



UNIVERSIDADE
CATÓLICA
PORTUGUESA

CONSUMER INTENTIONS TO CONSUME FOOD
SUPPLEMENTS: A SURVEY STUDY ON ITS PREDICTORS,
ASSOCIATED BIASED BELIEFS AND RISK-BENEFIT
PERCEPTION

Dissertation submitted to the Universidade Católica Portuguesa to
obtain a Master's Degree in Psychology of Business and Economics

By

Rafael Ismail Vicêncio Miah

Faculdade de Ciências Humanas

September 2023



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Under the supervision of Professor Rui Gaspar

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*“We are free to follow our own path.
There are those who will take that freedom from us, and too many of you gladly give it.
But it is our ability to choose - whatever you think is true - that makes us human...
There is no book or teacher to give you the answers, to show you the path.
Choose your own way! Do not follow me. Or anyone else.”*

Ezio Auditore da Firenze, in Assassin's Creed 2

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Abstract

Research on consumers' habits concerning Food Supplements (FS) suggests an increase in its consumption in recent years. Despite several studies being conducted, specifically with the elderly and sports practitioners, there is insufficient research on the potential predictors of intentions to consume FS in a general, non-specific sample of the population.

To fill such gap, a survey study grounded on an extended conceptual model adapted from the theory of planned behaviour was implemented, to assess predictors of FS consumption intentions such as: Consumer attitudes, intentions, self-efficacy, controlled perceived behaviour, injunctive norm, descriptive norm, general knowledge and beliefs, risk-benefit perception, trust in information sources and sociodemographic variables, were taken into consideration, alongside sociodemographic variables.

112 participants, showed to have a predominantly incorrect knowledge and beliefs regarding food supplements. Moreover, attitudes towards FS, risk-benefit perception, self-efficacy and the injunctive norm all were significant predictors of FS consumption intentions. Participants also showed high trust towards food safety National Authorities and European Union Institutions. Overall, the results exemplify the need for more studies on the general public, to have a wider understanding of FS consumption intentions, to implement risk prevention actions.

Keywords: Food supplements, Intentions, Consumption, Risk-Benefit Perception, Knowledge, Trust, Biased Beliefs.

Resumo

A investigação sobre os hábitos dos consumidores de Suplementos Alimentares (SA) sugere um aumento do seu consumo nos últimos anos. Apesar de terem sido realizados vários estudos, nomeadamente com idosos e praticantes de desporto, não existe investigação suficiente sobre os potenciais preditores das intenções de consumo de SA numa amostra geral e não específica da população.

Para colmatar esta lacuna, foi implementado um estudo de inquérito baseado num modelo conceitual alargado adaptado da teoria do comportamento planeado, para avaliar os fatores preditores das intenções de consumo de SF, tais como: Atitudes do consumidor, intenções, auto-eficácia, comportamento controlado percebido, norma injuntiva, norma descritiva, conhecimentos e crenças gerais, perceção de risco-benefício, confiança nas fontes de informação e variáveis sociodemográficas, foram tidos em consideração, a par de variáveis sociodemográficas.

Os 112 participantes revelaram ter um conhecimento e crenças predominantemente incorretos relativamente aos suplementos alimentares. Além disso, as atitudes em relação aos suplementos alimentares, a perceção do risco-benefício, a auto-eficácia e a norma injuntiva foram preditores significativos das intenções de consumo de suplementos alimentares. Os participantes também demonstraram uma elevada confiança nas autoridades nacionais de segurança alimentar e nas instituições da União Europeia. De um modo geral, os resultados exemplificam a necessidade de mais estudos sobre o público em geral, a fim de obter uma compreensão mais ampla das intenções de consumo de FS, para implementar ações de prevenção de riscos.

Palavras-Chave: Suplementos Alimentares, Intenções, Consumo, Perceção de Riscos e Benefícios, Conhecimentos, Confiança, Crenças Preconcebidas.

General Table of Contents

Introduction	8
Chapter I – Literature review	9
1. Study goals.....	15
Chapter II – Method	16
1. Sample.....	16
2. Procedure	16
3. Instrument	17
Sociodemographic questionnaire	17
Recent contact with food supplement advertisements	18
Attitude	18
Risk-Benefit Perception	18
Trust in information sources	18
Injunctive Norm	19
Descriptive Norm.....	19
Perceived Behavioural Control	19
Self-Efficacy	19
Knowledge	20
Beliefs	20
Intention to consume food supplements	21
Chapter III – Results.....	22
Descriptive analysis	22
Correlation analysis	24
Linear regression analysis.....	25
Chapter IV – Discussion.....	28

Trust in information sources	28
Knowledge and Beliefs regarding food supplements	29
Benefit and Risk Perception.....	30
Attitude, Self-Efficacy, Injunctive Norm and Perceived Control of Behaviour	30
Limitations and suggestions for future studies	32
Chapter V – Conclusion	33
Bibliography	34
Annexes	39

Table of Contents for Tables

Table 1 – <i>Percentage of correct answers regarding Knowledge of food supplements</i>	22
Table 2 – <i>Percentage of correct answers regarding Beliefs of food supplements</i>	23
Table 3 – <i>Pearson’s correlation between the variables Beliefs, Knowledge, Benefit Perception, Risk Perception, Intention, Attitude, Injunctive Norm, Perceived Control Behaviour and Self-Efficacy</i>	24
Table 4.1 – <i>Linear regression model summary</i>	25
Table 4.2 – <i>Linear regression ANOVA</i>	26
Table 4.3 – <i>Linear regression analyses between the variables Attitude, Risk Perception, Benefit Perception, Injunctive Norm, Perceived Controlled Behaviour, Self-Efficacy, Knowledge and Beliefs predicting the variable Intention</i>	26
Table 4.4 – <i>Linear regression analyses between the variables Age, Gender and Education Level predicting the variable Intention</i>	27

Table of Contents for Annexes

Annex 1 – <i>K1.1 – Knowledge scale</i>	39
Annex 2 – <i>K1.2 – Beliefs scale</i>	39

Introduction

Can we anticipate and gain insight into the individuals who engage in behaviours with consequences for health, such as the consumption of food supplements? This understanding could imply identifying predictors of behavioural intentions, and consequently identify potential targets for risk-benefit communications and also interventions aimed at changing health behaviours. As one might expect, a multitude of factors contribute to the differences in individual inclinations towards health behaviours (Conner & Norman, 2005). These factors encompass demographics, social dynamics, emotions, perceived symptoms, access to healthcare, personality traits, and cognitive factors. (Conner & Norman, 2005).

As a theoretical grounds for identifying such predictors, the Theory of Planned Behaviour (TPB) is a widely recognized social psychological theory that is commonly used, as it seeks to explain and predict intentions to perform behaviours in various domains (Ajzen, 1991). The TPB was developed by Icek Ajzen and has been extensively used to understand the factors influencing people's behavioural intentions and associated behaviours. The TPB posits that an individual's intention to engage in a specific behaviour is the key determinant of whether or not they will perform that behaviour. This intention, in turn, is influenced by three main factors: Attitude (towards the behaviour); subjective norms and perceived behavioural control (Ajzen, 1991). Subsequently to the model proposal, more proposal for its extension were made to increase its predictive value, including for example: belief salience, and past behaviour/habit (Conner & Armitage, 1998). Later, in 2005, Conner and Norman proposed an extended model of the theory of planned behaviour, which included: socio-demographic variables (e.g. age, sex, occupation, socioeconomic status, education, and religion); personality traits; and environmental influences (Conner & Norman, 2005).

This study was intended to be grounded on such literature and extended version of the theory of planned behaviour, in order to better understand consumer behaviour. In this case, consumer intentions regarding food supplements, with a goal to see if, and which, are the main predictors for this behaviour, including additional variables (e.g. trust; risk-benefit perception) commonly found in the food consumption literature.

Chapter I – Literature review

The use of Food Supplements (FS) or Dietary Food Supplements (DFS) has seen continuous growth over the decade and recent studies indicate that the consumption of these products is increasing in various consumer populations (Carvey, Farina & Lieberman, 2012; Dascombe, Karunaratna, Cartoon, Fergie & Goodman, 2010; Mettler, Bosshard, Häring, & Morgan, 2020). These include people who generally want to maintain a healthy and balanced diet and believe that food supplements help contribute to the homeostasis and well-being of their system, elders who seek to increase and improve health conditions, women during planned pregnancies, people recovering from or trying to prevent various health related issues, and also including athletes who may perceive the consumption of these products almost as a requirement to be competitive. (Dascombe et al., 2010; Özgen & Reyhan, 2020). The use of food supplements has wider implications (Dascombe et al., 2010), the usage in high performing athletes is higher than sedentary or physically active populations. However, studies investigating people's general knowledge of food supplement's benefits and risks have seen many contradictory results, which seems to depend heavily on the study's population. Due to the increasing availability of food supplements, evermore common methods of advertising, and consumers' beliefs that these substances have only positive effects on health and sport performance indicate a need for continuous monitoring of this phenomenon (Sirico, Miressi, Castaldo, Spera, Montagnani, Di Meglio, et al., 2018), especially since one of the factors can be the increasing number of older people in society and a mistrust in conventional medicine and the perception that natural is healthy (Egan, Hodgkins, Shepherd, Timotijevic & Raats, 2011).

In general, according to the literature, the perception that consumers have of food supplements seems to be mostly positive with a low awareness of risks as exemplified by a study performed at a fitness centre in Switzerland, in which 82% of the 417 fitness centre users consumed a food supplement recently, but only a small minority of 37% of them had informed themselves on the potential risks of their consumption. Most of their information gathered came from their coaches (28%), from the seller/website (26%) and from their training peers (24%) (Mettler et al., 2020). This means that despite the high consumption rate, there seems to be a low amount of awareness and knowledge when it comes to the risks

associated with the consumption of food supplements. This seemingly shows that many people who consume food supplements believe that it has some positive benefits, according to what is either told to them by a peer, or by what is advertised to them, and in general seem to have reduced knowledge regarding the topic. A study by Shareef, Mukerji, Dwivedi, Rana & Islam (2017) showed that people have a positive bias when receiving advertisement information from a peer and do not respond well to marketers advertising their own product. This would make sense for the members of this fitness centre to buy products more frequently when/if it is recommended to them by someone who they know and can be considered a peer/colleague/friend.

A study using a sample of active military duty personnel showed that 67% of all 990 respondents were at least somewhat confident that food supplements worked as advertised, and approximately half had high confidence in what was advertised (Carvey et al., 2012). However, another study showed some conflicting information: 358 individuals from Greece, of which 82% had higher education, considered food supplements as valid additives conferring beneficial effects, but expressed wariness in regards to product labelling and health claims, expressing a preference to purchase the food supplements from pharmacies (Tsartsou et al. 2021). This means that education levels can have an effect on consumption intentions, as it makes them more cautious about what they are willing to consume without a source that can be considered “trustworthy” (e.g. the pharmacies). A study by Siegrist (2019) concluded that the importance of trust in information sources varies by hazard and respondent group, so it would be relevant to see to some degree if trust, and in what institutions / which sectors, as there is the argument that trust does not causally influence risk perception, and both variables are simultaneously influenced by people’s attitudes (Eiser et al., 2002 cit. in Siegrist, 2019). However, a study by Siegrist, Stampfli & Kastenholz (2008) showed that consumers who have higher levels of trust in the food industry were more likely to buy functional foods when compared to consumers who did not trust the food industry, making trust an interesting variable to consider.

Also relevant is the actual perception/definition of what is a food supplement, for non-experts/laypeople. The study by Siegrist Stampfli & Kastenholz (2008) showed that some functional foods such as protein powders can sometimes be mistaken or interpreted as a food supplement, as knowledge regarding the specifications of what is considered and what

is not considered a food supplement can be hard to define. Since the study performed and presented in this thesis was conducted using a population based in Portugal, the context of what is defined as a food supplement in Portugal, and is regulated by the responsible authorities is relevant and being that the study is to understand people's intentions towards these products, it seems relevant to explain what is in the regulations of the law. Especially since, according to my research, there was no study conducted in Portugal or to a Portuguese based population regarding this topic. In Portugal one of the main authorities responsible would be the Portuguese Food Safety and Economic Authority (Autoridade de Segurança Alimentar e Económica – ASAE) – which follows closely the guidelines set by the European Food Safety Authority (EFSA).

According to ASAE, food supplements are foods which are intended to complement or supplement the normal diet and which constitute concentrated sources of nutrients or other substances with a nutritional or physiological effect, marketed in dosed form and intended to be taken in units of measure of reduced quantity (Decree-Law No. 118/2015).

Concentrated sources of "nutrients" are vitamins and minerals, these substances having a nutritional or physiological effect must have a beneficial effect (Decree-Law No 118/2015). Food supplements are intended to maintain the body's homeostasis. The definition excludes pharmacological action, which is the role of medicines, as food supplements are not intended to prevent, treat or cure diseases. They must be available in a clear, measured method for consumption, these include methods such as: tablets, ampoules, powders and packages containing a product, liquid or solid, which is intended to be consumed after being measured by measuring spoons or cup measurers. The DGAV (Direção-Geral de Alimentação e Veterinária) considers that the reduced unit of measurement may not exceed 25gr or 25ml and that the energy value of the daily dose may not exceed 50 kcal. The products classified as medicines for human use (Decree-Law No. 176/2006) and foods for sportsmen are not food supplements. Food legislation does not prohibit that substances with pharmacological activity can be incorporated as ingredients in food supplements, which means that products containing the same substance can be found on the market, while being produced and marketed according to different requirements (food legislation and drug legislation).

Food supplements are consumed in order to maintain, support or optimise normal physiological processes, i.e. the body's homeostasis, without altering or blocking these functions. Medicines are intended to be taken to prevent diseases and when physiological functions deviate from normality, which could lead to a pathological situation. The aim (with medicines) is to bring the organism back to normality, i.e., that the organism recovers its homeostasis ('restore' or 'correct') and also to prevent illness. (EFSA; ASAE; DGAV).

Despite the very specific definition of what is considered a “Food Supplement” according to ASAE, as seen previously from the literature, a large number of people do not have the general knowledge to fully understand the benefits and risks that can be associated with consuming food supplements. This is worrisome as there is also the possibility of harmful and unpredictable interactions between food supplements and medicines, these being prescribed by the consumer's doctor who may not have been informed about the food supplements consumption habits of his/her patient. Accordingly, in the study by Egan et al. (2011), a survey showed that some consumers reported adverse side effects, and that there was a higher proportion of food supplement users with adverse side effects that took prescription medicines, when compared to the consumers without adverse effects.

The risk and benefit perception of consumers can make a difference when it comes to the intentions of consuming food supplements, although the literature suggests that the benefits perception seems to play a big part in the reason why some people consume food supplements. The matter of having the right knowledge and being well informed is different to consumers beliefs in the claims marketed for the food supplements. Yet people 's beliefs regarding food supplements can differ from the health benefits claimed by the advertisement for these products. The literature regarding people who are more likely to consume food supplements suggests that it is people with education levels above high school (Egan et al., 2011), however the studies conducted to evaluate this topic are usually population specific, which can be a limitation to the veracity for a generalised population’s consumer intentions and habits regarding food supplements, as having a higher income was also associated with more consumption of food supplements (Egan et al., 2011), as food supplements can be quite expensive and “premium” when compared to alternatives which are more natural, such as having a varied and balanced diet (Tsartsou et al., 2021).

In addition to risk-benefit perception and to knowledge, other variables seem to play a relevant role with regard to intentions to consume food supplements. One example from a related area of research, is self-efficacy, i.e. the possibility to complete the act of the intention to consume food supplements, which was the single most important factor in regards to consumption of functional foods in the (Nystrand & Olsen, 2020) study. This makes sense regarding the context of food supplements as well, as if one has the intention to consume food supplements, but the consumer does not have the means to do so due to the expensive cost, they would not be able to proceed with their intentions.

Also, trust, whether it be towards the organisation that produces the products, or the institution that moderates them or even the people who sell and supply them to consumers, is something that should be evaluated to some degree. Siegrist (2019) concluded that the importance of trust varies depending on the sample population and the potential hazard. In the context of food supplements, it could depend on whether the individual perceives the entity at hand to be a hazard or not, and if so it would depend to which degree. They also mention how lay people generally possess limited knowledge about certain hazards (Siegrist, 2019).

Moreover, limited knowledge regarding a hazard or limited knowledge in general can be due to people having limited attention resources. Iyengar & Lepper (2000) showed that, in several different situations, people are usually worst at making decisions when they have extensive options rather than only a few. This is because people are likely to want to make the “right” decision, but this becomes harder when more options are available (Iyengar & Lepper, 2000). In the context of consuming food supplements, people will likely be overwhelmed if they have too many options and will probably generalise information/knowledge about a product to form a choice to consume or not based on their limited knowledge and the abundance of choice.

Another relevant variable is attitude as mentioned in (Nystrand & Olsen, 2020), i.e. a latent disposition or tendency to respond with some degree of favorableness or unfavorableness to a psychological object” (Fishbein & Ajzen, 2010, p. 76 cit. in Nystrand & Olsen, 2020), which refers to the positive or negative evaluation of the outcome associated with performing a given behaviour such as, in the context of this study, consuming food supplements. The attitude of a consumer within the context of the food domain, can often

have the strongest association with intention to consume (Nystrand & Olsen, 2020). This can possibly be due to the person's individual values and goals, such as being more healthy, aligning with what the food supplements offer to provide, which is typically marketed in a way to be a health benefit.

Also relevant are subjective norms which reflect perceived social pressure to display a behaviour, that in some cases can contribute to the prediction of the intention at hand (McEachan, Conner, Taylor & Lawton, 2011). For the thesis study, injunctive and descriptive norms were taken into consideration. Injunctive norms reflect social pressure through the perception of what others approve or disapprove regarding one's conduct (Cialdini, Kallgren, & Reno, 1991). In the context of the study, this means that if someone perceives that the act of consuming a food supplement is a socially approved behaviour, there is the possibility that it could have an effect on their intention towards their behaviour. Descriptive norms use social pressure through what others do, and reflect what is perceived to be normal conduct with respect to a certain behaviour (Cialdini, Reno, & Kallgren, 1990). In this sense, it means that if people think that others like them are consuming food supplements and that these people perceived this consumption to be something "normal" to do, the higher is the probability that they will perform such behaviour of consuming food supplements as this is the "norm" to follow.

As mentioned previously, self-efficacy is likely to be the most important predictor, as if there is no possibility to consume the food supplement, the intention may decrease. A person's Perceived Behavioural Control (or Perceived Control over Behaviour) influences their intention to perform a given behaviour and the actual performance of that behaviour. (Nystrand & Olsen, 2020). The study by Nystrand & Olsen (2020) says that "perceived behavioural control is the overarching, superordinate construct that is composed of two lower-level components: self-efficacy and controllability" (Ajzen, 2002b, p. 680 cit. in Nystrand & Olsen, 2020). Meaning that perceived behavioural control can influence the performance of consuming a food supplement based on their perceived control that the person has over the situation. In this sense, if a person perceives they are in control of consuming a food supplement they would probably be more likely to carry out that behaviour.

Given that many variables can have a relevant role in predicting consumers intention to consume food supplements and thus, to identify the main predictors of such intentions grounded on such existing literature, we considered relevant to assess the predictive role of the following variables: people's attitudes regarding food supplements; their risk and benefits perceptions regarding consumption; their general knowledge and beliefs concerning the products; the subjective norms, more specifically the injunctive norm and the descriptive norm; the perceived behavioural control; self-efficacy; and trust. In order to better characterise the study, sociodemographic factors (professional situation, education levels, gender, age and marital status) were also measured.

1. Study goals

The main objective of the study was to determine the main predicting factors of consumer intentions regarding the consumption of food supplements. The predictors taken into consideration for this study were mentioned previously in the literature review. The main predictors proposed to be tested were: Attitude, perception of risks and perception of benefits, injunctive norm, descriptive norm and self-efficacy. Other predictors such as trust, consumer knowledge and consumer beliefs were also taken into consideration, with some being identified from closely related areas of research (e.g. trust and functional foods), to explore whether an extended model would have a better predictive strength and which variables would have the highest predictive strength.

Additional specific objectives of the study were:

- Investigate correlations between the variables;
- Investigate if the sample was knowledgeable with regard to this topic, i.e., was able to identify correct and wrong information regarding food supplements.
- Analyse if gender was a significant predictor of intentions to consume food supplements.

Chapter II – Method

1. Sample

The sample consisted of 161 adult participants, 49 of which did not complete the questionnaire, resulting in a total of 112 participants. The participants' ages ranged between 19 and 67 years old, of which $M=32$ years old and $Mo=23$ years old (25 participants, 22,3% of the total sample). The sample population consisted of 70 women (62.5%) and 42 men (37.5%). Over half the sample was employed, with 62 participants (55.4%) having a worker status, 26 (23.2%) a student status, 15 (13.4%) being a working-student, 2 (1.8%) were unemployed, 5 (4.5%) were retired and 2 (1.8%) selected "Other". The sample population consists of a majority of people with higher studies, since 53 (47.3%) have a bachelor's degree, 26 (23.2%) have a master's degree and 3 (2.7%) have a PhD, while 26 (23.2%) have finished high school, only 4 participants (3.6%) did not finish higher degrees. In general, the study sample consisted of a majority of young adults, since 54.5% of the total sample was below 27 years old, with a majority of participants having a higher education degree, and being mostly female. 65.2% of the population were single, 21.4% were married, being in a civil union consisted of 8%, 4.5% were divorced and 1 (0.9%) participant was widowed. The high number of single participants can likely be explained due to the sample consisting mostly of a younger aged demographic population.

Most of the participants responded that they were in contact with an advertisement for food supplements within the past week, being a majority of 53.6% (60 participants) exposed to this factor.

2. Procedure

Data collection procedure

The data collected in this research was achieved through a non-probabilistic approach by convenience, using a "snowball" collection technique. The data was collected using an online survey applied via the Qualtrics platform. The questionnaire was disseminated during the months of August 2022 and May 2023 through the social media platforms LinkedIn, Facebook, Instagram, Whatsapp and by email.

The survey is composed of various questionnaires, these being: sociodemographic; consumer attitudes, risk and benefit perceptions, levels of trust towards various factions, intentions to consume food supplements, injunctive norm, descriptive norm, perceived controlled behaviour, self-efficacy, knowledge and beliefs regarding food supplements, and lastly if the participant had been in contact with food supplement advertisements within the past week of completing the questionnaire.

Data analysis procedure

The results were analysed using the statistical analysis software *GNU PSPP 1.6.2* - an open source project for data analysis.

Firstly, descriptive analyses were carried out to characterise the sample regarding the variables relevant to this research, these consisted of the sociodemographic variables (age, gender, education levels), consumer knowledge, consumer beliefs and consumer trust.

Secondly, a Pearson's correlation analysis was carried out between the variables consumer beliefs, consumer knowledge, benefit perception, risk perception, intention, attitude, injunctive norm, descriptive norm, perceived controlled behaviour and self-efficacy.

Lastly, a Multiple Linear Regression analysis was carried out to assess predictors of FS consumption intentions in two steps: step 1: sociodemographic variables (age, gender, education levels) as predictors; step 2, step 1 variables plus attitude, risk perception, benefit perception, injunctive norm, perceived controlled behaviour, self-efficacy, consumer knowledge and beliefs.

3. Instrument

Sociodemographic questionnaire

The sociodemographic questionnaire was specifically constructed for this study, aiming to clarify the sample regarding sociodemographic characteristics, these being: gender, age, marital status, professional status and education levels.

Recent contact with food supplement advertisements

This question was taken from the study by Karbownik et al. (2019), which was adapted for the context of this study (food supplements). The original question was “Did you have contact with DS advertisements within the past week?” while the adapted version was also translated to portuguese, as the sample population was portuguese. This studies version for the questionnaire is as follows: “Have you been in contact with advertisements for food supplements within the past week?”, with a simple “yes” or “no” answer option.

Attitude

To evaluate consumer attitudes, an adapted and translated version of the scale in the study by Nystrand & Olsen (2020). The question consists of three items (running from Bad-Good; Unenjoyable-Enjoyable and Foolish-Wise) with a 7-point scale. The adapted version was “Consuming food supplements regularly would be...”.

The original scale used by Nystrand & Olsen (2020) had an internal consistency of ($\alpha = .87$), the translated adapted version used for this study had an internal consistency of ($\alpha = .91$).

Risk-Benefit Perception

To evaluate the risk and benefit perception of the participants, an adapted and translated version of a few scales used in Gaspar et al. (2016) was used. This version was created specifically for this study. Having consulted with one of the authors, they suggested a version to include risk-perception and benefit-perception. To evaluate the data, this scale was divided into two sub-scales, one for risk perception, and the other benefit perception, both regarding the consumption of food supplements.

The variable created “risk perception” consisting of a 3 item, 7 point scale (1 = extremely low and 7 = extremely high), the internal consistency was of ($\alpha = .81$).

The variable created “benefit perception” consisting of a 3 item, 7 point scale (1 = extremely low and 7 = extremely high), the internal consistency was of ($\alpha = .78$).

Trust in information sources

To evaluate the participants levels of trust in various information sources, a scale was used from the Eurobarometer 2019 Wave EB91.3, which evaluated levels of trust in information sources, by European Union citizens from various European countries on a scale

of: 1 - Totally Trust; 2 - Tend to Trust; 3 - Tend Not to Trust; 4 - Do Not Trust at all; 5 - Don't Know.

For this study the scale was simply translated to Portuguese in order to be able to characterise the sample later on.

Injunctive Norm

To evaluate participants' injunctive norm, an adapted and translated version (from english to portuguese) of the scale was used from the study by Nystrand & Olsen (2020). The question consisted of a 3 item, 5 point scale (1 - Totally Disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Totally Agree).

The original scale's internal consistency was ($\alpha = .95$), the adapted and translated version used for this study had an internal consistency of ($\alpha = .93$).

Descriptive Norm

To evaluate participants' descriptive norm, an adapted and translated version (from english to portuguese) of the scale was used from the study by Nystrand & Olsen (2020). The question consisted of a 3 item, 5 point scale (1 - Totally Disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Totally Agree).

The original scale's internal consistency was ($\alpha = .93$), the adapted and translated version used for this study had an internal consistency of ($\alpha = .63$).

Perceived Behavioural Control

To evaluate participants' perceived behaviour control, an adapted and translated version (from english to portuguese) of the scale was used from the study by Nystrand & Olsen (2020). The question consisted of a 2 item, 5 point scale (1 - Totally Disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Totally Agree).

The original scale's internal consistency was ($\alpha = .72$), the adapted and translated version used for this study had an internal consistency of ($\alpha = .79$).

Self-Efficacy

To evaluate participants' perceived controlled behaviour, an adapted and translated version (from english to portuguese) of the scale was used from the study by Nystrand &

Olsen (2020). The question consisted of a 2 item, 5 point scale (1 - Totally Disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Totally Agree).

The original scale's internal consistency was ($\alpha = .78$), the adapted and translated version used for this study had an internal consistency of ($\alpha = .84$).

Knowledge

To evaluate participants' general knowledge regarding food supplements, an adapted and translated version (from english to portuguese) of the scale was used from the study by Karbownik et al. (2019). It consists of a 7 item scale, evaluated by the participant as either a true or false statement.

In order to evaluate whether the participants' knowledge was correct, some of the items had to be recoded in order to count the answer as either correct or incorrect, based on the correct answer to the statement being true or false. To check which statements' correct answer was either true or false, the original study was used as it had the correct option labelled.

The data was used to be able to evaluate and characterise the sample's general knowledge regarding food supplements.

Beliefs

To evaluate participants' general beliefs regarding food supplements, an adapted and translated version (from english to portuguese) of the scale was used from the study by Karbownik et al. (2019). It consists of a 10 item scale, evaluated by the participant as either a true or false statement.

In order to evaluate whether the participants' beliefs towards the statements regarding food supplements was correct, some of the items had to be recoded in order to count the answer as either correct or incorrect, based on the correct answer to the statement being true or false. To check which statements' correct answer was either true or false, the original study was used as it had the correct option labelled.

The data was used to be able to evaluate and characterise the sample's general knowledge regarding food supplements.

Despite the original study using this scale to evaluate the “specific” knowledge, in the context of this study and the nature of the items, it made more sense for them to be considered as consumer beliefs.

Intention to consume food supplements

To evaluate the study criterion variable, for which predictors would be identified, namely the participants' intentions to consume food supplements, an adapted and translated version (from english to portuguese) of the scale was used from the study by Nystrand & Olsen (2020). The question consisted of a 4 item, 5 point scale (1 - Totally Disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Totally Agree).

The original scale's internal consistency was ($\alpha = .95$), the adapted and translated version used for this study had an internal consistency of ($\alpha = .91$).

Chapter III – Results

Descriptive analysis

The sample appears to have a significantly low amount of general knowledge in regards to food supplements. The sample population's knowledge and beliefs were measured to understand, in a generalised way, if the sample was knowledgeable and informed regarding the topic of food supplements. However, a majority showed a very low amount of correct knowledge regarding the topic and overall biased beliefs towards food supplements.

Regarding knowledge, we can see in Table 1 that only two out of the seven statements were evaluated as either true or false correctly by the sample population, one of them having the correct selection percentage of 59.8% and the other 93.8%, although this second value was the statement “food supplements are food” which is quite simple, and could explain why the result is so high in comparison to the other options. The knowledge items can be seen in the questionnaire in Annex 1 on page 39.

Table 1.

Percentage of correct answers regarding Knowledge of food supplements.

	Knowledge						
	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7
True	96.4%	59.8%	63.4%	96.4%	93.8%	89.3%	67.0%
False	3.6%	40.2%	36.6%	3.6%	6.3%	10.7%	33.0%
Correct Answer	False	True	False	False	True	False	False

Note. Correct option chosen percentages are highlighted in bold.

Regarding beliefs, only one out of the ten statements was evaluated correctly, with a percentage of 60.7%. However, we can see in Table 5 that their beliefs seem to be more well distributed between correct and incorrect, instead of being a bit more polarising like what can be seen on Table 4 in regards to knowledge.

In general, the sample population shows to have low knowledge regarding food supplements and incorrect beliefs towards food supplements.

Table 2.*Percentage of correct answers regarding Beliefs of food supplements.*

	Beliefs									
	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7	1.2.8	1.2.9	1.2.10
True	55.4%	56.3%	79.5%	77.7%	39.3%	54.5%	75.9%	24.1%	79.5%	34.8%
False	44.6%	43.8%	20.5%	22.3%	60.7%	45.5%	24.1%	75.9%	20.5%	65.2%
Correct Answer	False	False	False	False	False	False	False	True	False	True

Note. Correct option chosen percentages are highlighted in bold.

Regarding Trust, the sample population has some degree of trust towards Non-Government Organisations (63.4% total, of which 58% selected “tend to trust” and 5.4% selected “totally trust”); high levels of trust towards European Union Institutions (77.7% total, of which 60.7% selected “tend to trust” and 17% selected “totally trust”); a majority trust National Authorities (67.9% total, of which 53.6% selected “tend to trust” and “14.3% selected “totally trust”); mixed levels of trust towards Farmers (44% total, of which 42% selected “tend to trust” and 2.7% selected “totally trust” while a total 42% show distrust, of which 33% selected “tend not to trust” and 8.9% selected “do not trust at all” and 13.4% selected “don’t know”); there was significant trust towards Consumer Organizations (57.1% total, of which 56.3% selected “tend to trust” and 0.9% selected “totally trust”); and finally a huge majority report high trust in Scientists (89.3% total, of which 55.4% selected “tend to trust” and 33.9% selected “totally trust”). Concerning the lack of trust, a large majority did not trust Celebrities, Bloggers and Influencers (84.9% total); Supermarkets and Restaurants (77,7% total); a small majority show distrust towards Journalist (55.4% total); a significant majority show distrust towards Food Industries (77.7% total, of which 54.5% selected “tend not to trust” and 23.2% selected “do not trust at all”).

Generally, we can say that the sample population showed high levels of trust towards Non-Government Organisations; European Union Institutions; National Authorities and Scientists. They showed low levels of distrust towards Celebrities, Bloggers and Influencers; Supermarkets and Restaurants and Food Industries. Mixed trust results towards Farmers and

Journalists, although it showed positive levels of trust towards Farmers, while journalists showed negative levels of trust.

Correlation analysis

Table 3 below shows the results of a Pearson's correlation was carried out with the criterion variable Intention, and all the predictors, which are: Beliefs, Knowledge, Benefit Perception, Risk Perception, Intention, Attitude, Injunctive Norm, Descriptive Norm, Perceived Control Behaviour and Self-Efficacy.

Table 3.

Pearson's correlation between the variables Beliefs, Knowledge, Benefit Perception, Risk Perception, Intention, Attitude, Injunctive Norm, Descriptive Norm, Perceived Control Behaviour and Self-Efficacy.

Variable	1	2	3	4	5	6	7	8	9	10
1.Beliefs	-									
2.Knowledge	.007									
3.Benefit Perception	-.195	-.176								
4.Risk Perception	*		*							
5.Intention	-.438	.067	.379	-.401						
	**		**	**						
6.Attitude	-.410	-.051	.526	-.265	.645					
	**		**	*	**					
7.Injunctive Norm	-.360	.014	.171	-.164	.493	.270				
	**				**	*				
8.Disjunctive Norm	-.376	.086	.195*	-.111	.440	.340	.487			
	**				**	**	**			
9.Perceived Controlled Behaviour	-.007	.087	.077	-.039	.001	-.036	-.136	-.046		
10.Self-Efficacy	-.315	.054	.328	-.207	.632	.541	.342	.188	.031	-
	**		**	*	**	**	**	*		

Note. * $p < .05$; ** $p < .001$; significant correlations are highlighted in bold.

Significant correlations were found between: Benefit Perception and Beliefs, $r=-.195$, $p=.040$; Risk Perception and Beliefs, $r=.256$, $p=.006$; Risk Perception and Benefit Perception, $r=-.266$, $p=.005$; Intention and Beliefs, $r=-.438$, $p=.000$; $r=.379$, $p=.000$; Intention and Risk Perception, $r=-.401$, $p=.000$; Attitude and Beliefs, $r=-.410$, $p=.000$; Attitude and Benefit Perception, $r=.526$, $p=.000$; Attitude and Risk Perception, $r=-.265$, $p=.005$; Attitude and Intention, $r=.645$, $p=.000$; Injunctive Norm and Beliefs, $r=-.360$, $p=.000$; Injunctive Norm and Intention, $r=.493$, $p=.000$; Injunctive Norm and Attitude, $r=.270$, $p=.004$; Descriptive Norm and Beliefs, $r=-.376$, $p=.000$; Descriptive Norm and Benefit Perception, $r=.195$, $p=.039$; Descriptive Norm and Intention, $r=.440$, $p=.000$; Descriptive Norm and Attitude, $r=.340$, $p=.000$; Descriptive Norm and Injunctive Norm, $r=.487$, $p=.000$; Self-Efficacy and Beliefs, $r=-.315$, $p=.001$; Self-Efficacy and Benefit Perception, $r=.328$, $p=.000$; Self-Efficacy and Risk Perception, $r=-.207$, $p=.028$; Self-Efficacy and Intention, $r=.632$, $p=.000$; Self-Efficacy and Attitude, $r=.541$, $p=.000$; Self-Efficacy and Injunctive Norm, $r=.342$, $p=.000$; Self-Efficacy and Descriptive Norm, $r=.188$, $p=.047$. There are no significant correlations regarding the Consumer Knowledge, or Perceived Controlled Behaviour.

Linear regression analysis

Table 4.1.

Linear regression model summary.

Model Summary

<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>Standard Error of the Estimate</i>
.81	.65	.61	2.69

Table 4.2.*Linear regression ANOVA.*

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Regression	11	1353.96	123.09	16.96	.000***
Residual	100	725.89	7.26		
Total	111	2079.86			

Note. * $p < .10$; ** $p < .05$; *** $p < .01$; model significance highlighted in bold

Table 4.3.

Linear regression analyses between the variables Attitude, Risk Perception, Benefit Perception, Injunctive Norm, Perceived Controlled Behaviour, Self-Efficacy, Knowledge and Beliefs predicting the variable Intention.

	Intention				
	Estimate	SE	95% CI		<i>p</i>
			<i>LL</i>	<i>UL</i>	
(Constant)	5.10	3.39	-1.63	11.83	.136
Attitude	.36	.09	.19	.53	.000**
Risk Perception	-.26	.08	-.43	-.10	.002**
Benefit Perception	.02	.09	-.16	.21	.798
Injunctive Norm	.32	.10	.11	.53	.003**
Perceived Controlled Behaviour	.03	.14	-.24	.31	.808
Self-Efficacy	.64	.18	.29	.99	.000**
Knowledge	.32	.21	-.10	.74	.132
Beliefs	-.16	.15	-.45	.13	.280

Note. * $p < .05$; ** $p < .01$; and $CL > 0$; significant predictions are highlighted in bold.

Table 4.3 shows the results of a multiple linear regression analyses between the predictors Attitude, Risk Perception, Benefit Perception, Injunctive Norm, Perceived Controlled Behaviour, Self-Efficacy, Knowledge and Beliefs predicting the criterion variable Intention. The linear regression model shows to be valid and has a significance of $R^2 = .65$, $F(111) = 16.96$, $p = .000$.

Consumer Intentions were significantly predicted by: Attitude, ($\beta = .36$, $p = .000$); Risk Perception, ($\beta = -.26$, $p = .002$); Injunctive Norm, ($\beta = .32$, $p = .003$); and Self-Efficacy,

($\beta = .64, p = .000$). There was no prediction regarding Benefit Perception, Perceived Controlled Behaviour, Knowledge and Beliefs.

Table 4.4.

Linear regression analyses between the variables Age, Gender and Education Level predicting the variable Intention.

	Intention				
	Estimate	SE	95% CI		p
			LL	UL	
(Constant)	5.10	3.39	-1.63	11.83	.136
Age	.01	.02	-.04	.05	.805
Gender	-.05	.56	-1.15	1.06	.934
Academic Degree	-.41	.31	-1.02	.20	.186

*Note. * $p < .05$; ** $p < .01$; and $CL > 0$; significant predictions are highlighted in bold.*

Table 4.4 shows the results of multiple linear regression analyses of sociodemographic variables Age, Gender and Education Level predicting the variable Intention, however none of these variables showed any significant prediction.

Chapter IV – Discussion

This study adopted a quantitative exploratory approach to the variables under study, based on the specific objectives guiding the exploration of the data. The results will be discussed below, based on the literature reviewed.

An objective of this study was to assess consumer trust, knowledge and beliefs, while also assessing the relationship between a diverse set of variables. The objective of this study was also to find out if there were any variables that could predict people's intentions to consume food supplements, by taking into consideration sociodemographic variables and also psychosocial variables (e.g trust, knowledge).

Overall the results showed low knowledge on the topic of food supplements, as well as biased beliefs regarding food supplements. The study showed no evidence that gender, age or education levels were a predicting factor towards consumer intentions. Differently, there were significant +psychosocial predictors found.

Trust in information sources

The trust values are also more common in what can be considered trusted sources, like European Union Institutions, National Authorities, Scientists and Non-Government Organisations, and they show low trust towards Celebrities, Bloggers and Influencers; Supermarkets and Restaurants and Food Industries, having mixed trust results towards Farmers and Journalists, although it showed positive levels of trust towards Farmers, while journalists showed negative levels of trust. This information makes sense given the context of the (Eurobarometer Wave EB91.3, 2019), which showed very similar values amongst the options which were selected (by the sample population of this study) as being one of significant trust, but there are some differences. On the Special Eurobarometer Wave EB91.3 (2019), the results for Portugal showed overall higher levels of trust in almost all options that were presented, with only having negative trust towards Celebrities, Bloggers and Influencers, however the value showed a lower rate of “total not trust” (45%) and higher amount of “total trust” (33%). Afterwards it is said that younger respondents are more likely than older respondents to say they trust most of the sources, applying in particular to

European Institutions and Celebrities, Bloggers and Influencers (Eurobarometer Wave EB91.3, 2019). However, in this study it is clear that does not seem to be the case, as the majority of the sample was mostly composed of young adults (being the majority of 23 years old, which is 22,3% of the total sample size).

Knowledge and Beliefs regarding food supplements

Regarding knowledge, as expected from the literature (Ceremuga et al., 2020; Mettler et al., 2020) and as described previously we can see that the sample did not identify a high level of correct information, indicating low knowledge of food supplements and a large amount of biased beliefs towards food supplements. By comparison, the general knowledge and beliefs of the sample is arguably worse, taking into consideration the study by Mettler et al. (2020): 37% of people were informed (or informed themselves) about potential risks associated with the supplement they were consuming. However, the studies are not directly comparable, as the latter was done to members of a fitness centre, making that population a more specific sample size (fitness centre sports practitioners). The study by Karbownik et al. (2019) also showed how the general knowledge (and beliefs) in a non-medical educated sample was low, and was found to be positively correlated to the respondent's level of education. However, since the main goal of this study was not to determine if education levels would predict higher values of consumer knowledge and correct beliefs regarding food supplements, this was not analysed. The goal was to understand the sample population's general knowledge and beliefs towards food supplements, and if they would predict the intention on consumption of these products. What was found is that beliefs did have a correlation with benefit perception, risk perception, intention, attitude, the injunctive and descriptive norm and self-efficacy, however knowledge did not have any correlation at all. What this means is that beliefs can influence how people may tend to react/evaluate the idea of consuming food supplements (i.e. their attitude towards FS), because despite the beliefs not being a predictor for consumer intentions, attitude, risk perception, the injunctive norm and self-efficacy all proved to be predicting variables of intentions to consume. More investigation needs to be done to better understand the predictive value of beliefs with regard to intentions. However, if people did not have a positive belief towards (or confidence in) the beneficial effect of food supplements, then

they likely would be sceptical and would likely not have an intention to consume these products (Carvey et al., 2012; Mettler et al., 2020; Tsartsou et al., 2021).

Benefit and Risk Perception

It was previously shown that benefit perception had a positive correlation with beliefs, intention, attitude, the descriptive norm and self-efficacy whilst having a negative correlation with risk perception (which was to be expected due to the nature of them being opposites). Despite benefit perception having significant correlations (including with intentions), it was not a significant predictor of intentions. This means that despite having a significant relation to intention, it does not seem to be predictive of it. Differently, risk perception positively correlated with beliefs and negatively correlated with benefit perception (as mentioned above), intention, attitude and self-efficacy. Meaning that having a risk perception of a food supplement would be a negative predictor/deterrent in having intentions to consume food supplements, thus maybe functioning as a barrier to consume its. Risk perception is one of only four variables that was a predictor of intentions to consume food supplements. This means that there can be a benefit perception regarding a food supplement, however if there is a perceived risk involved with its consumption, people may not have an intention to consume the product. The problem in the case of this population sample would be to properly identify the correct benefit and correct risk associated with the food supplement, due to the low levels of knowledge and incorrect beliefs regarding the subject. It can be inferred that low levels of risk perception could also indicate a higher level of intention to consume food supplements, due to the person not perceiving negative health consequences.

Attitude, Self-Efficacy, Injunctive Norm and Perceived Behavioural Control

As to be expected from the results of Nystrand & Olsen (2020), attitude and self-efficacy did end up being a main predictor for intentions to consume food supplements and thus would be contributing to the prediction of that behaviour. Attitude presented significant correlations with beliefs, benefit perception, risk perception, intentions, the injunctive norm, the descriptive norm and self-efficacy. Overall attitude is confirmed to be a predictor of intentions to consume food supplements, but also possibly influenced by several of the

previously mentioned variables. However, the main goal of the study was to understand if there were predictors for intentions to consume food supplements, and if so which were they. Therefore, an association investigation of other variables was not done with attitudes, or self-efficacy.

Self-efficacy, just like attitude, showed to be one of the most significant correlations as well as one of the predictors of intentions. As Nystrand & Olsen (2020) also show, self-efficacy is probably one of the most important predictors, as without the possibility to follow-up on the planned behaviour, the intention to do so would likely not exist.

The injunctive norm was negatively correlated with beliefs, but positively correlated with intentions and attitude, and was a predictor of intentions to consume food supplements. This means that if someone were to see consuming food supplements as a socially behaviour positive, they would be inclined to have the same intention. This can also be seen in the literature as the study by Nystrand & Olsen (2020) shows it also predicted intentions. In Mettler et al. (2020), due to the nature of being a sample from a fitness centre, there would likely be the perception of consuming food supplements as a socially positive behaviour. The products being recommended by a person who can be seen as a peer/colleague/friend would likely also increase the intake as it would be more positively received (Shareef et al., 2017), and therefore more likely to be consumed, thus increasing the intake of food supplements. It would be interesting if this study had incorporated a way to evaluate if people would feel more inclined to consume food supplements based on a recommendation from different sources, however that was not the initial goal of this study.

Perceived behavioural control, did not have any correlation with other variables and was not a predictor of consumer intentions, which matches the results seen in the literature (Nystrand & Olsen, 2020).

One thing to note is that, as mentioned previously, the study by Siegrist et al. (2008) showed that some functional foods such as protein powders can sometimes be mistaken or interpreted as a food supplement, as knowledge regarding the specifications of what is considered and what is not considered a food supplement can be hard to define. And as seen in the results, the sample population had low knowledge and mostly incorrect beliefs regarding the topic of food supplements, it is a possibility that they do not know the correct definition by ASAE and EFSA.

Limitations and implications for future studies

This study has some limiting factors. First of all, and as mentioned previously, this study had a small sample. Typically, a sample of 112 participants would be marginally satisfactory for conducting a quantitative study. Although the goal was to be a generalised sample of the Portuguese population, the majority of the sample being below the age of 27, makes this a limitation, as well as the majority of the participants having a higher education and the sample having a significant majority of females (62.5%). There was also a high number of participants that were single which can likely be explained due to the sample consisting mostly of a younger aged demographic population. This may also have an effect on some of the results, as women who had planned pregnancies showed more intention to consume food supplements and researched more about food supplements than young non-pregnant women (Funnell, Naicker, Chang, Hill & Kayyali, 2018; Evans & Weisman, 2010), and therefore can be considered a limitation to this study.

Other relevant limitations relate to measuring instruments and their application. First, the construction of the questionnaire was insufficiently planned, as some questions such as “Do you consume food supplements?” and “Have you been a consumer of food supplements?” were not present. To add to this, it would have been interesting to see if consumers would have a higher recommendation rate of food supplements than non consumers, and to see if willingness to try food supplements would vary based on who the recommendation would come from.

The usage of *GNU PSPP 1.6.2* provided limited analysis tools as some analyses were not possible due to the open source software having limited capabilities, impairing a more in-depth data analysis.

Chapter V – Conclusion

Food supplements consumption is becoming more prevalent in society, amongst various specific populations. Although there is not one determining factor for this phenomenon, it is safe to say that spreading awareness of correct information should be a concern for the future. As seen in this study, a majority of people have very little knowledge and largely incorrect beliefs and assumptions regarding food supplements. Although food supplements can have associated benefits, the opposite is also true and the notion of the risks associated with their consumption should be something to consider in the future.

However, there are results that lead to a more optimistic view, namely a tendency to trust food safety National Authorities and European Union Institutions, which follows the trend found in recent Eurobarometer surveys (EFSA, Special Eurobarometer Wave EB91.3., 2019). This may motivate these organisations to spread the news of prevalent risks with consumption habits of food supplements. Furthermore, as seen in the results of this study, people who perceive the act of consuming food supplements with an associated risk, will likely not have the intention of consuming them. In short, population health focused organisations and authorities should have an easier time to tell people to not consume food supplements if there is a known risk.

Is it worth mentioning that, out of all possible predictors to be thought of as relevant for this study, only four showed significant predictions, these consisted of attitude (towards food supplements), self-efficacy, the injunctive norm and risk-perception.

Lastly, this study could have a much more in-depth analysis if the study sample was larger and more varied, and had taken some of the limitations mentioned into consideration. However this study shows that it is worth investigating more on this subject, and possibly look into new ways that food supplements are being advertised, as a majority of the population had mentioned being in contact with some kind of advertisement of food supplements within the last week of replying to the questionnaire.

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Annexes

Annex 1.

K1.1 – *Knowledge scale:*

- K1.1.1 - Before being marketed, food supplements must be tested for efficacy and safety.
- K1.1.2 - An ingredient may be sold both as a medicine or as a food supplement.
- K1.1.3 - The quality of food supplements is routinely tested before being marketed.
- K1.1.4 - The packaging of food supplements must contain information on possible adverse effects resulting from their use.
- K1.1.5 - Food supplements are food.
- K1.1.6 - Food supplement registration requires assessing the composition of the product by the appropriate supervisory body.
- K1.1.7 - All food supplements sold in pharmacies have been tested for safety.

Annex 2.

K1.2 – *Beliefs scale:*

- K1.2.1 - Taking vitamin and mineral supplements prevents diseases in healthy people.
- K1.2.2 - In the elderly, taking vitamin D reduces the risk of bone fractures.
- K1.2.3 - In the elderly, the use of magnesium preparations prevents muscle cramps.
- K1.2.4 - Taking dietary supplements containing calcium reduces the risk of bone fractures in the elderly.
- K1.2.5 - The use of multivitamin preparations protects against heart diseases.
- K1.2.6 - The use of antioxidants prevents the development of cancer.
- K1.2.7 - Regular use of vitamin C reduces the risk of catching a cold.
- K1.2.8 - Taking excessive amounts of magnesium supplements can cause diarrhoea and nausea.
- K1.2.9 - Vitamin C naturally present in food is better assimilated than synthetic.
- K1.2.10 - People with kidney disease should not use high doses of vitamin C.