles such as environmental conditions, equipment design and workplace layout as per her need. The purpose is to enable them to perform activities in the kitchen comfortably, safely and without assistance.

In this context, kitchen space was chosen as the area of study as it is the highest functional room in every house. And the ability to cook for self with ease and comfort forms an important part of independent living. The aim of this project is to study Indian domestic kitchens, mostly the modular kitchen segment in urban apartments, with respect to the aging population and come up with simple design interventions that can be easily adopted and implemented by this segment, in order to eliminate or reduce ergonomic risk factors.

This paper reports on the contemporary kitchen experience from an ergonomics perspective and identifies the problems faced. This study addresses the need to study modern urban modular Kitchen space and its functionality as per requirements of elderly women. It addresses the ergonomic considerations while designing kitchen space. A central aim of the study was to produce guidance for older women to help them perform kitchen tasks more easily and make adaptations to the modular kitchen to match their evolving needs.

The study is conducted by selecting Pune city as urban context and kitchen space users in apartments in multistoried building units by doing a qualitative research study by survey and using structured questionnaire and focused group interview. A method used to select sample is a non-probability quota sampling and 36 samples are selected. The respondents are of age group 55 to 85 and all are residing and using kitchen space for everyday cooking activities. The questionnaire survey is done and data is analyzed. At second stage scheduled

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interviews are conducted in the user's environment and using interview technique field observations are noted. Both qualitative and quantitative data is analyzed and findings were noted. Design Guidelines are suggested using reference literature and standardized and established design solutions.

**Keywords:** Indian Kitchen, Urban homes, Modular Kitchen, Elderly population, active ageing, ergonomic design

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### **Introduction:**

The kitchen is an important area in the home serving many purposes both functional and social. It is central to enabling people to stay within their own homes in their later life. An Indian kitchen poses unique challenges to the elderly, in terms of its context and usage. With older people's changed physical, psychological and cognitive characteristics, design of kitchen space would play a crucial role in not only maintaining but improving their quality of life at this late stage. According to the law, a "senior citizen" means any person being a citizen of India, who has attained the age of sixty years or above. According to Population Census 2011 there are nearly 104 million elderly persons (aged 60 years or above) in India; 53 million females and 51 million males. A report released by the United Nations Population Fund and Help Age India suggests that the number of elderly persons is expected to grow to 173 million by 2026. [4]

Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. Nowadays, there is an increasing number of elderly living independently that makes us think about everyday spaces and tasks which might be difficult for them. Most common disability among the aged women was locomotor disability and visual disability as per Census 2011. [5] The daily spaces inside urban homes used by these people need to be designed well by analyzing specific requirements and not one size fits all kind of purpose.

In India, kitchen space is used for food storage, preparation, cooking and dishwashing. Although the main function of kitchen is cooking, it can be the entre of other activities as well depending on its size, furnishing, and equipment and a typical Indian cooks thrice a day.

Kitchen is a space which is used by all members of the family but typically in Indian households it is the women who takes care of cooking activities. Despite the fact that large numbers of Indian women are working, they continue to cook for their families. That women continue to perpetuate this pattern dovetails with the dominant gender ideology that ascribes certain tasks to women such as housekeeping, cooking, and taking care of the children while men take care of other responsibilities connected to the home. Even the women are in her later life when she is older still she continues to take up this responsibility. Thus Kitchen as a space is of a prime importance and need to be suitable to make her do the activities in a non-stressful way.

The work area especially kitchen should be adequately designed and properly arranged in order to reduce the physical, psychological and temporal cost of the homemaker. With the planning, one can transform the kitchen into a comfortable and pleasant working place and make the kitchen activities easy and enjoyable.

Ergonomic design takes into account the abilities and limitations due to aging such as limited accessibility, how a user with limited physical capacity can do the tasks with less efforts and helps to create the best person-environment fit. Safety, physical and social health must be taken into consideration to increase the quality of elderly women's lives. Old age is associated with many reduced physical and mental abilities. In this context, kitchen space was chosen as the area of study as it is the highest functional room in every house so it needs to be accessible and user friendly to these elderly women users.

### **Ergonomics:**

The study of ergonomics is extremely important in recent years. Ergonomics is a branch of science that aims to learn about human abilities and limitations, and then apply this learning to improve people's interaction with products, systems and environments. Ergonomics aims to improve workspaces and environments to minimize risk of injury or harm.

Ergonomics takes into account the user's capabilities and finds methods that make tasks easier utilizing equipment and the surrounding environment. Ergonomics principles should be considered in designing kitchens for elderly women especially in developing countries like India.

Ergonomic study can help in understanding postural issues when doing cooking like standing for longer time, problems with bending down, limitations for lifting up heavy vessels or groceries or issues related to grip and vision or fatigue due to repetitive movements while performing cooking activities etc. If ergonomic study is applied in kitchen design or renovating kitchen space to minimize these issues the women can perform these daily tasks more efficiently.

### **Research Problem/ Need for research:**

In contemporary times, more and more nuclear families are settled in urban areas of India, it is needed that Kitchen as a space need to be designed in a way to facilitate maximum functionality or ease of use for all age groups especially elderly people. For women as they are primary users of kitchen space it need to be comfortable to perform basic activities in later years. Ergonomic considerations while giving design guidelines can help for

the same. Thus there is a need to study Indian urban modular kitchen space and its functionality for elderly women. In the kitchen the need to have everything on hand and to move freely and tirelessly is often the goal which is not achieved satisfactorily by elderly women. One of the most important health problem for these women is pain observed at upper and lower back region and leg pain. Posture and mode of work had a great effect on the development of musculoskeletal disorders among women engaged in different kitchen activities. Repetitive movements like chopping and dicing vegetables, awkward positions like holding the head downward to cook food or bending while arranging utensils, overreaching like reaching for supplies on platform or reaching for higher cabinet's, lifting like moving pots and pans are the most commonly done while working in kitchen. A study was conducted to understand the problems faced while performing these kitchen activities and space design is also studied. This study helped to understand the special requirements in terms of design changes and user's aspirations for the same. Postures and its maintenance play a major role in reducing muscles stress. With use of certain ergonomics principles as well as proper interior of the kitchen can play an important role in reducing health related problems and can enable elderly women to work efficiently in the kitchen space.



urban kitchen space in India

### Objectives:

1. To study the kitchen layout and time spent in kitchen activities in urban apartments of elderly users. To study user persona of primary user to understand the activity pattern.  
(Direct observation and photographic documentation along with field notes is the methodology used for the same)
2. To study problems faced while working in Kitchen by user and insights about their requirements and suggestions.  
The above two objectives will be explored in this study.

### Methodology:

Qualitative research was conducted for the selected sample with questionnaire study and interviews with focus group by taking field notes and photographic documentation. The collected data was analyzed using parameters already decided and findings were presented. Questionnaire and focused interview with photographic documentation was done with selected 36 samples residing at two different locations of different multistoried apartments. All the respondents are women and of age group 65 to 85 years and actively using the kitchen space for cooking related activities independently or with some help.

Field survey, pre structured questionnaire survey, focused interviews, Contextual enquiry are the methods and tools used for the study.

The interviews were conducted in their kitchen space which lasted about an hour each along with detailed observation photographs were taken.

### Modular Kitchen Design in India

A modular kitchen is simply a modern and flexible way to design kitchen, allowing user to choose a variety of cabinets for different functions which come in "modules." The modules are available in different sizes. These can suit various functions depending on which area of the kitchen the user would choose to use the module. They are also available in any number of colour, styles and finishes.

In contemporary times, it is most popular practice in urban apartments to install these modular kitchens. In metro cities builders do offer this modular Kitchen already installed for user with standard design along with the purchase of apartment unit. Many times, user requirements as per ergonomics, user profile, tradition and

customs, lifestyle, requirements are not considered but just one size fits all kind of approach is adopted. For elderly users if they are living in the same house no changes are done in the modules and also there are not separate options available in market.

### Understanding Kitchen design:

The general layout of the kitchen is designed considering the work triangle, to minimize the walking distance in regard of the work sequence. The two main kitchen design principles that helps to design a more efficient kitchen – called the *work sequence* and *the kitchen triangle*.

The work sequence is the order of activities involved in preparing food. This means all the steps from walking in with the groceries, storing the produce, to prepping, cooking, eating, and to eventually cleaning it all away. So all the kitchen activities can be broken down into 6 steps. [11]

1. **Store** – unloading and unwrapping of food, storing in refrigerator/freezer/ cupboards
2. **Wash** – washing, sieving food, dishwashing
3. **Prepare** – peeling, chopping, weighing, mixing and pre making
4. **Cook** – hob/ stove for boiling and frying, grill for grilling and browning, oven for baking and roasting, microwave oven for defrosting, fast cooking and heating.
5. **Serve** – dishing up food, keeping food hot, toasting bread, storing cutlery, crockery and condiments
6. **Eat** – table laying and eating
7. Once these steps are completed, you usually go through the return sequence as follows;
8. **Clear** – removing dirty dishes to sink and dishwasher, returning uneaten food to refrigerator and cupboards.
9. **Wash up** – waste disposal, loading dishwasher, hand washing, draining, putting away

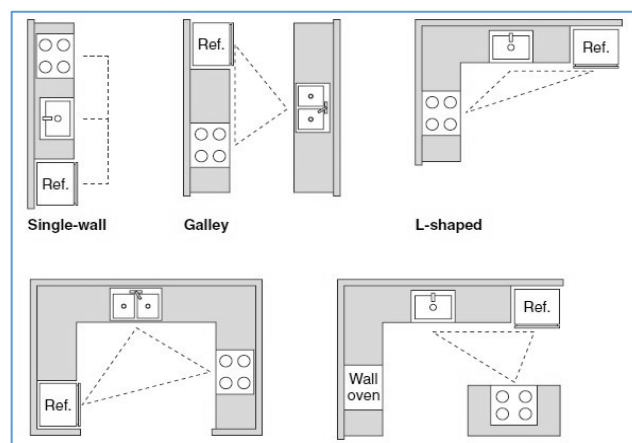
The design process is based on the idea to design a layout where cross circulation is as minimal as possible. In other words, to arrange the kitchen in a way that the listed tasks can be carried out with least possible effort.

### Kitchen work triangle:

The work triangle is the relationship between three of the main appliances used in the kitchen – the refrigerator, sink, and the cooker. As a rule of thumb, when we add the lengths together, the sum should not be less than 3.5 meters, and no more than 6.5 meters. Shorter distance means that we don't have enough work surface space, whereas longer distance means that we'll just end up walking around too much every time we cook a meal. So even though we are working on a fairly large family kitchen layout, we can keep it efficient by following the kitchen triangle rule. The triangle lengths are calculated from the center of each appliance. [3]

### Types of Kitchen layouts

Kitchen Layouts & Work triangle The layout of the kitchen has impact on the way the user cooks at the kitchen. Refer the image for the type of kitchen layouts and work triangle.



**Fig 1:** types of kitchen layouts

Single Line - A very basic layout that should be kept as compact as possible. The cooker and sink must be kept closer in this layout.

L Shaped - A work sequence

runs around two walls, keeping work triangle reasonable compact. Space utilization could have been better.

Gallery Layout - Gallery kitchen has the most compact work triangle which is less tiring to use.

U Shaped - This adaptable layout is wrapped around three walls in an unbroken sequence. The two corners would give some wasted space.

Island - This should be used in places where space is plentiful, if there is lot of walking while cooking, this plan might turn inconvenient

### **Literature study:**

The research consists of 65 peer reviewed research papers reviewed through different search engines like google scholar, science direct, elsevier, research gate using keywords like Indian Kitchen, Kitchen design, ergonomics and kitchen design, modular kitchen, Traditional and modern urban kitchen, kitchen for all, universal design and kitchen etc. Out of which selected research papers were considered for this paper which are on a topic of Kitchen design and elderly users.

#### **Accessibility in Kitchen design for elderly women:**

Kitchen Design will be applicable in all context only if it is made more accessible and user friendly. For application of universal design to kitchen design, considerations for not only the size, the shape of the kitchen and its appliances but also for clear floor space, work triangle, countertop, reach range, and knee clearance formed by the location of each appliance are required. A better alternative is to make common housing more accessible, usable, and universal for the highest number of people with varied capabilities by providing appropriate layouts and optional spaces for adjustments such as removable base cabinets, pull-down shelves etc. [1] This is to make the space more efficiently usable for elderly women and more possibility of adaptation to changes which will be required from time to time.

#### **Ergonomic Design:**

Ergonomics principles are not frequently considered in preparation kitchens especially in developing countries like India. Study conducted by SpineClinic in Kitchen Ergonomics and Back pain and found that simple changes in kitchen ergonomics have far lasting and very good effects on spine and joint pain of women.[1] Changes like taking foot stool while standing, arranging cabinets and postural modifications were done. A common goal of these changes was to reduce the unnecessary loading of muscles, improve the posture, and reduce the fatigue level. Excessive stress on the body can lead to disability resulting in pain in daily routine activities. Ergonomic solutions can help in reducing some of the fatigue level of women while optimizing their sense of overall well-being. [9] Maximum work in the kitchen is done in standing; due to this woman always feel fatigue after kitchen work. Also it is observed that Indian women spends more time for cooking in morning time for preparation of breakfast and lunch than preparation of dinner in later hours of the day. To conclude with use of certain ergonomics principles as well as proper interior of the kitchen plays an important role in reducing back related problems. Also training can be given to women to take breaks to rest while performing longer activities can help reduce these problems. Ergonomic principles do consider the time for which one type of task is performed and its effect on users, this analysis can help reduce fatigue. [2]

In contemporary times the majority of products are designed for healthy, young, active and agile people. According to research, such products form up to 90% of the market. Many elderly and disabled people no longer have the ability to fully use them due to limited availability and less motor control skills, therefore, domestic chores cause more stress. The analysis and results shows that the elderly people have trouble cleaning handles, profiled surfaces and unsuitable transitions between work-surfaces, walls and appliances in kitchen space. [3] 5. A challenge for kitchen designers, manufacturers and installers is to think in terms of kitchens that are more flexible and adaptable to people's changing needs. There is a need to think in terms of kitchens that are more flexible and able to be adapted to meet people's needs at different life stages particularly as they grow older. These may be thought of as 'democratic kitchens' that take on board the needs and concerns of all people, giving them an equal say in future kitchen design. The kitchen that accommodates the needs of people as they get older should be a kitchen that meets the needs of all age-groups.[5]

#### **India and women in Kitchen:**

In India, kitchen space is used for food storage, preparation, cooking and dishwashing. Although the main function of kitchen is cooking, it can be the entre of other activities as well depending on its size, furnishing, and equipment and a typical Indian cooks thrice a day. People preferred to rinse everything before use (consumables and utensils). Indian food has many greasy ingredients and involves a lot of kneading and mixing with hands, frequent hand wash becomes necessary. Sink is usually kept at a distance from the cooking area as it is used to collect dirty utensils and should make enough space to accommodate a maid who usually washes them. Platform and storage heights of established of modular kitchen brands were designed to fit European population and were too high for the 50th percentile, that is average range of height in which maximum Indian women population lies.... Indian woman. The kitchens were not ergonomically suited for forceful and repetitive task like chopping vegetables that require the elbow to be at right angles with the work surface.[4]

#### **Kitchen design and design approach:**

The study shows that there is a need to for a more inclusive approach to kitchen design to make life easier for this group of people. There is also a requirement to promote the benefits of modern kitchen gadgets as allowing them to live independently for longer. Elderly users try to adapt and deal with their problems within the space as most elderly people found it too expensive and troublesome to make additional changes in their kitchen due to lack of space. [6]

The literature referred is related to ergonomic principles and design approach for kitchen space and highlights the importance for the change required in design. The literature also states various problems and Indian contextual understanding for the space design. The study had emphasized the various ergonomics problems faced by elderly people in their daily life while using Kitchen space. The study also highlighted the importance of design guidelines for more ergonomic and user-friendly kitchen space with specific requirement to elderly needs. The literature supports the contextual understanding and challenge the societal ignorance towards the design needs of these elderly women to perform daily activities effortlessly and help them live independently. In this context survey is conducted by the researcher to understand the problems faced and to derive guidelines for better space design based on the analysis.

### Data Collection:

#### User Profiling

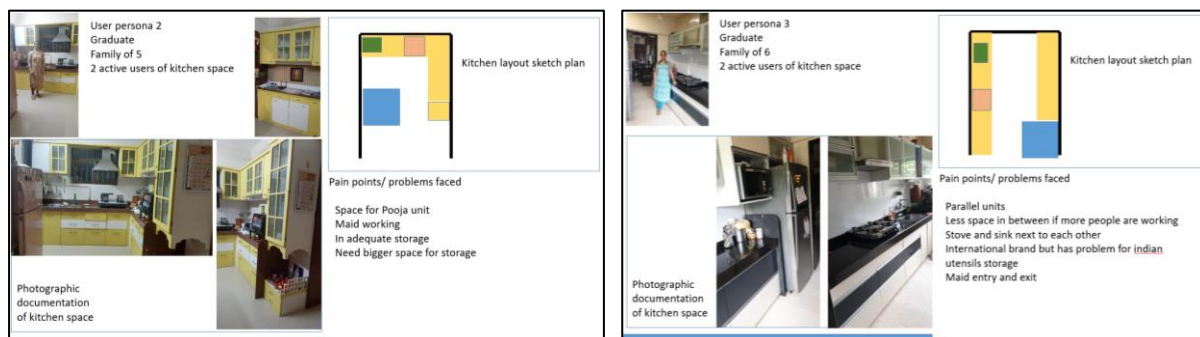
Age group of 65 to 85 were chosen for the research as the study is for elderly women users. because... The City selected is Pune city in Maharashtra state of India. The apartment units for all 36 samples in multistoried building are selected. All users are elderly women users involved in daily cooking activities in houses. These homes with modular kitchens of various brands are selected from three different localities within Pune city. Users with disabilities or complete or partial mobility were not considered for the study.

The Indian city of Pune witnessed rapid growth and deep transformation processes in the last three decades. Most of the Indian cities are witnessing immense demographic expansion due to migration from surrounding villages, leading to urban sprawl, housing demand, rise in cost of land. Housing has developed into an economy generating industry. Given this demand, high-rise residential structures have become a solution in the metropolitan cities and also is the condition in Pune. Pune is the seventh largest city in India and recently got expanded to become number one biggest city in Maharashtra. Migration rate is higher and thus also is the educated class in Pune. Because of urban structure, people prefer to live in multistoried, builder constructed apartment units of different configurations and areas, popularly known as 2BHK ( Bedroom hall kitchen ) and 3 BHK ( 3 Bedroom, hall Kitchen ) due to rise in the cost of land and more availability of these urban apartments. Thus the city is selected for study and all the users are settled in the city due to job and now spending their old age also in the same apartment type homes.

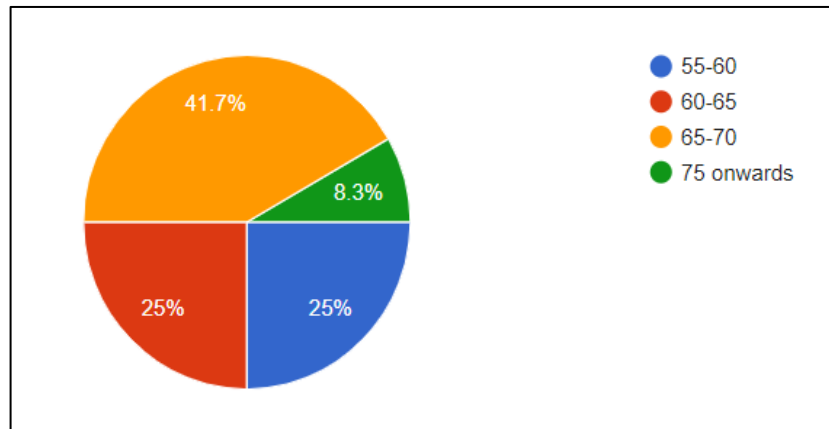
Because of urban structure, people prefer to live in multistoried, builder constructed apartment units of different configurations and areas, popularly known as 2BHK (Bedroom hall kitchen) and 3 BHK (3 Bedroom, hall Kitchen) due to size and configuration. Thus the city which is a representation of urban fabric of India is selected for study.

#### Key Findings:

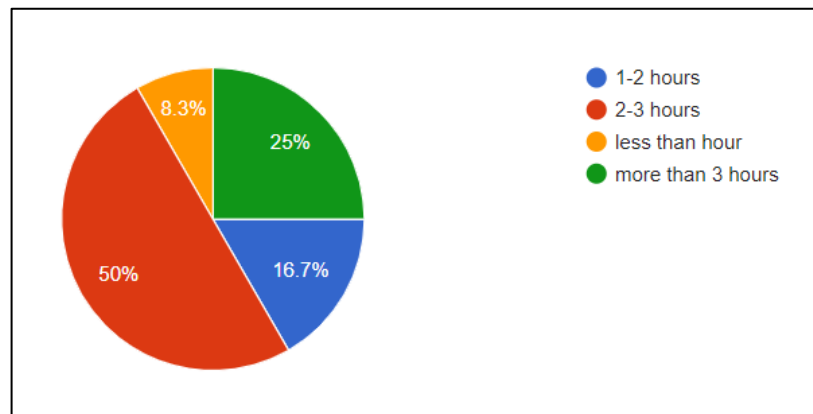
- Major findings of the study are noted. In all the samples the primary user of the kitchen space is the women. The family size is consisting of 4 to 6 members. In most of the samples the secondary user either a member of family or a house help (who is?) is also accessing and using kitchen space for various activities. The kitchen space is used for minimum four time's food preparation including breakfast, lunch, evening tea and snacks and dinner. The average installation cost for modular kitchen ranges from 500 to 2000 dollars, depends on the brand and vendor selected. Time spent in kitchen space in morning for activities like breakfast preparation and lunch preparation is almost double than the time spent in evening hours. The average time for morning activities is 1.5 hour higher than evening time kitchen activities.



- It is observed that after 75 years of age elderly women mostly depend on others like family members or house helps for daily cooking activities. [ ref figure 2 ] . 25% users spend more than three hours in daily cooking activities in Kitchen space.

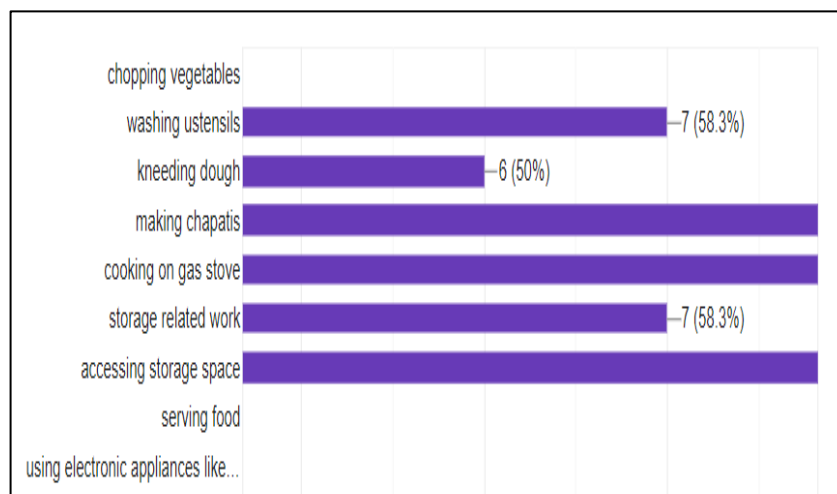


**fig2** ( represents the age group of users.)



**fig3** ( represents the time spent in kitchen activities in a day.)

3. More than 50% of these women face problems while cooking and accessing storage space and washing utensils. These women are from middle income class and they generally hire a house help for certain activities. But accessing higher and lower level storage racks becomes difficult as it creates pain in knee or back pain issues (difficult in what way) for them and standing for longer hours for making chapatis (a preferred food item in most of Maharashtrian families) is the most common concern as they find it tiring



**Fig 4** provides the data about the kind of activities these women do everyday.

4. Accessing higher or lower storage shelves or modular storage units is a problem faced for most of these elderly users. Standing for longer hours and cleaning the space is an issue. Most of the users take help of domestic workers for cleaning, washing utensils, making chappatis. Standing for longer time creates leg pain or back pain.

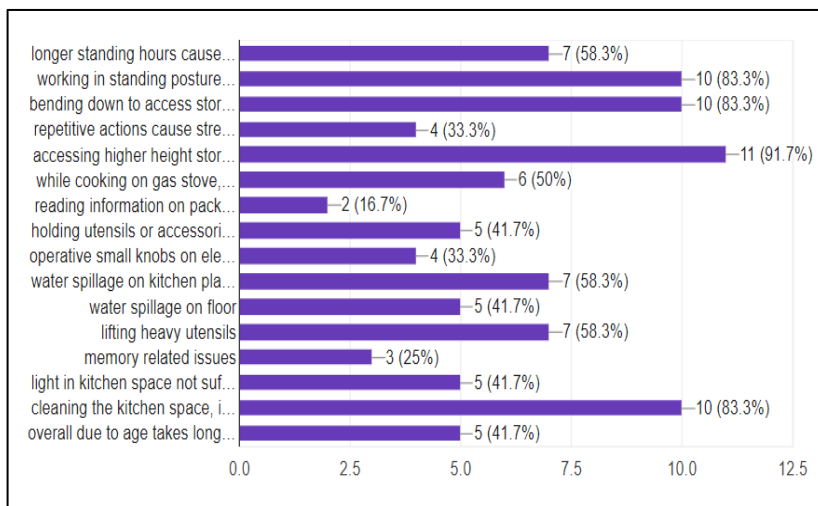


Fig 5

Longer standing hours, bending down to access storage, non height adjustable platforms or counters, water spillage, lifting heavy utensils or operating knobs of gas stove or taps of kitchen sink are some of the problems identified. Some of these pain points are due to slower movements due to age and weaker grip and less mobility. [fig 5]

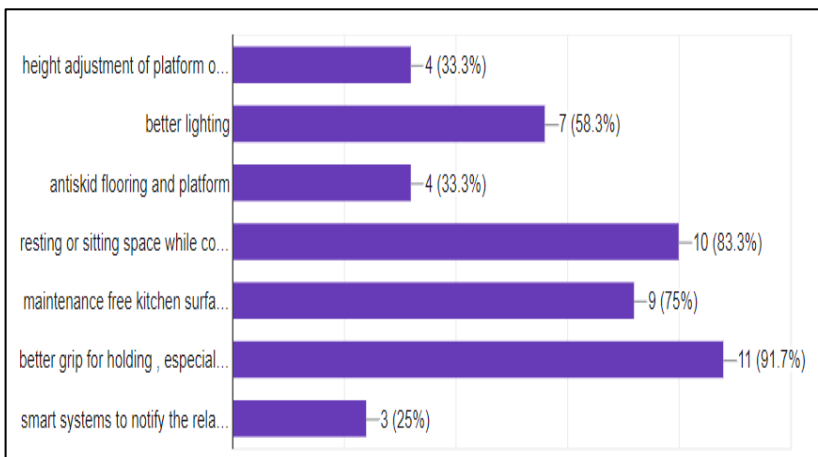


fig 6

5. Given a choice women wish to have more height adjustment for shelves of storage. They also wish to have resting space or sitting space while working. They adapt to this requirement by taking stool or chair. They need maintenance free surfaces and better lighting (aren't these easy and cheap fixes?) as with age they find it difficult to work in less lit space. Also they are ready to accept technological advanced aids to help them with reminders or smart systems of cooking activities using different electrical appliances. In short these women are acknowledging the issues and even ready to accept the changes required. The cost and assistance is needed to make these changes. The design of kitchen space need to be more flexible if one wish to modify the space as per their changing needs. The designers need to take into account this concern of active aging population and create more adaptable spaces.

**Conclusion:**

In domestic urban kitchen in India especially a case in Pune city the spatial planning is not according to cultural cooking practices which requires longer hours for cooking activities and requires different postures while performing those. It is also very clear that the kitchen space and modular kitchen units are not sufficient to cater to user's requirement of storage and easy accessibility to those in old age. Customization up to certain extent is possible in these modular kitchen units but it does not provide flexibility like varying counter height and flexibility of height and size of storage space. Elderly women do aspire to change the existing kitchen space to suit the age related requirements but not a very common practice as it involves cost and making changes in interior design. It is observed that even though people have migrated to cities and started living and adapting to these multistoried urban apartments their cooking practices are still the same and they need more customization and flexibility of spatial planning especially the space should cater to changes as per age and user profile and ergonomics.



**Design Guidelines suggested:**

Few suggested guidelines are listed below as suggested by users addressing to a concern of the changes they wish to make in their kitchen activity experience.

1. Efficient layout: Standardization of height of counter to be based on average Indian height of user or to suit the user's requirements and not a typical builder's one size fits all kind of approach.
2. Utility Kitchen Sink should be placed near the preparation area for washing and cutting vegetables and avoid frequent trips to the main sink as this will also help in tackling the issue of water spillage.[3]
3. Upgraded Cooking Slab: Simple height adjustable cooking slab is recommended to suit people of different heights and requirements as elderly women tend to bend more. Varying platform height to suit ergonomic posture required for the task at hand.
4. Redefining Storage Space- Height adjustable storage units are recommended at all places so that the user need not bend or stretch or struggle standing on stools for reaching higher heights.
5. For the application of universal design to kitchen design, different considerations need to be used like the size and shape of the kitchen, the placement of appliances and the sink, stove, refrigerator, microwave oven and storage, and also the design and layout of the clear floor space, work triangle, countertop, reach range, and knee clearance required for use of each appliance. Thus, the understanding of user characteristics with respect of ergonomic requirements and mobility capabilities of user and the spatial relationship between kitchen appliances has to be thought of. Small considerations in the design process can make the difference while designing for different types of users. So more customized approach should work compared to standard modules of different brands.
6. For the Use of kitchen Appliances: More flexibility for positioning of plug sockets than builder provided options or better positioning of microwave oven, refrigerator, mixer grinder, a dishwasher, automatic kettle, water filter, flour mill, wet grinder etc.is needed. Providing space for ovens and other appliances like grinders at mid-level which can offer easier access in many kitchens and it would make the kitchen more usable for people who find it hard to bend down to reach.
7. Adequate lighting should be there in order to facilitate more clarity in working in Kitchen space.
8. Elderly Women need resting surface while working for longer hours. So a small seating arrangement or a high chair to sit while doing kitchen activities is suggested.
9. As a social concern these women should take some assistance while working in Kitchen space for better safety and better health.

The design of bespoke kitchens is one way to achieve more inclusive kitchens by allowing the customer to specify worktop, base unit and cupboard dimensions for their particular height and reach, and to take account of any particular disabilities they may have. So for example a person in a wheelchair would require sink and worktops that are set at a lower height and are usable from a seated position and for cupboards and shelving to be open to save having to maneuvers around doors. If kitchen stores could offer more choice of sizes, for example three heights of worktop, this would lead to kitchens matching user needs more closely.

Before we start to design the kitchen for the elderly people one should take into consideration the following like (a) appropriate materials considering the configuration, security, cleaning and manipulation of the furniture, (b) incorporate the intelligent technology as much as possible, – the organization of kitchen elements in space has to be adapted with the requirements of the senior users in mind. Future kitchen design has to include advanced mechanisms and modern appliances and newer maintenance free materials on surfaces to simplify everyday chores and ensure better hygiene standards.

As elderly population is growing in urban areas in India it is the need of the hour to study requirements and provide functional and viable solution for the problems faced. Ergonomic considerations with appropriate spatial planning and use of functional appliances and use of right materials can give right direction to device a new model for modular kitchen design which is for all users irrespective of special need. It is necessary to go in the customized way of designing individualist space suitable to user with understanding of ergonomics, user requirements in more individualist way and not by market trends especially in case of elderly women users living in Urban apartments in India.

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