

Sustainable Eating Habits: Examining Beliefs, Attitudes, and Perceptions of Plant-Based Diets among Hungarians

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An important current trend is the healthy and sustainable lifestyle and consumption of fruits and vegetables. However, the healthiness of plant-based diets is not well understood by the general population or food professionals, and only a small proportion of the Hungarian population (1.1 %) follows a vegetarian diet because of sociocultural reasons (attachment to meat). This paper explores the main knowledge, beliefs, and misconceptions about plant-based diets (PBDs) among Hungarians. Behavioral change towards a more plant-based diet is slow and influenced by attitudes. In an online survey (n=397), four different factors related to beliefs about PBDs could be distinguished: (1) health and environmental issues, (2) lack of nutrients, (3) forbidden foods 1, and (4) forbidden foods. People are aware of the different types of plant-based diets (vegetarian, vegan) and the positive and negative psychological effects. The associations of plant-based diets are: healthy, environmentally friendly, and expensive. However, only a small part of the Hungarian population follows a plant-based diet, while the diverse and daily consumption of fruits and vegetables is essential for health and sustainability reasons. This study has the potential to provide a comprehensive review of the current state of knowledge regarding plant-based diets, which is essential for tailoring educational initiatives, formulating effective interventions, and ultimately advocating for healthier and more sustainable dietary preferences.

1. Introduction

Sustainable attitudes are becoming increasingly important in many areas of life, such as transportation (Guo et al., 2022), consumption, and education. According to the Food and Agriculture Organization (FAO), adopting sustainable diets on a global level is urgently needed (OECD, 2016). A more plant-based diet (PBD) is considered to be a sustainable eating habit since this diet produces 2.5 times less carbon emissions than a meat-based diet. A sustainable diet is a “nutritionally adequate, safe, healthy, culturally acceptable, economically affordable diet that has little impact on the environment” (Perignon et al., 2017:3). A balanced and more plant-based diet can reduce the risk of heart disease, cancer, and stroke (Jenkins et al., 2021). In terms of global fruit and vegetable consumption, the majority of countries do not meet the 2003 WHO/FAO recommendation of at least 400 g of fruit and vegetables per day. Daily per capita intake of fruits and vegetables was 235 grams in 2010 and then increased steadily to a maximum of 299 g in 2018 and 293 g in 2020 (KSH, 2022). Fruit and vegetable consumption increases with age, education, and financial status (EHIS, 2019).

In 2020, the total available food per person in Hungary was 683.7 kg, a slight decrease of 0.6 % compared to the previous 5 y (KSH, 2022). The structure of the food supply remained stable, with fruits and vegetables accounting for almost 30 % of consumption. Per capita consumption of these items was 189.9 kg in 2020, a slight decrease from previous years. On a positive note, fruit and vegetable consumption has increased by about 20 % since 1970, indicating an upward trend (KSH, 2022).

Approximately one-fifth of Hungarians follow a specific diet, with 14 % following one diet and 4.3 % following several diets simultaneously (EHIS, 2019). The most common diets are diabetic (6.4 %) and lactose-free (4.1%) diets. Special diets tend to increase with age due to factors such as allergies and sensitivities. Women, regardless of age, are more likely than men to follow special diets. Higher education and income correlate with a higher likelihood of following a special diet. While Hungarians generally prefer meat, the vegan lifestyle is gaining traction (NAK, 2019). In recent years, vegetarian and vegan diets have emerged as a distinct lifestyle

trend (Schmidt, 2019). "Vegetable stars" is a notable trend that reflects the rise of plant-based foods. This shift away from meat is driven by concerns about its environmental impact and sustainability (Törőcsik, 2016).

The aim of this study is to explore the knowledge, beliefs, and misconceptions about plant-based diets. Although motivations and barriers have been extensively studied in the international context, only a few studies have analyzed PBD in the Hungarian market, mainly from a theoretical perspective (Véha et al., 2019b) and barriers (Fehér et al., 2020). Beliefs and perceptions play an important role in individuals' willingness to switch to a plant-based diet, which would be important for sustainability reasons.

The article is organized as follows: first, in relation to the research question theory and literature on plant-based diet. Then, the methodology is explained, followed by the results. Finally, the theoretical and practical implications of the findings are discussed, and the paper concludes with an exploration of research limitations and future research opportunities.

2. Theoretical background

Currently, plant-based diets are one of the trendy diets (Törőcsik, 2016), and their impact on health is attracting the attention of an increasing number of researchers. In fact, plant-based diets have been used for centuries. Vegetarianism first appeared in India and the ancient Greek world and was part of the religious aspirations of both cultures. A plant-based diet consists of "all minimally processed fruits, vegetables, whole grains, legumes, nuts, and seeds, herbs, and spices and excludes all animal products, including red meat, poultry, fish, eggs, and dairy products" (Ostfeld 2017). Plant-based diets range from strict veganism to semi-vegetarianism. Today, vegetarianism encompasses a holistic worldview, with advocates holding strong philosophical, ethical, environmental, and agro-technological beliefs, often driven by socioeconomic factors (Balogh, 2017). Törőcsik and Szűcs (2021) observed that Generation Z is actively engaged in climate protests and embraces a vegan lifestyle, even prioritizing these actions over attending school.

Vegans abstain from all products of animal origin, including meat, eggs, and dairy products. In Hungary, the Hungarian Vegan Association, founded in 2017, advocates for this lifestyle, which is seen as a nonviolent way of life that opposes the exploitation of animals. It includes dietary choices (excluding meat, dairy, eggs, gelatin, honey, etc.), clothing preferences, and recreational activities. Vegans choose non-leather shoes and avoid cosmetics tested on animals. Balogh (2017) categorizes veganism as a form of vegetarianism alongside other trends such as semi-vegetarianism, ovo-vegetarianism, ovo-lacto vegetarianism, and raw vegetarianism.

People adopt plant-based diets for various reasons, including ethics, environment, economics, politics, animal welfare, spirituality, and health. Several religious traditions - Brahmanism, Judaism, and Hinduism - also advocate a meatless or meat-free diet (Szabó et al., 2016). Several recent national studies have been conducted on plant-based diets (Szabó et al., 2016). They mainly present the literature background and the characteristics of the diet (Fehér et al., 2020). Krause and Williams (2019) conducted an empirical study to investigate the knowledge of university students on plant-based diets. Fehér et al. (2020) created a conceptual model for transitioning to a plant-based diet based on the planned behavior model and considering objective supporting and inhibiting factors. Several researchers have also investigated the factors that hinder (Lea et al., 2006) and support (Reipurth et al., 2019) plant-based diets. Plant-based diets provide health benefits that enhance overall well-being, satisfaction, and quality of life, as noted by Véha et al. (2019b). Ethical and environmental benefits include efficient resource use, reduced global pollution, and improved animal welfare (Benites-Alfaro et al., 2023). Economically, plant-based diets are more sustainable, with a significantly smaller ecological footprint compared to omnivorous diets (Perez-Cueto et al., 2022). Concerns about climate change are increasingly driving the shift to a plant-based diet (Reipurth et al., 2019). Ethical arguments also play an important role (Véha et al., 2019b). These include a rights-based view, which posits the intrinsic value of animals, and a utilitarian perspective, which argues for the right of sentient beings not to be treated as property. Ethical vegans reject the commodification of animals altogether, abstaining from animal-derived products in clothing, fragrances, and other applications, and seeking to avoid ingredients tested on animals (Balogh, 2017).

Vegetarian principles reject any form of animal slaughter as humane. A plant-based diet offers numerous health benefits, potentially improving overall quality of life (Lea et al., 2006), but individuals should be prepared. Such diets tend to be lower in energy and fat, especially saturated fat, which reduces the risk of overweight, obesity, and cardiovascular disease (Szabó et al., 2016). Beacom et al. (2021) found that Irish and British women were almost twice as likely as men to consume plant-based products (PBPs), driven by motivations such as sustainability, animal welfare, and health.

A predominantly or exclusively plant-based diet may lead to protein deficiency (Reipurth et al., 2019), necessitating the use of dietary supplements or functional foods (Szakály, 2008). It is advisable to consult a dietician before making this dietary change. According to Lea et al. (2006), lack of information is the primary perceived barrier to adopting a plant-based diet. Véha et al. (2019a) identified various barriers, including physiological concerns, attachment to meat consumption, convenience, information acquisition, social and

discriminatory challenges, and financial constraints. For consumers of non-plant-based products, reluctance to change diet and taste were significant barriers (Beacom et al., 2021), a sentiment echoed among Dutch adolescents (Havermans et al., 2021). Pohjolainen et al. (2015) found that enjoyment of meat, established eating routines, health beliefs, and difficulties in preparing vegetarian foods hindered adaptation to a plant-based diet.

Based on the literature review, the authors defined the following research questions:

RQ1: What do people know about plant-based diets in Hungary?

RQ2: What are the respondents' attitudes toward plant-based diets? Do they consider PBD as a sustainable eating habit?

RQ3: What associations do people have with plant-based diets?

3. Methodology

3.1 Data collection

To answer the research questions, we chose a cross-sectional survey as the primary research method. The planned sample size was 400 people. Data was collected through non-probability snowball sampling by distributing the online questionnaire (Google Sheets) to Hungarian consumers through social media for one week in December 2022. The researchers used their own circle of acquaintances and shared the questionnaire with members of various lifestyle groups to include the views of engaged users. In the end, 397 people were reached. The questionnaire was pre-tested to ensure consistency and understanding.

The questionnaire was divided into three sections: (1) health behaviors, (2) knowledge and beliefs about plant-based diet, (3) socio-demographic characteristics. Knowledge about a plant-based diet was measured using a nominal scale, which was used by Krause and Williams (2019). Attitudes toward a plant-based diet were measured by 15 attitude statements using a 5-point Likert scale based on a previous study by Krause and Williams (2019). Associations toward a plant-based diet were measured using a semantic differential scale. 10 contrasting attributes were asked. Sociodemographic characteristics included age (in years), place of residence (village, town, city, capital), occupation (student, white-collar worker, blue-collar worker, unemployed, retired), marital status (single, cohabiting, married without children, family with children).

3.2 Data analysis

On the respondents, 83.1 % were women, and 16.9 % were men, with a mean age of 31.5 y (standard deviation 11.3 y), and a median age of 28 y, with the youngest respondent being 18 and the oldest being 70. The demographic distribution is shown in Table 1.

Table 1: The demographic composition of the sample

Age	young (18-34)	middle-aged (35-50)	senior (51+)		
	64.2 %	29.2 %	6.5 %		
Residence	village	town	county center	capital city	
	32.0 %	31.5 %	21.9 %	14.6 %	
Occupation	active white-collar job	active blue-collar job	student	retired	unemployed
	41.8 %	20.4 %	33.8 %	1.5 %	2.4 %
Marital status	single	live in relationship	married	family with children	divorced
	31.5 %	32.2 %	19.9 %	11.9 %	3.9 %

Source: Own research, n=397

The sample was not a representative sample - the authors would like to emphasize that this is an exploratory study and that the main conclusions are only valid for this sample. Data analysis was conducted using SPSS 26.0 software. Uni- and multivariate statistical analysis was used to answer the research questions. To answer the first research question, the authors used factor analysis. The method of factor extraction was principal components analysis. The number of factors was determined by a priori determination (4) and approaches based on eigenvalues (4), scree plot (4), and percentage of variance accounted for (4). The number of factors was determined by the eigenvalues. The benchmark of factor loading above 0.4 was used as a criterion for the inclusion of items in each factor.

4. Results

4.1 Beliefs of plant-based diets

As indicated in the literature review, there are different trends in plant-based diets, such as veganism and vegetarianism, and different types of vegetarianism. Awareness of the principles of plant-based diets was also examined. The majority of respondents (69.8 %) equated it with a vegan or vegetarian diet. 29.0 % thought it meant minimal meat consumption, essentially a meat-free diet. Fish consumption (0.3 %) and dairy consumption (1 %) were rarely mentioned. Only 21.9 % of respondents considered adopting a plant-based diet, with the majority (56.4 %) rejecting it. The percentage of undecided respondents was relatively low at 14.4 %. Previous research on the TÉT platform has confirmed that Hungarians are predominantly meat-based eaters and are reluctant to adopt a plant-based diet. Only a small percentage (7.3 %) planned to temporarily switch to a plant-based diet for health reasons. Factors such as enjoyment of meat (Beacom et al., 2021), pleasure derived from meat consumption (Havermans et al., 2021), and established eating habits (Pohjolainen et al., 2015) posed challenges to adapting to a plant-based diet.

4.2 Attitude towards plant-based diets

Fifteen statements on healthy eating were assessed. The values of the indicators of factor analysis (KMO: 0.841, Bartlett's Test: 3820.136, Sig. 0.000) were adequate.

Table 2: Results of factor analysis

Attitude statement	Mean	Standard deviation	Factor Loading	Factor	Cronbach Alpha	Variance explained
helps prevent chronic diseases	3.44	1.27	0.810			
good for extra energy	3.33	1.30	0.800			
facilitates digestion	3.86	1.18	0.793	health and environmental issues	0.875	27.518 %
is beneficial for some illnesses	3.96	1.12	0.766			
more environmentally friendly	3.78	1.20	0.735			
reduces saturated fat consumption	3.82	1.11	0.625			
perfect for muscle building	2.84	1.29	0.607			
does not provide the body with enough protein	2.47	1.26	0.747			
does not get enough omega-3 fatty acids	2.51	1.23	0.655			
encourages consumption of dairy products	1.95	1.14	0.537			
avoids processed foods	3.39	1.38	0.458	forbidden foods 1	0.618	11.318 %
eliminates or minimizes the consumption of animal products	3.98	1.33	0.786			
limits or excludes eggs	3.27	1.34	0.740			
discourages complex carbohydrates	3.04	1.23	0.755	forbidden foods 2	0.582	7.760 %
promotes oil consumption	2.38	1.16	0.522			

Source: Own research, n = 397 respondents. Method: Main component analysis, Rotation: Varimax

The number of factors was determined by the Scree test. That is, four factors could be distinguished, explaining 59.40 % of the total variance (Table 2). The first factor included seven variables representing health and environmental issues. The second factor included four variables representing the lack of nutrients such as protein omega-3 fatty acids. The third and fourth factors included items related to the avoidance of animal products, eggs, and complex carbohydrates. It can be stated that four factors can be distinguished on the basis of attitudes towards PBD, namely health and environmental issues, lack of nutrients, and forbidden foods 1 and 2. People were aware of the basic rules of PBDs (Ostfeld, 2017) and the positive health outcomes (Lea et al., 2006). People admitted that this diet was environmentally friendly (Reipurth et al., 2019), so this can be a sustainable eating style. On the other hand, consultation with doctors is important since it can lead to deficiency diseases (Szabó et al., 2016), and dietary supplements or functional foods should be consumed (Szakály, 2008) by followers of PBDs.

4.3 Perception of plant-based diets

Overall, respondents are aware of the positive physiological effects of a plant-based diet. The majority of respondents perceived plant-based diets as easy to digest, environmentally friendly, expensive, and varied.

There are some characteristics about which respondents were neutral. They see it as equally dangerous and safe, boring and exciting, healthy or nutritionally deficient. The average also hovers around the mean for the fashionable versus outdated and simple versus complicated pairs (Figure 1).

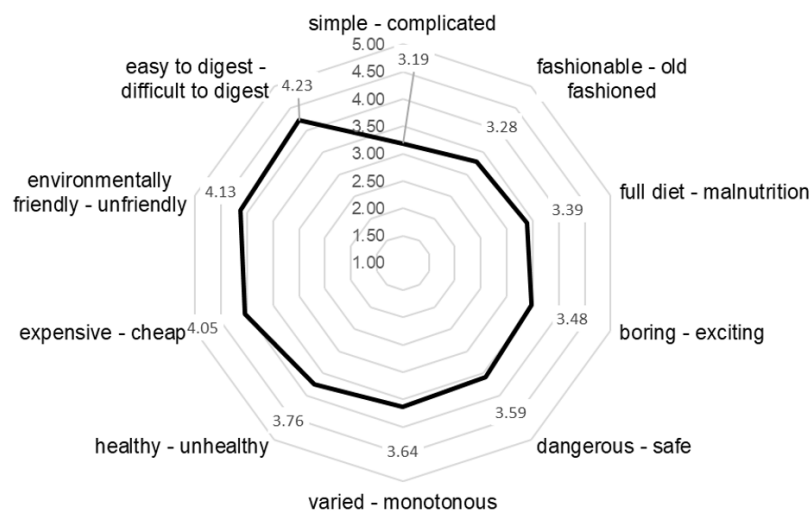


Figure 1: Perception of a plant-based diet, n=397

5. Conclusions

The aim of the present research was to explore the knowledge of plant-based diets through a large sample questionnaire survey. A key strategy for achieving more sustainable consumption patterns is the shift to a plant-based diet. Researchers support the idea that plant-based diets have economic benefits and can contribute to a more sustainable food system. Based on the results of an online survey, Hungarians thought that a vegetarian diet meant avoiding white and red meat and fish while eating other foods of animal origin, such as eggs and dairy products. There are several different schools of vegetarianism, which probably led to knowledge about the different foods that are allowed and forbidden to eat. According to the respondents, a vegan diet means rejecting all animal products, not only meat but also eggs and dairy products. Relatively few of them plan to follow or try a plant-based diet, which can be explained mainly by the enjoyment of eating meat. Those who intend to try the diet also plan to do so on a temporary, intermittent basis. In terms of attitudes, there is a positive attitude among the respondents who are aware of the benefits, the positive physiological effects, and the principles of the dietary approach. Respondents acknowledge the positive impact on the environment but are aware of the positive health effects and the rules (permitted and prohibited foods) of PBDs. In terms of associations, they associate plant-based diets with adjectives, qualities, and principles such as environmental friendliness, digestibility, health benefits, cost, and variety. To increase consumption of plant-based foods, it is important to target different dietary lifestyles and address sensory and nutritional concerns. Behavioral change toward a more plant-based diet is often slow due to attitudes, beliefs, misconceptions, and other psychological factors.

The present study is useful for the health sector (physicians, dieticians, and nutritionists) and the government, as targeted marketing programs can be planned to change dietary behavior. In the case of the government, social marketing programs would be necessary. People should be informed about the progress of more PBDs and the principles of a sustainable and healthy lifestyle (food pyramid, smart plate, WHO principles). These applications could be developed in collaboration with doctors, dieticians and nutritionists. It is in the interest of society to educate people and change their unhealthy habits. Not only the individual level, but also the national economic interest, such as sustainability issues, should be emphasized. The social marketing campaign aims to change people's attitudes and behaviors.

This paper is not without limitations. First, the sample was not representative. There is little age bias in the sample. Mainly young women, students, and white-collar workers could be reached by the online survey. However, previous studies have highlighted the importance of age and educational level in relation to PBDs. In addition, the study focused on a regional sample from the economically developed western part of Hungary. However, the respondents were actively involved in health issues, which may have influenced the results. On the other hand, the survey was shared in different online social media groups, so the respondents were engaged in health issues at a higher level. In the future, the authors plan to use qualitative research (focus group interviews) and later quantitative studies to explore the motivations of people following PBDs.

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