1. INTRODUCTION

1.1.   Background

Dietary pattern is defined as "the quantity, variety, or combination of different food and beverage in a diet and the frequency with which they are habitually consumed" (Sánchez-Villegas & Martínez-Lapiscina, 2018). There are multiple determinants of dietary pattern, with demographic and socioeconomic determinants significantly affecting food choices (de Mello et al., 2020). Identifying dietary patterns, and subsequently setting up an optimal diet should be a priority in order to improve public health and improve efforts to prevent chronic diseases (Cespdedes & Hu, 2015). Elderlies are of particular interest as during ageing, a healthy diet becomes more challenging due to the changes in physiological, social and economic factors, making them a vulnerable part of society (Whitelock & Ensaff, 2018).

According to the WHO (2021), susceptibility to noncommunicable diseases (NCDs) increases with age with a greater share of deaths experienced by elderlies due to NCDs compared to younger age groups within the population. Furthermore, older individuals are at risk of becoming frail and more vulnerable as they age due to age-associated decline across multiple organ systems (Chen, Mao & Leng, 2014). The average population of countries inside the European Union (EU) is currently undergoing an ageing population. Currently, a large proportion of the population belongs to individuals born between 1940s and the late 1960s who have now reached the age of retirement, initiating a major demographic change within Europe with older individuals dominating the population structure (Börsch-Supan et al., 2013). Börsch-Supan et al. predicted that Europeans aged 65 years and older will likely increase from 17.4% to 30% by the year 2060. As the demographic transition happens, it is important to understand the change of different aspects that may be affected by this transition, one of which is the public health of the population.

As European countries expect a growing number of elderlies both in number and proportion, it is important to have strategies in place in order to prevent a large part of the population experiencing NCDs and frailty. Currently, 53% of European elderlies are considered to be at nutritional risk (De Morais, 2013). Daily intake of European elderlies in total fat, saturated fat, salt and free sugars were also found to be exceeding recommended dietary intakes (Kehoe, Waltono & Flynn, 2019). Given the negative outcomes in health status from excessive consumption of the nutritional components mentioned, an increasing number of European elderlies with nutritional risk can be expected to increase. Poor health status of the elderly may lead to poor quality of life, which subsequently burdens their families and themselves (Nerlich & Schroth, 2018). Furthermore, this will put strain on public health care and services, resulting in a significant economic and social impact on society.

An emphasis on optimising opportunities to enhance the quality of life as people age is needed, also known as healthy ageing (Tsz & Sandra, 2014). The expected outcome of healthy ageing is not only to extend the life expectancy but to ensure that older individuals are also healthy and active during those years. Nutrition, energy intake and body weight significantly affects the quality of old age as well as life expectancy (Shlisky et al., 2017). There has been growing evidence exhibiting the direct relationship between improper nutrition intake and the development of NCDs, indicating nutrition as a significant part of NCDs intervention (Nikolic, Stanciole & Zaydman, 2011). Furthermore, insufficient nutrition intake is also a consequential modifiable risk factor for frailty. Nutritional interventions to ensure a sufficient intake of energy, protein and micronutrients as well as an adequate dietary quantity can help promote healthy ageing (Goisser, Guyonnet & Volkert, 2016).

An inhibitor to a healthy and adequate diet is the fact that the food consumed by the general population is getting more highly processed. This is particularly concerning as depending on their degree of processing, processed foods can have significant consequences on the nutritional status and public health of the population (Baker et al., 2020). In order to help understand the level of processing of foods consumed by the population, there have been multiple categorization methods devised, such as NOVA food classification. The NOVA system, developed to categorise food products depending on their degree of processing, distinguishes food into four different categories and labels food products with the highest degree of processing as ultra-processed foods (UPFs) (Moubarac et al., 2014). Baker et al. outlined that there are increasing studies now showing that a greater proportion of UPFs of total energy intake results in poor dietary quality, higher risks of mortality, obesity, cardio-metabolic diseases, cancer, gastrointestinal disorders, asthma and frailty. Despite the growing evidence of UPF consumption associated with negative health effects, the consumption and sales of UPF is growing in the EU with an emphasis on the Central and Western part of Europe (Vandevijvere et al., 2019).

French and Bulgarian elderlies are of particular interest as universities included in the research consortium of this study are situated in France and Bulgaria. Furthermore, France and Bulgaria are within the top 10 countries with the largest number of elderly population in the world (PRB, 2019). On top of that, UPF also contributes to 35.9% of total energy intake in French adults compared to the 27.2% share of total energy intake of the European population (Mertens et al., 2022; Julia et al., 2018).

There have been limited studies on the topic of dietary analysis in respect to ultra-processed food, especially concerning elderlies in Europe. To the author's knowledge, this is the first study which analyses the dietary patterns in respect to UPF on the European elderly population. Furthermore, the utilisation of a semi-quantitative food questionnaire presents a novel approach

compared to a recent similar study carried out by de Moraes et al. (2021) which utilised the 24-h dietary recall method. The use of a semi-quantitative FFQ offers several advantages over the 24-h dietary recall method including its capability to evaluate long-term intakes and the comparatively lower time consumed as well as cost needed to conduct (Resnicow et al., 2000). As the use of a semi-quantitative FFQ in this topic is still experimental, highlighting issues on methodology will play an important role to help improve the quality of similar research in the future. Therefore, the aim of this study is to identify dietary patterns in European elderlies in respect to UPF and the determinants associated with it as well as providing any recommendations to improve the methodological protocol.

1.2.   Objectives

This study aims to achieve the following points:

- Identify dietary patterns and group of subjects with similar food consumption habits (i.e. dietary profiles) in respect to ultra-processed food consumption
- Compare the number of food choices within each NOVA processing level between different identified dietary patterns, with emphasis on UPF (NOVA 4)
- Analyse factors associated with UPF consumption of French and Bulgarian elderlies

1.3.   Hypothesis

This study hypothesised that there are identifiable dietary patterns in respect to ultra-processed food within the French and Bulgarian study population. This study also hypothesised that there exists significant differences in the number of UPF products within identified dietary patterns and between similar dietary patterns of the study population. Furthermore, there are significant associations between dietary patterns and sociodemographic determinants of the study population.

1.4.   Research Significance

This study intends to provide a clear picture of the different dietary patterns in respect to ultra-processed food in European elderlies and the different determinants significantly associated with it. As this is the first kind of its type of study, it can be used as a reference and main methodological approach for a study with a larger population, or within different communities and countries. Furthermore, it can be used to help governments and public health officials better understand the demography as well as determinants of high UPF elderly consumers when setting up a strategy to promote healthy ageing and public health policies.

1.5.   Research Scope

This study is part of the NutransAge research consortium between the German Institute of Human Nutrition, Medical University of Varna Bulgaria, and UniLaSalle college of Health Science. Data collection was carried out by Medical University of Varna Bulgaria and UniLaSalle college of

Health Science. This research is only confined to the cleaning, preparation and analysis of the collected data. The scope of this study is limited to individuals aged 65 years old and above, residing in France and Bulgaria and recruited through networks and associations related to the Medical University of Varna and UniLaSalle College of Health Science. Participants were asked to complete a self-administered semi-quantitative food choice and frequency questionnaire once in order to analyse the dietary pattern in respect to UPF and determinants associated with it.