CHAPTER 1
INTRODUCTION

Geriatric population is fastest growing segment worldwide due to year by year enhancement in average life expectancy (Ghani et al, 2013). The number of older adults (aged ≥65) is estimated to grow from about 524 million in 2010 to nearly 1.5 billion in 2050. “Between 2010 and 2050, the number of older people in less developed countries is projected to increase more than 250.0% compared with a 71.0% increase in developed countries” (Global Health and Ageing, 2011). World Bank projection reported that in India, number of geriatric population is projected to be 141 million by 2020 and 508 million by 2100 (Kimaya and Sharma, 2013). Individuals are living longer, that does not essentially mean that they are living healthier. Higher age is associated with greater risk of disease, functional disabilities, frailty and sensory losses (Johansson et al, 2009; Rasheed and Woods, 2013). Energy needs of the individuals decreases with ageing whereas requirements of protein (i.e., for maintenance of muscle mass) and different micronutrients (eg., for bone health) remain same or increases depending on their health and nutritional status (Bauer et al, 2013), demanding more nutrient dense diet (food choices) to meet their nutritional needs (van Stavern and de Groot, 2011).

Malnutrition is prevalent in old age (Merrell et al, 2012) which negatively affects the health status of elderly, i.e., loss of skeletal muscle mass, reduced bone mass, impaired immune function resulting in poor wound healing, cognitive decline and increased morbidity and mortality (Schiffman, 2009). Inadequate food and nutrient intake consequently creates chronic metabolic disruption including mitochondrial decay resulting in higher prevalence of various degenerative diseases (Ames, 2006). Eating difficulties negatively affect food choices, quantity and variety of food (Lorefält et al, 2006) and social context of the meal and meal experience (Gustafsson et al, 2003), hence, they are important risk factors for malnutrition (Westergren et al, 2009). Eating difficulties lead to the need for several adoptions with regard to food choices, food preparation and eating frequency (Nyberg et al, 2015). Age related decrement in olfactory function as well as sensory losses are the frequently encountered phenomenon of old age (Doty and Kamath, 2014). Age and sensory losses seem to affect the food perception, liking of food items and self
reported food-evoked emotions (den Uijl et al, 2016), emphasising the necessity of meticulous menu planning, monitoring of food consumption, formulation of specific geriatric food items that especially addresses specific micronutrients.

Conventional diet, fortified food items and vitamin or mineral supplements are the sources of macro and micro nutrients. Limited intake of these nutrients is responsible for nutrient inadequacies or nutrient deficiencies in the geriatric population. Dietary sources of nutrients are preferred option and pharmacological supplements should only be targeted to those who do not get sufficient amount of these nutrients from diet or have serious deficiencies.

Elderly people want to be independent for as long as possible (Fjellström, 2008). The experience of self determination, freedom and autonomy are important for elderly people (Pajalic, 2013), which also applies for the decisions about the purchase of food, food choices and meals. Various determinants of food choices in old age need to be identified to facilitate the formulation of pertinent strategies for improving food and nutrient intake and to obtain optimal health among them (Host et al, 2016).

Nutrient dense food is thought to be one of the prerequisites of the healthy ageing (Ford et al, 2013; Hodge et al, 2014). To enhance the quality and quantity of food intake among elderly, public health providers and policy makers need a better understanding of successful strategies to maintain elderly’s interest in food and to aid them in meeting their nutritional requirements. Nutrient and food intake can be improved by means of nutritional advice on consumption patterns as well as by using fortified foods (Dwyer et al, 2015). Formulation of food products tailoring the nutritional and health related needs of elderly are very important while considering their cultural habits and food preferences. Fortification of different food items with geriatric health promoting ingredients could be considered a public health strategy to encourage sufficient nutrient intake and to meet the nutrient requirements of geriatric population. The food industry and product developers need to deal with these factors to be able to formulate and offer food items that meet the demands of elderly (Doets and Kremer, 2016). When the food items will better align with requirements of geriatric people, these specific foods will be more often consumed and popularised among them which will be helpful in improving food and nutrient intake as well as their health and wellbeing (Hawkins and Mothersbaugh, 2009).
Applications of science and technology within the food system have allowed production of foods in adequate quantities to meet the needs of society, as it has evolved (Floros 2008). One of the recent techniques being used for development of optimum food products to enhance their nutritional quality is process optimization. Response surface methodology (RSM) is a powerful mathematical model with a collection of statistical techniques where interactions between multiple process variables can be identified with fewer experimental trials (Karuppaiya et al 2010). In order to formulate and test ingredients that will be used, many food processing industries use statistical approaches such as RSM in their research department in order to achieve the best formulation in relation to sensory acceptance, shelf life, nutritional demands, and physicochemical stability of product. RSM is a design of experimental technique (Ruangme and Sangwichein 2013) which is frequently used in food industries to optimize the efficiency of the ingredients such as fibres, improvers, composite flours, optimization in food processes like product development, functional food preparation, etc., as well as in optimizing processing conditions (Das et al 2012). Central composite design (CCD) is a technique used commonly for RSM. Therefore, RSM was used in present study to obtain geriatric foods optimized for different nutrients and overall acceptability. Older adults are the most vulnerable group who require special foods for catering their different needs and to maintain their nutritional and health status.

Inadequate nutrient intake and associated consequences on elderly can effectively counteracted by dietary supplementation or food intervention (Ames, 2006). Exercise and nutrition are effective interventions in frail community dwelling older adults (Abizanda et al, 2015). European Society of Clinical Nutrition and Metabolism (ESPEN) gave grade A recommendations to oral nutritional supplements to maintain or enhance nutritional status in elderly (Volkert et al, 2006). Intervention or supplementation of formulated food products is necessary to identify the beneficial effects and after effects of that particular item on health and nutritional status of individuals for whom the product was specially developed. Studies have reported the beneficial effects of nutritional supplementation on improvement of health and nutritional status of older adults (Marteau et al, 2011; Smoliner et al, 2008; Streppel et al, 2008; Tucker and Thomas, 2009).
Institutional bodies gave dietary recommendations for elderly covering most of their macro and micro nutrients requirements which are helpful in limiting the impact of malnutrition in older adults (Rémond et al, 2015). However, these efforts are far from having reached their promises because the knowledge covering the efficiency of the delivery of nutrients has not be integrated neither into the health status of elderly nor into the development of novel food items tailored for the requirements of elderly, therefore, a new paradigm must be formulated for these elderly to prevent and treat malnutrition more effectively.

In this regard, present study was conducted with following objectives

1. To develop and standardize a range of nutritious geriatric food products by using food and fortificant nutrients or premixes.
2. To assess their acceptability among geriatric people.
3. To conduct nutritional, chemical and shelf life analysis of standardized products.
4. To study the impact of selected geriatric food on nutritional status of elderly.