ANALYZING THE EXTENT OF USE OF MONOSODIUM GLUTAMATE IN THE MALTA LOCAL FOOD INDUSTRY AND HOW IT COMPARES WITH OTHER COUNTRIES

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September 2022

Abstract

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Date
01/09/2022

Programme Level: BA in Culinary Arts

Research/Project Title:
Analyzing the extent of use of monosodium glutamate in the local food industry and how it compares with other countries.

Number of words excluding abstract, references and appendices:
14,676

This research explores monosodium glutamate (MSG) use among people in the Malta local food industry and in other countries. The research aimed to establish how much MSG is consumed in the target population and how well the population knows about the flavor enhancer. The research was conducted using the qualitative method. Questionnaires were given to the general public and culinary chefs to gather primary data. The general findings are that most people have embraced MSG as a preferred flavor enhancer (Ataseven et al., 2016; Bera et al., 2017). However, a significant percentage of the population dislikes MSG owing to its negative health effects such as weight gain, high blood pressure, and dehydration (Freeman, 2006; Hien et al., 2013). Nevertheless, the reviewed literature review shows that the negative effects of MSG are only recorded when the substance is taken raw or in large quantities (Kamal, 2019; Kubala, 2020). The conclusions reached are that MSG is a favorable flavor enhancer when consumed in food and small quantities (Lavine, 2007; Sano, 2009). Finally, the research findings and conclusions imply that MSG should be embraced by the general public and people with a culinary background.

Keywords
Monosodium glutamate, MSG, Malta, Flavour enhancer

Declaration of Authenticity

INSTITUTE OF TOURISM STUDIES
IN ACADEMIC AFFILIATION WITH THE EMIRATES ACADEMY OF HOSPITALITY MANAGEMENT

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Research Title : Analyzing the extent of use of monosodium glutamate in the local food industry and how it compares with other countries.

Declaration:

I hereby declare that this research study is based on the outcome of my own research. I, as the author, declare that this research study is my own composition which has not been previously produced for any other qualification.
The research study was conducted under the supervision of Aldo Vella.

_____
Date

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Student's Signature

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Aldo Vella for his guidance and advice in all the stages of writing my project. I would also like to thank my family for their continuous support and understanding when undertaking my research and writing my project. Their prayers sustained me throughout my studies. I would also like to acknowledge the administration of the Institute of Tourism Studies for providing access to the various materials used in compiling this work. Above all, I thank my maker for carrying me through the entire project.

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INTRODUCTION

1.1 Research Background

This research is about using Monosodium Glutamate (MSG) in the Malta local food industry. Further, the study analyzes the extent of the use of MSG in other countries. The researcher's positionality is that MSG is healthier in food than other flavor enhancers such as salt. The latter contains higher sodium quantities than MSG. High amounts of sodium can contribute to cardiovascular diseases (Grillo et al., 2019). Monosodium glutamate is an indispensable taste in Japanese cuisine as an umami ingredient in kelp soup stock and is widely used in Asian cuisine (Cauchi et al., 2015).

For this reason, each country has very successful umami seasonings that are purely extracted from monosodium glutamate. However, on the other hand, this umami seasoning is also the most misunderstood food additive that has suffered the most severe accusation in recent years. Even today, most people have the image that umami seasonings are toxic substances that modern chemical technology has unleashed on society.

Kikunae Ikeda from Japan is a scientist who discovered monosodium glutamate at the beginning of the 20th century (Freeman, 2006). He was inspired by a Japanese seaweed broth called "dashi" with a strong flavor (Tracy, 2016; Freeman, 2006). Ikeda was the first to isolate glutamic acid as its key ingredient and realized that it would enhance the flavor if used in foods (Sano, 2009). He patented the process for manufacturing monosodium glutamate in 1909 (Mouritsen and Styrbæk, 2014). Today the use of MSG is widespread in the food industry worldwide (Cauchi et al., 2015). It is mainly used in fast and prepared foods for home and commercial use (Tracy, 2016). However, the concern about the safety of this product has been raised in the last decades due to several reports of adverse reactions at high doses (Freeman, 2006; Tracy, 2016).

Despite being used in Asia since around the late 1800s, MSG did not become a common additive in Western societies until after World War II, when soldiers returning from the war noticed the difference in taste and demanded that it be added to their food (Freeman, 2006). Consumers' positive reception of MSG eventually led to the mass production and popularization of MSG-laden food products (Premakumari et al., 2013). Today, the use of monosodium glutamate in food worldwide continues to raise controversy. The production and consumption of MSG have both been banned or severely restricted in some countries, while other jurisdictions have no such restrictions on its availability (Tracy, 2016). The use of this product has raised many controversies in recent decades due to its possible side effects on health (Bera et al., 2017). However, evidence shows that MSG does not cause adverse effects when ingested at normal levels (Premakumari et al., 2013).

1.2 Research Aim, Objectives, and Hypothesis

This study intends to analyze the extent of monosodium glutamate usage in the food industry in Malta. Moreover, it evaluates the awareness level of MSG among Maltese customers and players. The study's hypotheses are that there are misconceptions associated with the use of monosodium glutamate. People know of monosodium glutamate usage in the local food manufacturing industry. Lastly, the general public is informed about monosodium glutamate usage in food preparation. In order to evaluate the usage of MSG in the food industry in Malta and to meet the underlying hypothesis of the study below are the objectives of the study:

Objective 1 – is to conduct a study on the consumption of MSG among the general population in the food industry in Malta.

Objective 2 – is to evaluate the usage of MSG among people with a culinary background.

Objective 3- is to analyses the perception of the populace about MSF in food.

Objective 4 – evaluate the attained data of MSG usage in the food industry in Malta and comparing them with that of the neighboring countries.

Hence, in order to be able to answer these objectives, the running question would be: What is the extent of the use of Monosodium Glutamate in the Malta local food industry?

1.3 Research Methods, Material, and Structure

This research is distinctively qualitative. One of the main reasons this study adopts this approach is because it enables the researcher to explore the subject under study more in-depth (Crowe et al., 2011). Moreover, this approach provides more flexibility to the researcher to understand the thoughts and opinions of prospective participants. The qualitative approach is instrumental in informing how the Maltese food industry is perceived by various stakeholders, including government bodies, international organizations, and food businesses in Malta.

The dissertation is mainly based on secondary data. Secondary data refers to all existing information previously collected by other investigators (Largan and Morris, 2019). In this dissertation, a variety of secondary data is collected using a literature-based method. The research is descriptive. The research describes qualitative data collected from study participants and exploratory data gathered from underlying literature. Descriptive research is usually done to analyze data collected over time (Siedlecki, 2020). In this study, descriptive research will come in handy in describing the extent of use of MSG among the people of Malta and other countries. Further, two distinctive questionnaires were designed to collect data. The first questionnaire was for people without culinary backgrounds (general public), and the second aimed at evaluating culinary chefs' knowledge and attitude toward MSG.

The areas under study include the properties of MSG, its potential effects on the nervous system, its potential to cause obesity, and the controversies and myths associated with the flavor enhancer. The study also assesses the impact of products without clearly labeled MSG content on consumers. Further, the study explores MSG's substitutes and the role of the media in creating MSG awareness. The study concludes with a SWOT analysis of how MSG affects culinary chefs and other people. The dissertation utilized the Harvard-Anglia 2008 version for formatting and referencing.

LITERATURE REVIEW

2.1 OVERVIEW OF MONOSODIUM GLUTAMATE

Monosodium glutamate, also known as MSG, is a sodium salt that derives its umami taste from glutamic acid, an amino acid found naturally in seaweed, tomatoes, parmesan cheese, and meats (Mouritsen and Styrbæk, 2014). MSG is prominently used in ready-to-eat and convenience food items, including soups, salad dressings, snack foods, sauces, and seasonings to enhance flavor (Premakumari et al., 2013). Monosodium glutamate is known worldwide by its acronym E621 (Premakumari et al., 2013). This popular flavor enhancer is used in various sectors of the food industry, both quantity and specialty products for human consumption (Tracy, 2016). Its wide use lies in its capability to stimulate specific taste receptors, enhancing the meaty or savory flavors in many foods (Tracy, 2016). MSG is mainly used to improve the flavor of foods, especially in Asian cooking (Maluly et al., 2017). It is made by mixing an amino acid with ordinary salt, producing sodium glutamate (Maluly et al., 2017). Due to this reason, it is also extensively used in different food products such as canned vegetables, soups, and processed meats (Maluly et al., 2017). Potato chip brands such as Pringles and Doritos also use MSG in their products (Pringles®, 2022), (DORITOS®, 2022). The amount of MSG that can be added varies according to the type of food product it will add (Tracy, 2016).

The function of glutamate in MSG is to stimulate specific receptors found on the tongue, thus creating a unique taste called umami (Mouritsen and Styrbæk, 2014). This process of enhancing the umami taste is called excitation while suppressing other taste components is called seduction (Sano, 2009; Mouritsen and Styrbæk, 2014). MSG is manufactured in a factory that involves fermenting starch, sugar beets, sugar cane, or molasses with bacteria in large vats (Premakumari et al., 2013). By adding hydrochloric acid to the sugars, glutamic acid is produced, purified, and converted into MSG (Sano, 2009). This process creates a white-colored powder soluble in cold and hot water. MSG is a white, crystalline solid with no odor or taste in its pure form (Premakumari et al., 2013).

2.2 MSG INVENTOR

Kikunae Ikeda from Japan is a scientist who discovered monosodium glutamate at the beginning of the 20th century (Freeman, 2006). He was inspired by a Japanese seaweed broth called "dashi" with a strong flavor (Tracy, 2016; Freeman, 2006). Ikeda was the first to isolate glutamic acid as its key ingredient and realized that it would enhance its flavor if used in foods (Sano, 2009). He patented the process for manufacturing monosodium glutamate in 1909 (Mouritsen and Styrbæk, 2014). Today the use of MSG is widespread in the food industry all over the world (Cauchi et al., 2015). It is mainly used in fast and prepared foods for home and commercial use (Tracy, 2016). However, the concern

about the safety of this product has been raised in the last decades due to several reports of adverse reactions at high doses (Freeman, 2006; Tracy, 2016).

Despite being used in Asia since around the late 1800s, MSG did not become a common additive in Western societies until after World War II, when soldiers returning from the war noticed the difference in taste and demanded it is added to their food (Freeman, 2006). Consumers' positive reception of MSG eventually led to the mass production and popularization of MSG-laden food products (Premakumari et al., 2013). Today, the use of monosodium glutamate in food worldwide continues to raise controversy. The use of this product has raised many controversies in recent decades due to its possible side effects on health (Bera et al.,2017). But evidence shows that MSG does not cause adverse effects when ingested at normal levels (Premakumari et al., 2013, pp.1-7).

2.3 UMAMI

There are five different classes or modalities of taste in humans; sweet, salt, sour and bitter, and umami, the latter being described as a meaty taste sensation. Kikunae Ikeda first identified the taste of umami when he isolated the amino acid L-glutamate and proposed that it was the principal source of the characteristic flavor of dashi broth used in many Japanese dishes (Mouritsen and Styrbæk, 2014, pp. 23-40). Umami is a distinct, clean, and pleasant taste that develops during the preparation of foods or through aging. It is defined as a pleasant "brothy" or "meaty" taste with a long-lasting, mouthwatering, and coating sensation over the tongue (Shi et al., 2010). This taste is vital in many cuisines worldwide, including those from Japan, China, Korea, India, and Southeast Asian countries (Mouritsen and Styrbæk, 2014, p. 25). However, the chemical nature of umami is still not fully understood despite being identified over 100 years ago (Sano et al., 2009). The taste receptor cells responsible for sensing umami are found primarily in the fungiform papillae at the tip and edges of the tongue. This is in contrast to sweet, bitter, and sour tastes detected in the circumvallate papillae at the back of the tongue (Mouritsen and Styrbæk, 2014, p. 26). The taste cells responsible for sensing umami are distinct from those for sour, bitter, and salt tastes (Mouritsen and Styrbæk, 2014). Taste receptor cells typically express only one type of taste receptor; however, multiple glutamate receptors co-expressed in the cells detect umami taste (Shi et al., 2010). This implies that these different glutamate receptors signal this particular taste, distinct from sour, bitter, and salt tastes (Lugaz et al., 2002).

2.4 PROPERTIES OF MONOSODIUM GLUTAMATE

As a salt, monosodium glutamate contains no calories and has negligible sodium (Maluly et al., 2017). Monosodium glutamate is primarily used as a flavor enhancer for food. According to Wang and Adhikari (2018), citing from the Food and Drug Administration (FDA), MSG helps intensify flavors in soups, gravies, and meat dishes. On the other hand,

monosodium glutamate is not recommended for people with asthma (Shi et al., 2010). MSG causes asthmatic symptoms such as wheezing and skin rash (Tracy, 2016).

2.4.1 Potential Effects on the Body

Many studies have shown that MSG can cause side effects if consumed in large doses; however, these problems are rare and usually only occur after a person has consumed unusually large amounts of the additive (Premakumari et al., 2013; Sano, 2009). These side effects include headaches, heart palpitations, dizziness, and nausea. Research shows that MSG is safe for human consumption under normal conditions, especially when ingested with foods instead of as a replacement for food ingredients (Shi et al., 2010). This is because glutamate binds to carbohydrates in food and prevents them from binding with the bitter-tasting amino acid phenylalanine (Freeman, 2006).

Monosodium glutamate is a sodium salt with no nutritional value (Freeman, 2006). Monosodium glutamate contains approximately 78mg of sodium per gram (Bera et al., 2017, p.140). Consuming large amounts of MSG may cause side effects such as headaches or nausea for sensitive patients, mainly when consumed with no food (Tracy, 2016). However, some studies show that MSG can cause problems for people who do not have any allergies to the additive (Bera et al., 2017). These effects include inflammation and damage to the nervous system (Bajwa, 2016). This is particularly true when monosodium glutamate is consumed in large amounts or on an empty stomach (Bera et al., 2017). In such cases, the sodium content in MSG may cause high blood pressure and increase the risk of heart disease (Tracy, 2016). While this is rare, it should be avoided if possible (Tracy, 2016).

Furthermore, studies suggest a link between MSG intake and asthma symptoms among those not allergic to the additive (Yang et al., 1997, pp.757-762). Various studies have shown that people with asthma experience more wheezing and respiratory discomfort when consuming MSG (Tseng, 2015; Beyreuther et al., 2007). This may be due to increased glutamate levels in the bloodstream (Tracy, 2016). People allergic to MSG experience a different reaction than those with asthma. These individuals often show symptoms such as skin rash and swelling (Tracy, 2016).

In most cases, MSG is safe for people with no allergic reactions to it (Bera et al., 2017). This is particularly important because side effects from consumed MSG are rare and only occur when the additive is consumed in high amounts (Tracy, 2016). People concerned about sodium consumption should consult their physicians before using MSG to reduce salt consumption (Bera et al., 2017). According to Premakumari et al. (2013) and Wang and Adhikari (2018), cited by the FDA, companies that produce monosodium glutamate do not need to list it on food labels because MSG usually breaks down into its constituent components, namely glutamic acid and sodium, during digestion. While these components

are both safe for human consumption, this is not the case when MSG is consumed in large doses (Tracy, 2016). As such, people should avoid consuming large amounts of monosodium glutamate if they plan to use it as a food flavoring agent (Freeman, 2006). Furthermore, many foods containing monosodium glutamate contain other flavorings, such as yeast extract and soy sauce (Premakumari et al., 2013). As such, people considering making dietary changes to reduce their sodium intake should not cut out foods containing MSG but instead change their consumption habits to include a variety of healthy foods (Husarova et al., 2013). In the EU, glutamate additive is usually permitted up to a maximum of 10 g/kg of ready-to-eat food (EFSA, 2017)

2.4.2 Potential Effect on the Nervous System

Monosodium glutamate is a salt that stimulates taste buds, causing them to release neuropeptides called excitatory amino acid neurotransmitters (EAA) (Shi et al., 2010). These EAA act directly on nerve cells that are present in our sensory organs (Maluly et al., 2017). This causes the taste buds to send messages to the brain, producing an enhanced sense of taste (Niaz et al., 2018). It is important to note that this effect has only been observed when MSG is consumed independently. When MSG is mixed with other foods or consumed with other flavors, it does not affect the nervous system (Maluly et al., 2017; Yang et al., 1997). The different sensitivities of people to MSG are due to heredity (Tracy, 2016). Studies have shown that children are more sensitive to MSG than adults because they have higher concentrations of EAA in their neurons (Tseng, 2015). Monosodium glutamate is also known to cause damage to the nervous system and other health issues such as headaches (Niaz et al., 2018). Studies have shown that MSG can affect brain function and activity (Tracy, 2016; Niaz et al., 2018). While no direct link has been made between MSG and neurodegenerative diseases such as Alzheimer's, studies, have shown that high concentrations of glutamate may affect the brain (Niaz et al., 2018; Lugaz et al., 2002).

2.4.3 Potential Role in Causing Obesity

From a scientific viewpoint, monosodium glutamate is known to cause weight gain in rats. The noticeable weight gain is due to increased palatability and its unpalatable effects on satiety (Rotimi et al., 2012). Isolation of umami taste cells from mice led researchers to the finding that these cells from this area of the tongue regulate energy balance by acting on hypothalamic neurons that control food intake (Cauchi et al., 2015; Farombi and Onyema, 2006). These cells stimulate key molecules in the vagus nerve that send signals to brain regions that control appetite and metabolism. According to Miranda et al. (2016), mice lacking these umami taste cells display a loss of response to compounds that enhance insulin production and were more likely to develop obesity and insulin resistance when fed a high-fat diet (Miranda et al., 2016, pp.27-38).

The role of glutamate receptors in regulating ghrelin secretion has also been found (Beyreuther et al., 2007). Ghrelin is a peptide that increases appetite and food intake through stimulating hypothalamic neurons involved in feeding behavior and energy homeostasis (Tracy, 2016). Glutamate receptor agonists stimulate the release of ghrelin by way of hypothalamic neurons through a pathway involving agouti-related peptide (AgRP) and neuropeptide Y (NPY) (Freeman, 2006). They also activate orexigenic NPY/AGRP neurons (Shi et al., 2010). On the other hand, glutamate receptor antagonists reduce appetite, food intake, and the number of NPY-expressing cells (Rotimi et al., 2012; Yang et al., 1997).

The evidence linking MSG to obesity in humans is limited. According to Miranda et al. (2016), some studies show that ingesting MSG does not affect appetite and food intake (Miranda et al. 2016). Others have found that it stimulates food intake, particularly when consumed with carbohydrates (Mouritsen et al., 2014). The finding that cephalic phase responses are influenced by umami taste cells supports the theory that glutamate receptors influence hunger and food intake (Miranda et al., 2016). One study that stands out experimented with 752 healthy Chinese (48.7% women) aged 40-59 years, randomly chosen from three rural villages in north and south China (He et al., 2008). Most participants made their meals at home without using pre-packaged items. BMI > or =25.0 or > or =23.0 kg/m (2) was considered overweight (based on World Health Organization recommendations for Asian populations) (He et al., 2008). MSG was used by 82 percent of the subjects. The average daily consumption was 0.33 g (standard deviation = 0.40) (He et al., 2008). According to He and colleagues, MSG consumption was positively related to BMI despite adjusting for possible confounders such as physical exercise and total calorie intake. Overall, being overweight was more common in MSG users than in control subjects (He et al., 2008).

Other studies show that there is no association between MSG consumption and BMI. For example, Shi et al. (2010) analyzed data collected from 1282 Chinese women and men. The researchers measured MSG usage and body mass quantitatively in 2002, and the results were followed up in 2007(Shi et al. 2010). After controlling for age, sex, various lifestyle variables, and energy intake, the researchers concluded that MSG use was not associated with significant weight gain (Shi et al. 2010). When total glutamate intake was included in the model, an inverse relationship between MSG intake and 5% excess weight was observed (P = 0.028); however, this connection disappeared when the model was modified for grains intake or dietary patterns (Shi et al. 2010). Overall the researchers concluded that when other food products or dietary habits are considered, these data show no link between MSG intake and weight gain (Shi et al. 2010).

2.5 Monosodium Glutamate Controversies

In 1968, Dr. Robert Ho Man Kwok wrote a letter to the *New England Journal of Medicine* expressing his concern about a strange illness he experienced after consuming Chinese (Freeman, 2006). This unusual experience came to be known as "Chinese Restaurant Syndrome" and is still a common complaint today (He et al., 2008). Kwok wrote that his symptoms included numbness, heart palpitations, and weakness. He also noticed these symptoms worsened when he ate food with MSG added (Regnier-Davies, 2014, pp.85-91). According to Dr. Kwok, the Chinese restaurant syndrome was primarily experienced by those who were MSG intolerant (Blythman, 2018). These individuals often show headaches, flushing, and burning of the back of the neck, upper arms, and chest (Freeman, 2006). Kwok's letter led to a flurry of experiments where various animals were subjected to large doses of monosodium glutamate (MSG) (Miranda et al. 2016).

In a study by Regnier-Davies (2014) where mice were involved, the mammal showed nerve cell damage and impaired growth. However, they also found that these harmful effects occurred when large doses were administered; smaller amounts of MSG had no impact on the nervous system (Miranda et al., 2016). Since this initial discovery, researchers have found that monosodium glutamate can cause adverse effects when given to animals in large doses (Regnier-Davies, 2014). However, no experiments have established causation between monosodium glutamate and humans neurodegenerative diseases such as Alzheimer's disease (Regnier-Davies, 2014; Yang et al., 1997). Scientists are still trying to uncover why monosodium glutamate has adverse effects on the nervous system (Ataseven et al., 2016; Bera et al., 2017). Unfortunately, there is no clear-cut answer to this question (Miranda et al., 2016). Researchers have postulated that the effects of monosodium glutamate on nerve cells may be due to various reasons, including the formation of free radicals (Tracy, 2016; Miranda et al., 2016).

It has also been suggested that monosodium glutamate can cause damage to the nervous system because it may deplete the brain of glutathione (Bera et al., 2017). Glutathione is an antioxidant that protects neurons from damage caused by free radicals and is a neurotransmitter (Bera et al., 2017). Without enough glutathione in the brain, nerve cells may become damaged more quickly when free radicals attack them (Bera et al., 2017).
In one study, researchers found that healthy individuals who were given MSG or placebo experienced similar rates of "Chinese Restaurant Syndrome" symptoms (Tarasoff and Kelly, 1993).

A placebo effect is when the mind has a powerful influence over the body and tricks the body into feeling better or worse, believing the fake rumors, news, or descriptions stated by other people on that consumed commodity (Maher et al., 2021). In this case, placebo

effect-based studies mean that patients are tricked into consuming MSG, resulting in feeling the negative effect even though MSG was not present (Geha et al., 2000). Even though participants switched to the alternative option and had different doses administered altogether, their experiences weren't too drastically impacted by this changeover in treatment options (Tarasoff and Kelly, 1993).

To put the rumors surrounding monosodium glutamate (MSG) to rest, in 1995, the U.S. Food and Drug Administration commissioned a study from the Federation of American Societies for Experimental Biology Association (Geha et al., 2000). The Federation looked into all available evidence on whether MSG was genuinely harmful (Tracy, 2016). The results showed no convincing evidence supporting that monosodium glutamate (MSG) causes adverse symptoms when humans consume it (Tracy, 2016). However, they did find that consuming large doses of MSG in a short period can cause unpleasant symptoms in some people. Geha et al. (2000) tested 130 people who claimed to have adverse reactions from MSG. The participants were first given a dose of the chemical without food or as placebos. The results indicated that only the participants who had MSG without food experienced symptoms such as headaches and flushing (Geha et al., 2000). Researchers retested those who reported a reaction with higher doses to investigate whether self-described MSG sensitivity was valid (Geha et al., 2000). After another round of testing, only two out of 130 original subjects showed consistent responses when tested with MSG. In the end, it was concluded that monosodium glutamate (MSG) did not cause adverse effects when consumed by humans under normal conditions (Geha et al., 2000). More specifically,

> *"The results suggest that large doses of MSG given without food may elicit more symptoms than a placebo in individuals who believe that they react adversely to MSG. However, neither persistent nor serious effects from MSG ingestion are observed, and the responses were not consistent on retesting*" (Geha et al., 2000, p.973)

The debate on whether or not monosodium glutamate is harmful has continued for decades primarily because its effects are still relatively unknown (Tarasoff and Kelly, 1993). Proponents of Dr. Kwok's arguments about MSG argue that the rate of Chinese Restaurant syndrome has increased significantly since its initial discovery in 1968 (Regnier-Davies, 2014; Hien et al.,2013, pp. 922-927). The Doctor suggested this could be due to Westernization and the increase in MSG consumption by the general population (Tarasoff and Kelly, 1993).

According to Regnier-Davies (2014), many individuals blame their symptoms on climate change when they mean Chinese Restaurant Sndrome (CRS) because of the lack of awareness surrounding the popular food additive (Hien et al., 2013). While it is still uncertain whether or not MSG induces harmful effects, the debate has prompted many people to avoid

this additive (Tracy, 2016). The controversy surrounding monosodium glutamate is still present today, with some people believing it is harmful while others think it is entirely safe (Tarasoff and Kelly, 1993). However, many studies show that consuming large amounts of MSG can harm your health (Geha et al., 2000; Hien et al., 2013). For example, MSG can cause obesity and other chronic metabolic diseases. Furthermore, there is a link between MSG intake and hypertension (Hien et al., 2013). Because of the many controversies, some researchers suggest that limiting monosodium glutamate in foods may be best or avoiding it altogether (Bera et al., 2017).

2.6 MSG Myths

MSG myths have been around for decades, and people are still unsure whether it is harmful (Tarasoff and Kelly, 1993; Williams and Woessner, 2009). Many people still believe that monosodium glutamate causes adverse reactions when there is insufficient proof to support these claims (Williams and Woessner, 2009). Repeated studies have shown that monosodium glutamate is safe when consumed in average amounts, but that does not stop people from believing the contrary (Freeman, 2006; Williams et al., 2019). One of the myths surrounding monosodium glutamate is that it is unnatural or synthetic (Tracy, 2016; Yang et al., 1997). However, monosodium glutamate is one of nature's most abundant amino acids (Tracy, 2016). It is entirely natural and safe (Tracy, 2016). Another myth is that MSG contains high amounts of sodium; MSG does contain sodium, but it is relatively low compared to other seasonings such as salt and pepper (Williams et al., 2019).

Furthermore, MSG does not consist of solid particles as some believe; MSG is a crystalline powder that dissolves completely in water (Tracy, 2016). Another acknowledged myth was that antioxidants, such as vitamin C would negate the toxic effects caused by monosodium glutamate (Williams and Woessner, 2009). This myth has also come up in other studies, where researchers investigated whether vitamin C reduces monosodium glutamate intolerance symptoms (Williams and Woessner, 2009; Farombi and Onyema, 2006). In one study, the researchers showed that vitamin C and E antioxidants could significantly reduce the oxidative damage caused by monosodium glutamate (Farombi and Onyema, 2006). Additionally, it was found that these nutrients prevented DNA strand breaks from occurring when exposed to an animal bone marrow micronuclei model, which suggests they may be able to protect against potential genotoxins (Farombi and Onyema, 2006). According to Ayman et al. (2013), administering vitamin C can help alleviate MSG-induced liver injury. This is because vitamin C can reduce oxidative damage by acting as an antioxidant (Ortiz et al., 2006; Ayman et al., 2013). Overall, the evidence in the existing literature shows that certain myths surround monosodium glutamate, although they require further investigation (Williams and Woessner, 2009; Ataseven et al.,2016, pp.8-18).

The most widespread myth is that MSG causes Chinese Restaurant syndrome (CRS) (Tracy, 2016). While many people report having adverse reactions after ingesting monosodium glutamate, no scientific evidence conclusively supports this claim, as Heston Blumenthal insists (Blythman, 2018). Blumenthal is a renowned chef from the U.K. who believes that MSG has been demonized unfairly and lacks thorough research surrounding its safety. Other famous chefs from the U.S. also support the use of MSG, arguing that the use of MSG has no adverse effects on one's health (Blythman, 2018). For example, the founder of the Momofuku food group, chef- David Chang, states that claims that people have been brainwashed into believing MSG is scary (Blythman, 2018). Still, in the real sense, it is a sodium ion attached to glutamate (Blythman, 2018). This is nothing but monosodium glutamate, which are protein building blocks that are natural to the body (Blythman, 2018). As a result, there has been little to no scientific evidence that MSG can cause many side effects (Blythman, 2018). MSG opponents argue that food companies use monosodium glutamate as a cheap filler and is harmful to the body. However, monosodium glutamate is an amino acid in many foods, such as tomatoes and parmesan cheese (Blythman, 2018).

2.7 No MSG Labeling

To deal with a threat, one needs to know what it is and how serious it is (Cauchi et al., 2017). Suppose people are unaware of the health risks that monosodium glutamate poses (Lavine, 2007). In that case, they cannot make an informed decision about whether or not they want to eat something or use a product containing monosodium glutamate (Lavine, 2007). Thus, part of the issue is that people are unaware of what monosodium glutamate is, its health, and its side effects (Farombi and Onyema, 2006). As a result, people cannot make an informed decision whether or not they want to use it in their food. A rich body of evidence shows that Monosodium Glutamate is not clearly labeled in most locally produced and imported products (Freeman, 2006; Lavine, 2007). This is because the brands that use Monosodium Glutamate do not want to put it into their list of ingredients (Freeman, 2006). Otherwise, they might lose business or encourage people to change brands.

Furthermore, no regulation enforces food producers to ensure all products are labeled with monosodium glutamate when added (Freeman, 2006). In Malta, the Food Safety Commission has set labeling rules, specifically Legal Notice 483, which regulates the labeling of foods in packaged or unpackaged form (Food Legislation, 2021). The rules in the legal notice state that if a food contains detectable levels of glutamate derived from any source, the label must carry a statement to that effect close to the name of the food (Food Legislation, 2021). The label should also state the total quantity of added glutamate in the food. The Labeling Regulations state that food additives can be identified with a specific name or the E Number (Food Legislation, 2021). There are three legally acceptable ways to

label MSG: flavor enhancer (E621), monosodium glutamate, and flavor Enhancers Monoammonium Glutamate(E611) (Food Legislation, 2021). Food additives and labeling in the U.S. are regulated by the FDA (Food and Drug Administration) (Levina, 2007). According to FDA regulations, foods containing glutamate in hydrolyzed protein, food proteins, and certain dairy products must be labeled appropriately (Lavine, 2007, p.349). The FDA only requires the manufacturer to declare the presence of MSG under the name "monosodium glutamate" or any ingredient which naturally contains MSG under the name of its ingredient (for example, hydrolyzed yeast, autolyzed yeast, or hydrolyzed oat flour) (Lavine, 2007). The United States Food and Drug Administration (FDA) has not set a limit for acceptable daily intake of MSG, but they do require that it is safe for use as a flavor enhancer (Wang and Adhikari, 2018).

According to European Union rules, if a food contains any ingredient that contains the source of glutamate (for example, hydrolyzed plant protein or hydrolyzed yeast extract), that ingredient has to be declared in the list of ingredients and also mentioned next to the name of that food (Mifsud, 2015). The European Union takes labeling seriously as it has been found that many individuals who have food allergies rely on the labeling to avoid consuming foods that contain ingredients they are allergic to, as many food allergies are life-threatening (Mifsud, 2015). Despite these rules, many foods that contain MSG may not be labeled as such. According to a study in the United States, 93% of all foods containing MSG do not have it labeled on their packaging (Lavine, 2007). This poses a potential health threat for individuals sensitive to MSG since they must be careful about the foods they choose to purchase (Geha et al., 2000).

2.8 Monosodium Glutamate Substitutes/Alternatives

Previous research has described various alternatives for MSG to be used as food additives, including beef stock, parmesan cheese, dulse, shiitake Mushrooms, and yeast extract (Tracy, 2016). According to Wang and Adhikari (2018), these alternatives can be used as functional alternatives to MSG. In other words, these alternatives can be used for the same effect as monosodium glutamate and have similar functionalities (Wang and Adhikari, 2018; Maluly et al., 2017). Also, these alternatives are less likely to elicit side effects associated with monosodium glutamate (Ataseven et al., 2016). Unfortunately, most of the respondents in this study are unaware of these alternatives, as they never thought about them or did not have knowledge of these alternatives. According to Wang and Adhikari (2018), the situation is similar in America "possibly due to the absence of detailed information about the alternative ingredients such as its content and manufacturing information" (Wang and Adhikari 2018). This suggests that food producers need to be more transparent with their ingredients, including disclosing the use of monosodium glutamate in

their products, as Wang and Adhikari (2018) suggest. Still, further research is required to understand the impact of giving monosodium glutamate on health (Tracy, 2016).

2.9 The Media's Role in Creating Monosodium Glutamate Awareness

The media plays a significant role in helping to make people aware of their food (Cauchi et al., 2017). For instance, different media types can be used to warn people about the risks that monosodium glutamate has on health (Harris and Bargh, 2009). This includes uploading articles on social media platforms, broadcasting T.V. segments related to health, public service announcements, and publishing op-eds related to monosodium glutamate issues (Chi et al., 2017; Harris and Bargh, 2009). Previous research asserts that as people become more aware of these issues, they can make informed decisions about their consumption habits (Harris and Bargh, 2009). For instance, if people know that monosodium glutamate poses a risk to their health or that it is not properly labeled on food products, they might be more inclined toward eating healthier foods instead of consuming monosodium glutamate (Cauchi et al., 2017).

Research in the U.S. shows that the "influence of information demonstrated a stronger effect to risk perception about MSG" (Wang and Adhikari, 2018). This assertion is supported by a survey questionnaire based on a focus group study distributed in three geographical areas" (Wang and Adhikari, 2018). The results showed that U.S. consumers mainly had negative attitudes towards monosodium glutamate; consumers' concern level regarding this ingredient correlated positively to their risk perception for potential side effects from consuming MSG (Bera et al.,2017, pp.139-144; Husarova and Ostatnikova, 2013). Other researchers have found evidence suggesting that the media portrayal of MSG as an "unhealthy ingredient" can influence consumers' perception and behavior (Kazmi et al.,2017). For example, Wu et al.'s (2013) study examined the factors that affect public risk perception and possible food scares in Suzhou, China (Wu et al., 2013). The model was based on the literature on people's knowledge about additives and their attitudes towards purchasing them (Wu et al., 2013). Their study showed that three factors affected how people felt about food safety: attitude towards behavior, subjective norms, and information perception (Wu et al., 2013). The relationships were all mediated by risk perceptions of additive safety, with significant covariance observed between attitudes toward behaviors/subjective norms and subjectively perceived risks from additives in food products (Wu et al., 2013). Existing research suggests a similar situation in Malta, with the Maltese media as "an important vehicle for communicating risk information to the public" (Cauchi et al., 2017). Researchers have also found "increased concerns about MSG following news reports" (Janssen et al., 2012, p.24). Their results showed that newspaper articles were the primary source of information about MSG for Maltese consumers, with television being the

additional primary source where stories about MSG are concerned (Freeman et al., 2017; Harris and Bargh, 2009, pp.660-673). Overall, these results highlight the need to develop MSG communication strategies for public health agencies and media to allow them to reach their intended audiences.

2.10 The Food Industry in Malta

A rich body of evidence shows that the Maltese food industry is a thriving sector, although it is relatively small compared to other European countries (Cauchi et al., 2017, p.423). The food industry is a significant contributor to the Maltese economy, and its workforce consists of more than 15,000 people (Juchniewicz and Łukiewska, 2014). The scholars observe that the food industry has stood at over a billion in recent years, representing an increasing trend. The main exports are Maltese bakery, pasta, hazelnut spread, dairy products, and canned food. The industry is competitive because it faces tough international competition from Asia and Eastern Europe (Grech, 2020). According to researchers, this situation is because local food production costs often translate above the European Union average (Grech, 2020; Cauchi et al., 2017). The industry's current major challenge is to stay afloat amidst global competition while still complying with European Union regulations (Juchniewicz and Łukiewska, 2014). As Grech (2020) asserts, this has already resulted in some businesses having to shut down operations (Cauchi et al., 2017). Maltese food manufacturing companies must also keep up to date regarding technological trends and innovations (Cauchi et al., 2017).

The Maltese food industry is diverse but mainly consists of small businesses. As such, it must be supported by the government to stay competitive (Juchniewicz and Łukiewska, 2014). For this reason, Malta enterprises are encouraged to contribute toward better market access while providing training and advisory services (Juchniewicz and Łukiewska, 2014). The Maltese government recognizes the food industry's importance for its economy and has already made some efforts to support it. However, there is still room for improvement; in this regard, support through public-private collaboration can be beneficial (Juchniewicz and Łukiewska, 2014). Lately, the Maltese government has increased awareness regarding potential health hazards associated with food products (Food Legislation, 2021).

Furthermore, the Maltese Food Safety Act now requires that food businesses observe proper hygiene standards. The act also requires information on foods containing high fat, sugar, or salt. Researchers also indicate that the Maltese public has a varied opinion of food additives (Grech, 2020). On the one hand, they are not satisfied with the alternatives available on the market, but on the other hand, they have a strong connection to their food (Cauchi et al., 2017).

2.11 The SWOT Analysis

The SWOT analysis was conducted to analyze MSG's most important strengths and weaknesses from the perspective of three stakeholders: those involved in the manufacturing process, culinary chefs, and people in general. Furthermore, it was also important to provide insights into the key opportunities and threats from the perspective of these parties. Results of the SWOT analysis are presented in the table below.

	Strengths	**Weaknesses**
People in general	- Good taste (Sano, 2009; Premakumari et al., 2013; Mouritsen and Styrbæk, 2014); - Low toxicity (Nogrady, 2015; Zanfirescu et al., 2019)	- Negative stereotypes surrounding the product's image (Solomon et al., 2015; Niaz, Zaplatic and Spoor, 2018; Wang and Adhikari, 2018)
Culinary chefs	- Low price as compared to most other labor enhancements (Spend Matters, 2014); - Flavors that are hard to duplicate (Kubala, 2020); - MSG could be used in numerous meals (Nogrady, 2015)	- Negative stereotypes surrounding the product's image (Solomon et al., 2015; Niaz, Zaplatic and Spoor, 2018; Wang and Adhikari, 2018); - Possible supply problems (Kubala, 2020); - High price as compared to the price of salt (SpendMatters, 2014)
	Opportunities	**Threats**
Public in General	- A chance to reduce people's desire to salt foods (Stanska and Krzeski, 2016); - Possible positive effects on the improvement of the taste of food (Stanska and Krzeski, 2016); - An opportunity to reduce people's sodium intake (Zanfirescu et al., 2020);	- Possible contributions to obesity (Niaz et al., 2018; Lang, 2021); - Adverse effects on people with the MSG symptom complex (Niaz et al., 2018; Lang, 2021); - Other adverse health effects were allegedly reported in studies (Zanfirescu et al., 2020)
Culinary chefs	- A chance to use MSG as a salt substitute (Stanska and Krzeski, 2016)); - A chance to receive reputational gains by using MSG if public opinion changes (Kubala, 2020; Lang, 2021);	- Possible threats to chefs' and restaurants' image (Solomon et al., 2015; Niaz, Zaplatic and Spoor, 2018; Wang and Adhikari, 2018)

	- An opportunity to experiment with various flavors (Premakumari et al., 2013)	

2.11.1 The General Public

The available evidence provides a compelling reason to believe that ordinary people would benefit from increasing the intake of MSG. Empirical studies show that people are usually highly satisfied with the taste of products with MSG (Sano, 2009; Mouritsen and Styrbæk, 2014). Accordingly, from consumers' perspective, the good taste could be MSG's first and most important strength. If customers can overcome their resistance to trying MSG based on misconceptions regarding its allegedly adverse effects on health, they could embrace rich umami flavors in their food. Low toxicity is the second critical strength of MSG from the perspective of ordinary people. Recent evidence suggests that MSG is extremely low in toxicity (Zanfirescu et al., 2019).

On the contrary, Miranda et al. (2016) linked MSG intake to toxic effects and primarily reported on self-reported harmful effects. However, as Nogrady (2015) explains, the data show that a mouse could take 15.18 grams of MSG per kilogram of body weight before exposing itself to the risk of dying from poisoning, which is a very high figure illustrating the low toxicity of MSG. Accordingly, the flavor enhancer seems to possess an evident strength related to low toxicity, which benefits consumers.

2.11.2 Stereotypes Associated with MSG

Negative stereotypes surrounding the product’s image are currently the only known weakness of the product. An analysis of the literature illustrates that many studies blame MSG for several adverse outcomes in animals and humans. For instance, Solomon et al. (2015) study illustrate that even the intake of small doses of MSG daily has dramatic toxic effects. Niaz, Zaplatic, and Spoor (2018) believe that their arguments prove the harm of MSG and even encourage the international community to ban the product altogether. At the same time, as explained above, all such studies contain critical methodological flaws. Unfortunately, although recent evidence and reports from various organizations, including government bodies, argue that MSG is safe for humans, many people still have negative associations with this product and are reluctant to use it (Wang and Adhikari, 2018). A peculiar “image problem” is the only essential weakness of MSG from the position of ordinary people.

If people consume MSG more frequently, they could take advantage of several promising opportunities. First, MSG could reduce people’s desire for salt food, a well-known benefit for human health (Stanska and Krzeski, 2016). Second, the intake of MSG makes the mouth water, thus potentially improving the taste of food (Stanska and Krzeski, 2016).

Third, as Zanfirescu et al. (2020) report, the occasional intake of MSG instead of salt could trigger a 3% decline in sodium intake without damaging flavor. The literature cites certain risks associated with MSG, such as possible contributions to obesity, potential problems with reproductive function, and adverse effects on people with the MSG symptom complex (Niaz et al., 2018; Lang, 2021). However, as explained above, most of these concerns are based on misinformed research, whereas the number of people with the MSG symptom complex hardly exceeds 1% of the general population (Zanfirescu et al., 2020). Therefore, all these risks are characterized by very low likelihood.

2.11.3 Culinary Chefs

MSG has several important strengths from the perspective of culinary chefs. First, the price of MSG is relatively low as it retails at $1.5 per kilogram (SpendMatters, 2014). The price of $1.5 per kilogram is low compared to many flavor enhancements, but it is still high compared to the price of salt. Other weaknesses of MSG that could be relevant for chefs include a slight chance of possible supply problems and potential image losses because of the negative stereotypes surrounding the concept of MSG. Despite these weaknesses, MSG is a valuable product for culinary chefs because of the unique flavors that are hard to duplicate and the fact that it could be used in numerous meals (Kubala, 2020). Thus, culinary chefs could consider using it in their meals.

MSG provides promising opportunities for culinary chefs. First, as stated above, MSG could be used as a salt substitute. In the long term, relying on MSG could make chefs' menus more diverse and attractive. Finally, the last opportunity pertains to the possibility of getting reputation gains due to the expected shift in the public attitudes towards MSG. An analysis of the media and literature shows that many articles have tried to change public opinion on MSG by proving that this product does not have adverse health effects (Nogrady, 2015; Kubala, 2020; Lang, 2021). Accordingly, it seems justified to expect that public opinion will change soon. Some culinary chefs could take advantage of this shift by positioning their establishments as restaurants that actively use MSG to enrich food flavor. There is currently no premise to believe that MSG could contain some threats to culinary chefs except for the ones about possible reputation losses discussed above.

METHODOLOGY FOR DISSERTATION

3.1 INTRODUCTION

This research is about using Monosodium Glutamate (MSG) in the Malta local food industry. Further, the study analyzes the extent of the use of MSG in other countries. The researcher's positionality is that MSG is healthier in food than other flavor enhancers such as salt. The latter contains higher sodium quantities than MSG. High sodium can contribute to cardiovascular diseases (Grillo et al., 2019). The areas under study include the properties of MSG, its potential effects on the nervous system, its potential to cause obesity, and the controversies and myths associated with the flavor enhancer. The study also assesses the impact of products without clearly labeled MSG content on consumers. Further, the study explores MSG's substitutes and the role of the media in creating MSG awareness. The study concludes with a SWOT analysis of how MSG affects culinary chefs and people.

The hypotheses developed through secondary data include misconceptions associated with monosodium glutamate, knowledge and awareness of the use of monosodium glutamate in the local food manufacturing industry, and the general public on the use of monosodium glutamate in food preparation.

This study intends to analyze the extent of monosodium glutamate used in Malta's food industry. Moreover, it evaluates the awareness level of MSG among Maltese customers and players. In addition, the attained data on the use of MSG will be compared with other countries in the EU and how much MSG the general public consumes within a day by conducting a qualitative research method. Further, the study explores literature that addresses the subject matter.

3.2 QUESTION DEVELOPMENT AND QUESTION DESIGN

The research question is: what is the extent of the use of Monosodium Glutamate in the Malta local food industry? I chose the research question because it allows participants to discuss their basic knowledge of Monosodium glutamate. MSG occurs naturally in the body and plays several essential roles, including regulating hunger and appetite. Studies suggest that consumption of monosodium glutamate improves memory and mood. It increases alertness and focuses during prolonged mental tasks. Also, monosodium glutamate promotes healthy brain function (Kouzuki et al., 2018).

However, there are concerns over safety regarding the high intake of MSG. Some studies indicate excessive intake may lead to neuropsychiatric disorders (Hajihasani et al., 2020). Thus, dietary guidelines recommend limiting the amount consumed. Studies show that excess mono sodium glutamic acid does not appear harmful. MSG can be used in various foods such as soups, broths, salads, and sauces. It is also used in meat and poultry products to enhance flavor. It is also used as a seasoning in processed foods.

Some questions assess participants' views on whether MSG is safe for consumption. Monosodium Glutamate has been proven to be harmless to humans and does not have any side effects. In the United States, the Food and Drug Administration (FDA) has approved using MSG in food (Hajihasani et al., 2020). It has been approved for use in producing frozen foods, bread, crackers, and cheese products.

These questions also analyze the awareness of MSG in Malta by asking the participants to name a product that may contain MSG. The study also considers people unsure if they have ever tried MSG. The researcher wanted to probe the answers by asking questions that seek to understand issues such as if consumers believe that MSG could have the potential to make food taste better. Further, the researcher sought to understand whether individual adds MSG to their food to see the usage of the flavor enhancer in Malta. Another concern was how often the consumers add MSG to their food to understand how much the individual uses the product in terms of quantity in grams. Further, the questions analyze if people know that MSG is not a chemical. Rather, the commodity is made from fermented sugarcane, the most abundant amino acid produced in the body.

3.3 RESEARCH TYPE AND RESEARCH METHOD

This dissertation is qualitative. Qualitative research is a broad methodology where the focus is on investigating phenomena. The research identifies and describes existing phenomena (Crowe et al., 2011). Furthermore, qualitative research attempts to understand the phenomena through the subjective interpretation of the phenomenon under study. Qualitative research has distinct advantages over quantitative research, one of them being that it allows for an investigation of topics that are hard to measure (Mohajan, 2018). Another advantage of qualitative research is that it provides insights into the reasons behind phenomena (Pathak et al., 2013).

This research is distinctively qualitative, just like the existing literature on this topic. One of the main reasons that this study adopts this approach is because it enables the researcher to explore the subject under study more in-depth (Crowe et al., 2011). Moreover, this approach provides more flexibility to the researcher to understand the thoughts and opinions of prospective participants. If a quantitative approach has been employed for data collection, such an approach will not offer much of an opportunity. The qualitative approach is particularly useful in informing how the Maltese food industry is perceived by various stakeholders, including government bodies, international organizations, and food businesses in Malta. The use of monosodium glutamate is identified and documented in the literature review.

The dissertation is mainly based on secondary data. Secondary data refers to all information that has been previously collected by other investigators (Largan and Morris,

2019). Secondary research is a useful way to use previous work since it allows for creating new knowledge. The benefit of using secondary data is that it allows for a broad range of sources, especially when the topic focuses on an issue that has been widely researched (Martins et al., 2018). In this dissertation, a variety of secondary data is collected using a literature-based method. The collection of secondary data also allows for the generation of new hypotheses.

The research is descriptive in nature. The research describes qualitative data collected from study participants and exploratory data gathered from underlying literature. Descriptive Research is usually done to analyze data collected over a while (Siedlecki, 2020). Thus, it may include both quantitative and qualitative data. This study records observations made during the original data collection and then analyzes later. The researcher looks into the past events to determine why something happened, how it came about, and what was going through the mind of the participants (Atmowardoyo, 2018).

The main focus of descriptive research lies in describing situations, relationships between individuals or groups, attitudes, values, norms, patterns of behavior, and interactions within specific areas (Sahin and Mete, 2021). The goal of descriptive research is to describe a phenomenon and its characteristics. The descriptive approach is more concerned with what rather than how or why something has happened. The data may be collected in a descriptive study, but it is often analyzed quantitatively, using frequencies, percentages, averages, or other statistical analyses to determine relationships. However, such an approach can be applied to report opinions and attitudes.

Qualitative research often involves an inductive exploration. This phenomenon aids the researcher in identifying recurring themes, patterns, or concepts and then describing and interpreting the identified themes or categories. In this study, descriptive research will come in handy in describing the extent of use of MSG among the people of Malta and other countries.

The literature review is primarily based on various international bodies such as the European Food Safety Authority (EFSA), the World Health Organization (WHO), the Food and Drug Administration (FDA), and the Food Safety Commission in Malta. The literature review also includes various websites of local food businesses in Malta, particularly in beverage production. Amongst international and local agencies, and to sustain credibility, peer-reviewed articles and other secondary data resources such as books on the use, cause, and effects of MSG were used.

3.4 QUESTIONNAIRE DESIGN

Questionnaire design is crucial for carrying out any study. To ensure reliable results, appropriate questions should be asked and designed based on the specific objectives of

each investigation (Nayak and Narayan, 2019). Questionnaires help researchers collect data efficiently and conveniently. They save time, money, energy, and resources (Dalati and Marx Gómez, 2018). Moreover, questionnaire designs are flexible enough to meet new situations. Questionnaires may be adapted according to the needs of participants. Researchers often fail to conduct proper studies due to a lack of attention to designing appropriate questionnaires (Einola and Alvesson, 2021). Lack of clear instructions regarding how to complete questionnaires and inappropriate selection of items limit the reliability of data collected through questionnaires.

3.4.1 Questionnaire for the general public

Two distinctive questionnaires were designed. The first questionnaire was for people without culinary background (general public). The questionnaire was used to identify the awareness level of monosodium glutamate among Maltese consumers. The researcher aimed to explore the subject of MSG among the general public of Malta.

A questionnaire is designed and sent out to several respondents through email. The questionnaire includes open-ended questions in an attempt to understand the perception of monosodium glutamate among consumers. The questionnaire results identify whether consumers perceive monosodium glutamate positively or negatively and their main concerns.

Furthermore, the results examine how much is known about monosodium glutamate and consumers' main sources of information. Moreover, the research includes an assessment of current regulatory policies about using monosodium glutamate in food products. Most of the data used in this research were collected through survey-monkey questionnaires.

The questionnaires sent to the general public were divided into three sections. The first section assessed people’s basic knowledge of MSG, while the second section assessed the use and taste of MSG. The last section assessed the reputation and health concerns of MSG. One of the questions sought participants’ views on the value of Pringles®/Doritos® in food. Another question assessed participants’ knowledge on whether they know that MSG is incorporated in different food products.

Further, the research sought to assess participants’ views on MSG as a flavor enhancer in savory foods. The researcher also enquired about the frequency and quantity of MSG the participants added to their food. Also, the participants were asked whether they think MSG is harmful to health and prefer buying products with no MSG label.

3.4.2 Questionnaire for the culinary chefs

The second questionnaire evaluated the knowledge and attitude of culinary chefs to MSG. The researcher also sorts to establish whether culinary

chefs use MSG in their food or workplace. Further, the chefs were asked whether they would recommend MSG to their customers. The questionnaires sent to individuals with a culinary background were divided into four sections. The first section was about the information of participants, while the second section was about the use and perspective of MSG. The third section was on customer feedback and taste of MSG, while the fourth section was about the health of consumers and the reputation of MSG.

Some of the questions assess the respondents' use of MSG at work or alone, while others sought to find out whether customers ask for more food owing to the MSG flavor in the food. The researcher also asked the respondents whether they think Pringles® or Doritos® contain MSG probing to acknowledge whether consumers know what they are consuming. Further, the respondents were asked whether they would promote the use of MSG in catering establishments. The researcher also sought to establish whether the respondents were aware of any harmful effects of MSG on health and whether the cons would ruin a restaurant's reputation.

Scholars argue that the purpose of the study should be clearly understood before conducting a particular investigation (Morin, 2013). This makes sure that the findings will be based on valid data. If a researcher does not have enough information about the subject matter that interests them, then there is no way they will be able to come up with proper conclusions. Therefore, if one plans to conduct their project, they should make sure that they first gain complete knowledge about the topic that they want to cover.

The study employs existing theories to analyze the elements of the topic of discussion. Theories explain the concept of a phenomenon (Gelso, 2006). They are based on facts and observations and also on the experiences of the researcher. Theories are an important part of any research study and are used to explain phenomena. Theories are used to explain the phenomenon which is to be explained and the concept which is to be explained. Theories are often considered tools for explanation and prediction in psychology and sociology.

3.5 POPULATION

The target population comprises 100 people, both males, and females. The population was chosen based on convenience sampling. In research, convenience sampling uses non-random sampling methods to collect data (Sedgwick, 2013). It is commonly used in research when a large sample is not needed, and there is a limited time to collect data. Convenience sampling is also used to collect data from many people in a short period. It is often used when too many people are randomly selected for a study. The advantage of convenience sampling is that it is easy to do and very effective in gathering information. The

disadvantage is that the sample may not represent the larger population. It is also difficult to generalize the results. The research included persons in the culinary sector, such as chefs and members of the general public. A consent form was sent to the target group to seek their approval to participate in the study.

3.6 THE SWOT ANALYSIS

The SWOT analysis was adopted to assess MSG's strengths, weaknesses, opportunities, and threats. The SWOT analysis narrowed down how MSG impacts the general public and culinary chefs. The researcher was able to explore the areas that need improvement as far as MSG's weaknesses and threats are concerned.

The strengths of MSG among people, in general, are that the flavor enhancer has a good taste and low toxicity. However, MSG has weaknesses that include negative stereotypes regarding the product. The opportunities associated with the product among the public, in general, include a reduction in people's desire for salty foods, improvement of the taste of foods, and an opportunity for people to reduce sodium intake. However, there are threats, including an increase in the risk of obesity, adverse effects on people with the MSG symptom complex, and other adverse health effects.

The strengths of MSG among culinary chefs include relatively low prices, flavors are hard to duplicate, and MSG can be used in various meals. The weaknesses include negative stereotypes, possible supply problems, and higher prices than salt. The opportunities include substituting salt for MSG, a positive reputation if public opinion changes, and an opportunity to experiment with various flavors. The only threat is a possible threat to chefs' and restaurants' image if the public dislikes MSG in their food.

3.7 LIMITATIONS

The sample size was relatively big, making the data analysis process quite hectic. If I had to repeat the process, I would reduce the number of participants from 100 to around 80. A smaller sample size simplifies the data analysis method. However, the size may limit the generalizability of data to a larger population. Research shows that sample size is an important factor that affects the generalizability of research results (Einola and Alvesson, 2021). The size of a sample is a crucial factor in any research. Small sample sizes tend to be overgeneralized, while large sample sizes are more likely to produce generalizable findings. Research findings are always subject to error due to random variation. If the sample size is too small, the chances of finding differences between groups may increase.

3.8 DATA COLLECTION ANALYSIS

The data will be analyzed using content analysis. The approach is used to identify the themes or patterns in the data (Atmowardoyo, 2018). Themes are the patterns of ideas or categories in the data. It is a method of analysis in qualitative research. It is a systematic and objective data analysis involving identifying and organizing all the meaningful units in the data into categories. It is used to understand the meaning of the data. In qualitative research, content analysis can describe, explain, and interpret data, including qualitative data. It can also be used to analyze quantitative data coded into qualitative variables. Content analysis is useful in qualitative research projects because it allows the researcher to see patterns in the data that are hidden in raw data. In this study, the approach will help analyze data about the extent of use of MSG in the Malta local food industry.

FINDINGS AND RESULTS

4.1 THE USE OF MONOSODIUM GLUTAMATE AMONG PEOPLE WITH A CULINARY BACKGROUND

A majority of the research participants were from Malta. The Maltese comprised 92.59% of the respondents. The term respondents is hereby used to describe culinary chefs and other professionals in the culinary industry. People from Bulgaria and Germany were 7.41%. Further, most respondents had worked in the culinary industry for more than a year, with 92.86% having worked between five and 30 years. Those who had worked for less than one year were 7.14% only. There were nine types of culinary industries that the respondents had worked in. The industries include fine dining, casual dining, fast food, hotel, pastry, bakery, food Science, pizzeria, and ice cream parlor. The respondents' job positions included owner/CEO, head chef, sous chef, chef tournant, chef de partie, commis chef, pastry chef, lecturer of a culinary module, a student in a culinary institute, baker, pizzaiolo, and Food Scientist.

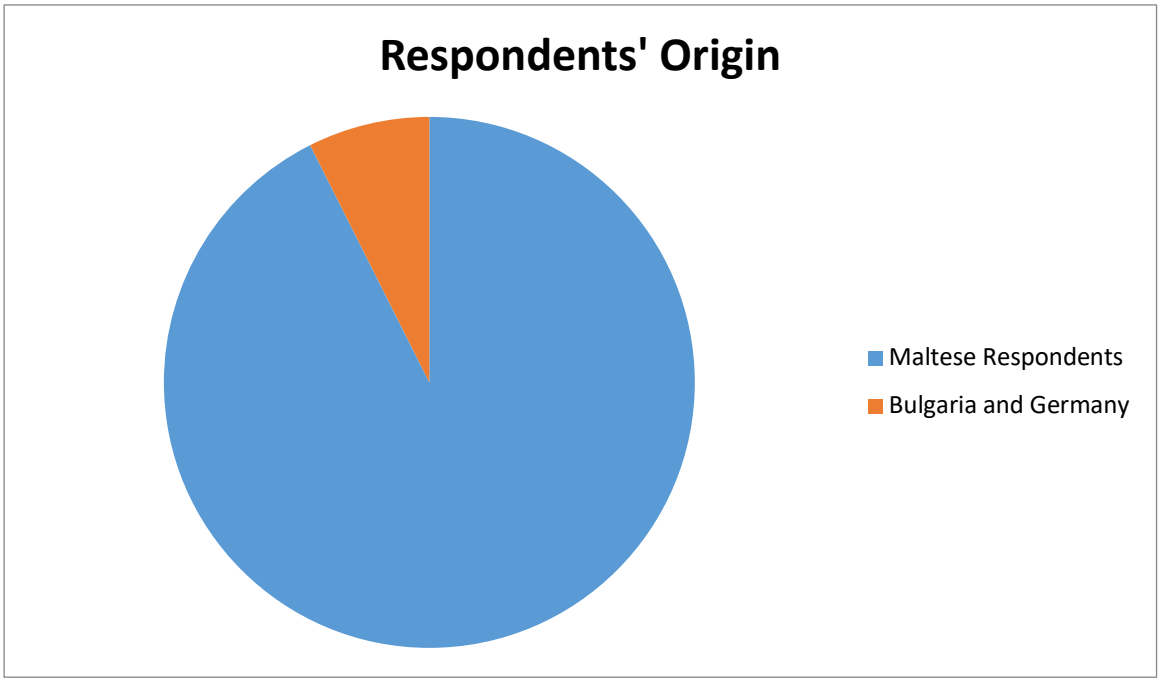

Figure 1: Respondents' Origin

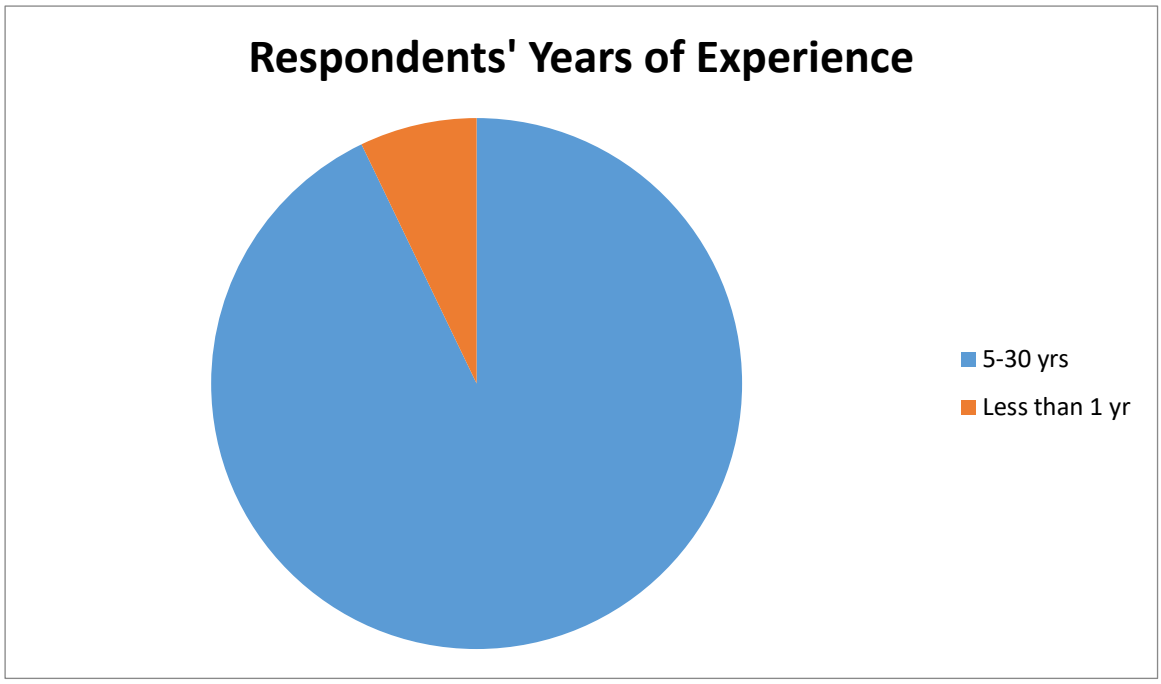

Figure 2: Respondents' Years of Experience

Half of the respondents embraced using MSG at work, particularly CEOs and head chefs. The study results show that the Monosodium Glutamate (MSG) level in Malta's local food industry is relatively high compared to the other countries. However, the food industry in Malta is not fully aware of the level and extent of the use of MSG (Tracy, 2016). The study reveals that the food industries in the other European countries use MSG in relatively low quantities.

Despite the popularity of MSG, 75% of the respondents said that they have never used the flavor enhancer alone without adding salt. The use of monosodium glutamate (MSG) in food is widespread worldwide and has been used for many years to enhance flavor and improve the taste. MSG is used predominantly in meat products, such as sausages, meatballs, meat loaves, meat patties, soups, and stock (Maluly et al., 2017). The culinary chefs noted that they find the foods tastier when MSG is combined with salt.

The CEOs and head chefs said that most customers do not ask more for food owing to the MSG flavor in their food. Contrary to the researcher's expectation, customers did not seem very intrigued by the MSG flavor. MSG is commonly used in processed food. It is a compound used in food to make it more appetizing. It is also known as glutamic acid monosodium salt (Sano, 2009). The similarity in flavor between MSG and salt could be attributed to the customers' lack of enthusiasm for meals with MSG.

The CEOs and head chefs noted that they would consider eliminating MSG from their list of flavors if many customers complained of allergic reactions. The possible side effects of this food additive include migraines, eye-watering, stomach cramps, and nausea

(Freeman, 2006). The United States Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA) identified a possible link between the consumption of MSG and the occurrence of a headache.

Approximately 88.89% of the culinary professionals said they think Pringles or Doritos contain MSG. One of the main ingredients in Doritos is monosodium glutamate, which is a popular and common ingredient in many chips and snacks (Shi et al., 2010). It is known for its flavor and texture. Pringles or Doritos provide a quick energy boost, especially when used in salads. However, some people feel nauseous after consuming these two foods.

The culinary chefs who favored the use of MSG were 25.93%, while those with neutral views were 59.26%, and those who were against MSG were 11.11%. Research shows that MSG was adopted in Asia around the late 1800s, while soldiers from Western societies embraced the flavor enhancer after World War II (Freeman, 2006). The adoption and reception of MSG have contributed to the mass production and distribution of the product worldwide (Wang and Adhikari, 2018). Nevertheless, some countries have banned the production and consumption of MSG due to fears of health risks.

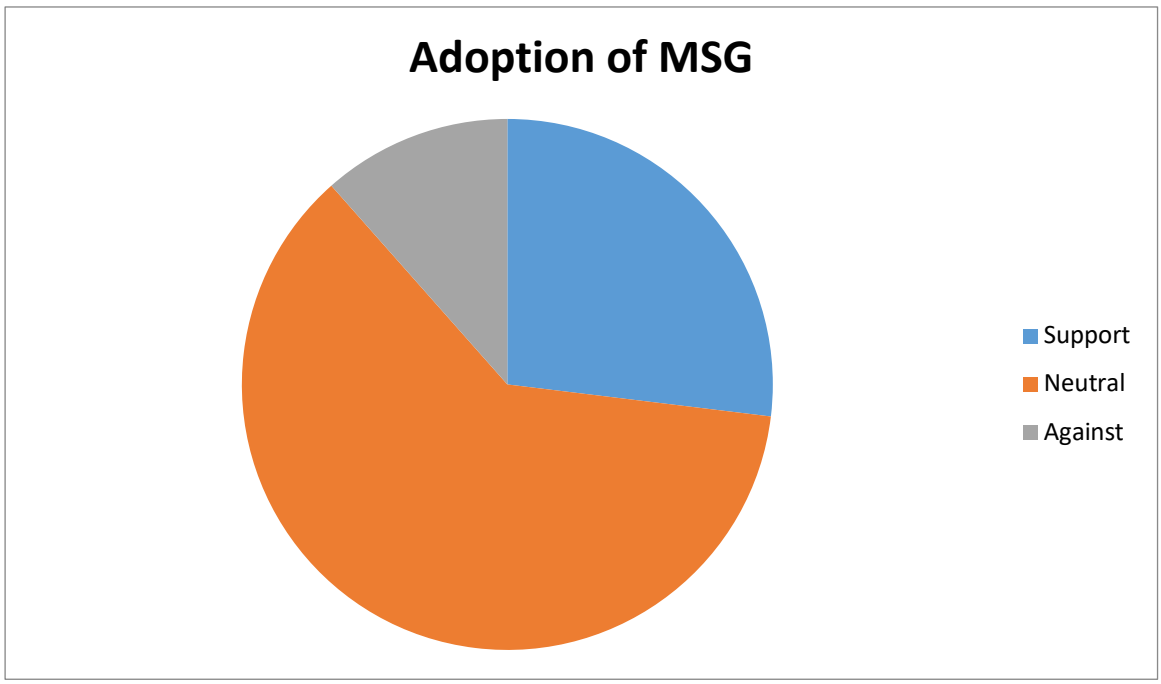

Figure 3: Adoption of MSG

Over 80% of the chefs did not think MSG is a dangerous chemical in food. However, some said the product could be dangerous if not used as per requirements or in high quantities. Recent studies suggest that MSG may contribute to obesity (Miranda et al., 2016). The scholars further noted that in recent times, MSG has gained much attention due to reports on its possible adverse effects. Some of these chemicals might prove beneficial,

while others are harmful if ingested. Studies show great concern over the safety profile of the long-term ingestion of additive agents.

The banning of MSG was supported by 26.92% of the respondents. The small percentage supporting the banning of MSG said that flavors should be brought out using natural foods, not additives. Previous researchers have called on the Food and Drug Administration (FDA) to ban the product claiming that MSG has “dramatic toxic effects” (Niaz and Spoor, 2018). Most people seem to love MSG in their food hence the statistics favoring the additive.

Over 90% of the respondents said that they think MSG in food has the potential to enhance the taste of savory food. Tracy (2016) affirmed the assertion by noting that MSG can stimulate certain taste receptors, thus enhancing the meaty flavors in many foods. Further, MSG enhances the taste of savory foods without necessarily adding too much salt or other spices (Bera et al., 2017). Such savory foods include soups, canned vegetables, and processed meats.

The respondents outlined several food items that have a flavor that compares to MSG in the kitchen at their workplaces. Some listed food items include reduced stocks, salt and soy sauce, dried mushrooms, katsuobushi, chicken nuggets, bonito, dashi, garums, and fermented goods. Others include miso, balsamic powder, Asian dishes, curry, tomatoes, vegetables, and pepper. Other respondents said that MSG is unique as it gives a nice umami flavor and that they would not compare it with any other type of food.

Most respondents said they do not think MSG can replace salt as a raw food additive. One of the respondents said that, in their own opinion, MSG could not replace salt as a raw food additive because salt also works as a preservative when applied to food. On the other hand, MSG is a fermented powder, and the respondent was not sure how the microorganisms would affect food. According to Maluly et al. (2017), unlike salt, MSG does not contain calories, and it has minimal amounts of sodium. Therefore, the additive is much healthier than salt. Nevertheless, critics associate MSG with asthma; hence not recommended for asthmatic people (Shi et al., 2010).

Over 60% of the respondents said they do not think the cons of MSG could harm the reputation of a restaurant/company using the additive. However, some respondents felt that the lack of knowledge about the advantages of MSG could harm an enterprise's reputation as people tend to focus on the harmful side of the product only. In a particular article on the *Times of Malta* website, the author quoted an e-mail that claimed that Tal-Furnar Galletti biscuits are harmful because they contain MSG (Massa, 2008). The reputation of Galletti producers, Consolidated Biscuit Co. Ltd, was at stake. However, the authorities and producers termed the allegations misleading, malicious, and alarming.

There were minimal reports of MSG image loss due to negative stereotypes surrounding the product. Over 50% of the respondents were not aware of such reports. However, as mentioned earlier, there are people out to tarnish the reputation of MSG. All in all, the merits of the additive outdo its shortcomings. Therefore, people are challenged to gather the correct information about MSG before spreading misleading information (Husarova et al., 2013). The only caution regarding using MSG is that it should be added to foods in minimal quantities lest it becomes excessive (Premakumari et al., 2013).

MSG did not affect the consumers' health by 54.55% of the respondents. Those who said that MSG negatively affects the consumers' health were 18.18%, while those who said that the additive positively affects the consumers' health were 4.55%. Some respondents said that MSG has no health effects if used in moderation. However, excessive consumption of MSG was linked to negative health outcomes. Others said that they were not sure whether MSG was a health hazard. The lot said they rely on other people's findings to enlighten themselves about the health impacts of MSG. Underlying research studies recommend low quantities of MSG in food to prevent conditions such as obesity (Tracy, 2016).

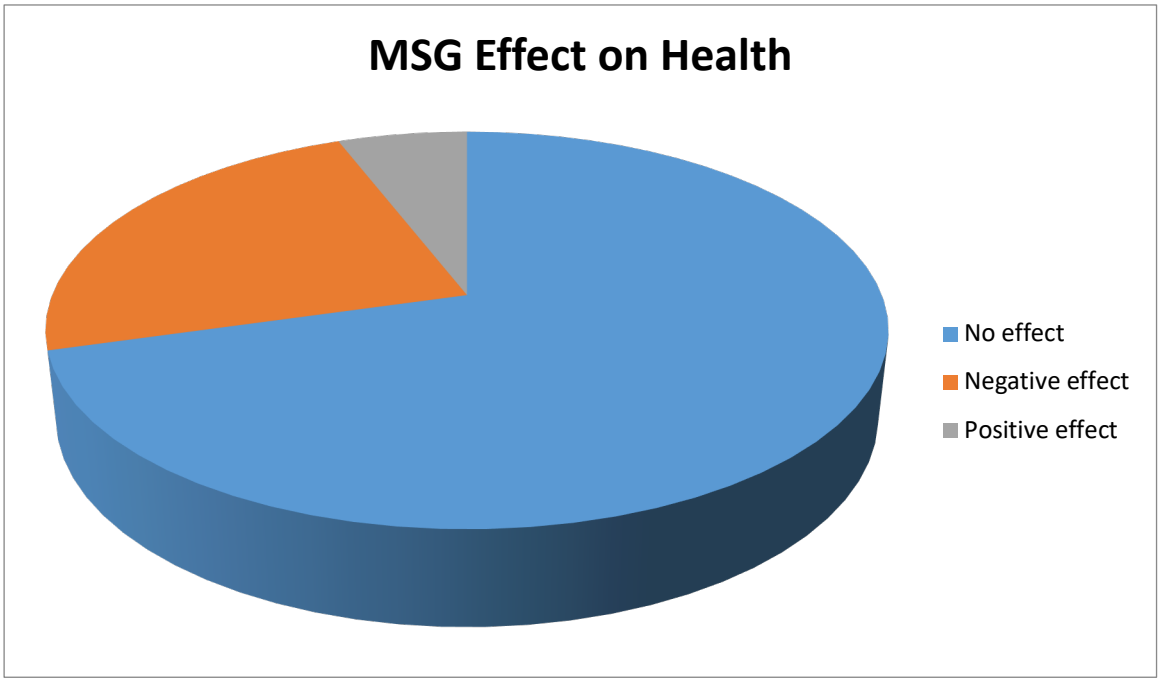

Figure 4: MSG Effect on Health

An interesting finding is that 100% of the respondents said they have never had a negative reaction to MSG. Underlying research shows that MSG should not be taken without food lest it causes unpleasant symptoms such as headache and flushing (Geha et al., 2000). The researchers concluded that MSG is safe for human consumption under normal conditions. Nevertheless, some people react negatively to the additive, hence the need for

caution while consuming foods with MSG. Besides obesity, MSG is also linked to hypertension and chronic metabolic diseases (Bera et al., 2017). The scholars advocate for reducing the intake of MSG once negative symptoms surface or stopping the consumption of foods with the additive altogether.

4.2 THE USE OF MONOSODIUM GLUTAMATE AMONG THE PUBLIC IN GENERAL

Over 40% of the respondents, hereby used to describe the general population, who were between 20 and 50 years old, found Pringles/Doritos to be good and addictive/extra tasty. The products contain MSG. Therefore, the research finding implies that the respondents loved the flavor of MSG in Pringles/Doritos. It causes damage to the optic nerve, which may lead to a loss of vision. It may also cause a loss of hearing. It affects the central nervous system and may cause convulsions, coma, and death (Solomon et al., 2015). It also affects the digestive system and causes nausea, vomiting, and diarrhea. It has been found that it may also increase the risk of cancer.

Over 50% of the respondents knew about MSG, while only 1.01% said they had just learned about the additive. The flavor enhancer is used in many countries across the world. For the right application, consumers need to know the benefits and shortcomings associated with MSG. Previous researchers describe the taste of MSG as umami (Mouritsen & Styrbæk, 2014). The taste is derived from an amino acid known as glutamic acid. The scholars further note that the umami taste is enhanced through a process known as excitation, while other taste components are suppressed via seduction.

The awareness that MSG, as an ingredient, is added/incorporated in several food products was high among 53.54% of the respondents. The respondents listed some food products such as soups, salads, snacks, sauces, and seasonings. MSG is also present in various processed foods, including canned, fast, and condiments. It is added to tons of food and beverage products. Nevertheless, most people know little about the danger it can cause their health (Sano, 2009). This can be attributed to a lack of awareness in the general public.

Over 80% of the respondents said that they think MSG in food has the potential to make savory food taste better. Monosodium glutamate is a non-nutritive chemical compound that acts as a flavor enhancer. It is found in many processed, packaged, and fast foods, which helps preserve and enhance food taste without adding calories (Freeman, 2006). It is listed as Generally Recognized as Safe by the U.S. Food and Drug Administration (FDA) and is considered safe for most consumers.

Despite the knowledge of MSG, only 25% of the respondents said that they add MSG to their food. Food scientists have long known that adding monosodium glutamate increases consumers' perception of savoriness (Zanfirescu et al., 2019). But little was known about the effects of MSG on consumers’ food preferences and consumption habits.

According to a study in the International Journal of Obesity (IJO), adding MSG to food increases consumers' desire for it, making them more likely to eat it (Ortiz et al., 2006). In addition, the study found that children were more likely to like and eat foods with MSG added to them. While studies of MSG's effect on food preferences have been conducted in Japan, China, and Korea, little research has been conducted on the topic in the United States.

Over 60% of the respondents said they add under four grams of MSG to a single serving. Research shows that excessive consumption of MSG can be detrimental to health (Sano, 2009). Many people eat fast food regularly. There have been many reports that the monosodium glutamate added to the food is not beneficial to human health. One study found that MSG causes the brain to have a high activity level, thus causing mental disorders (Cauchi et al., 2017).

Over 90% of the respondents said they have never consumed raw MSG. However, 7.84% had consumed raw MSG and experienced side effects such as feeling extra hunger in the morning. Some scientific studies suggest that consuming foods containing high levels of MSG can cause headaches, stomach aches, dizziness, anxiety, depression, irritability, and even heartburn or indigestion (Sano, 2009). According to the American Cancer Society and the Food & Drug Administration (FDA), no scientific findings exist that conclusively link eating large amounts of MSG to any disease (Cauchi et al., 2017). Some people worry nevertheless.

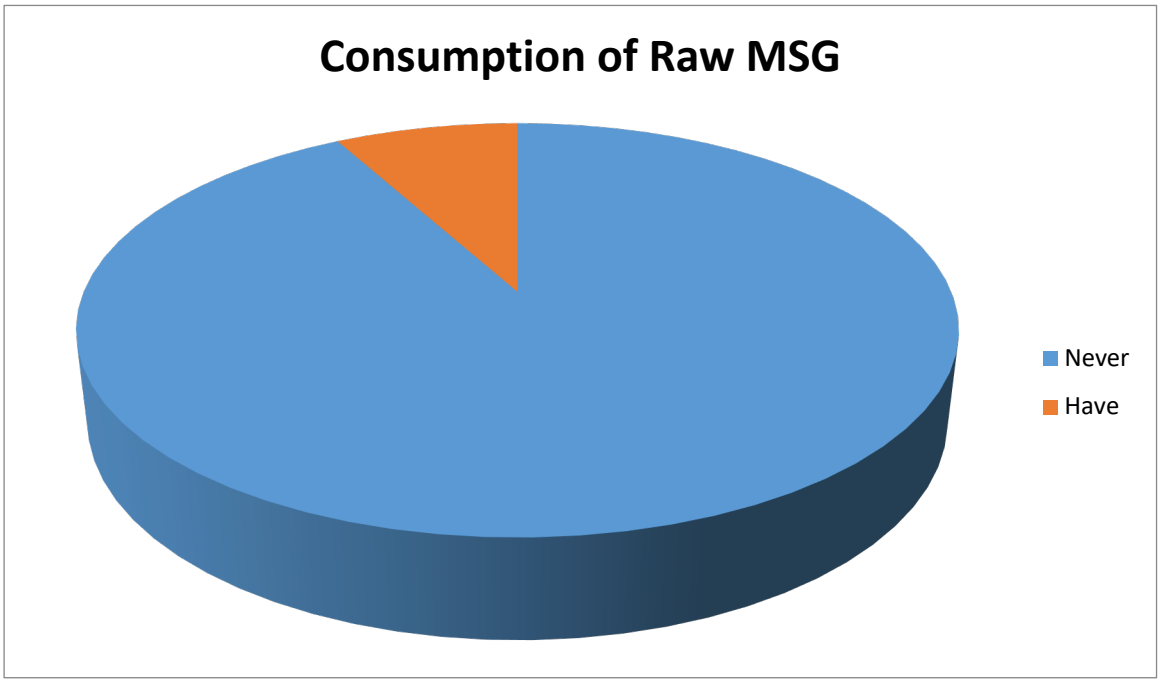

Figure 5: Consumption of Raw MSG

Half of the respondents said that they think MSG is a dangerous chemical in food because it is an artificial additive. Another 25% said MSG is not dangerous since it occurs naturally in food. The Food and Drug Administration (FDA) has determined that this chemical is safe for human consumption, but many health experts disagree (Hien et al., 2013). They note that the glutamate in natural foods is a complex substance that differs from the glutamate in artificial foods and that humans need to stay on the natural path of eating fresh foods.

Labeling of food products was also put into consideration. 40.38% of the respondents said they prefer buying a product with a 'No MSG' label, while the other 50% said that they don't mind the labeling or lack thereof. In a report, critics of MSG argued that the product manufacturers had disguised the flavor enhancer with the label E621 to blind consumers (Massa, 2008). The critics implied that MSG is dangerous; therefore, manufacturers should label it correctly to help consumers make informed decisions. It is important to note that E621 is MSG's acronym and FDA legally approves the label.

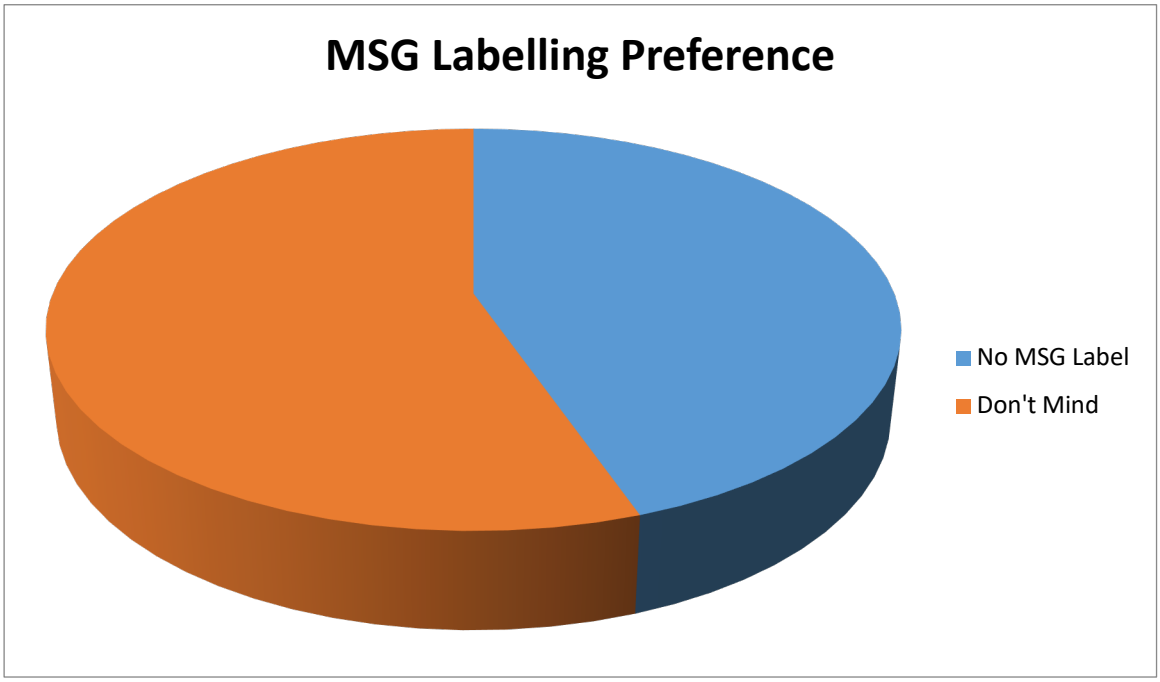

Figure 6: MSG Labeling Preference

MSG seemed to gain the support of most respondents, as 73.08% said the additive should not be banned. Those who said MSG should be banned said the additive has too many side effects, such as muscle pain. Others said the additive is unhealthy since it is artificial and may cause cancer. However, proponents of MSG argue that flavor enhancer should not be banned as it presents various opportunities. First, it reduces people's desire for salt food, thus improving consumers' health (Stanska & Krzeski, 2016). Second, MSG

causes the mouth to be watery, thus improving food taste. Third and last, occasionally taking MSG reduces excessive consumption of sodium from salt while retaining foods' flavor.

MSG was associated with a significant fat weight gain after consumption for a while among 5.77% of the respondents. Others said they do not think MSG is the sole contributor to weight gain. Research shows that MSG contributes to consumers' weight gain (He et al., 2008). However, different researchers did not find a positive correlation between MSG consumption and an increase in body mass index (BMI) (Shi et al., 2010). All in all, individuals' weight gain could be attributed to other factors such as lack of exercise and not necessarily consumption of food rich in MSG.

Less than 20% of the respondents said that their family members suffered from high blood pressure, skin rash, joint pain, inflammation, headache, dehydration, heart palpitations, heart disease, brain problem, dizziness, nausea, bloating, and a damaged nervous system after consumption of food with MSG and oriental food. According to Williams and Woessner (2009), excessive MSG consumption and raw flavor enhancer intake can harm consumers' health. In some cases, high blood pressure may be followed by heart disease. In other cases, dehydration may trigger headaches, while inflammations damage the nervous system (Hien et al., 2013).

Over 60% of the respondents said they have never had a negative reaction to MSG. Those who reacted with the additive said they had high blood pressure, dehydration, headache, nausea, and inflammation. Research shows that MSG is only harmful when consumed in large quantities and as a replacement for food ingredients (Shi et al., 2010). Therefore, the side effects mentioned above of MSG can be avoided by consuming the flavor enhancer in moderation. Drinking much water is also essential in managing dehydration and headache.

The respondents listed several products that may contain MSG. Such include Doritos, hot dogs, Chinese food, mayo, noodles, Asian food, stock cubes, sauces, ketchup soybeans, burgers, Mc Donalds, processed meats, chicken stock, and knorr dried soups. Others include frozen foods, yeast, twisties, KFC, Pringles, condiments, cheese, processed and canned food, seasoning, crisps, and Coca-Cola. The listed food products are rich sources of MSG as they come pre-packaged with the additive. Critics of MSG discourage people from consuming foods with artificial additives due to the potential side effects. However, consumers at risk are those with allergies to MSG or asthma (Hien et al., 2013). Further, most of the listed food items contain high cholesterol. Therefore, MSG increases the risk of obesity and heart problems.

Only 14.81% of the respondents said they add MSG to their food. They added MSG to chicken noodles, pasta, egg fried rice, ketchup, chicken salad, Bolognese sauce, and

meatballs. Others said they add MSG to any dish. One of the respondents said that they never add MSG to their food, while 75% said they only add MSG to their food sometimes. Monosodium glutamate is a type of amino acid that has a taste of sweetness (Freeman, 2006). It is a natural salt of lysine. Like every other amino acid, it is an important building block of proteins in the body. It is also a vital element of many other proteins for forming the muscles, nerves, immune system, bones, hormones, eyes, skin, and tendons. The respondents who said they never consume MSG argued that the additive harms health, so people should avoid eating foods rich in MSG and start taking much salt and drinking more water. Others complained of the additive having a bad effect on the stomach.

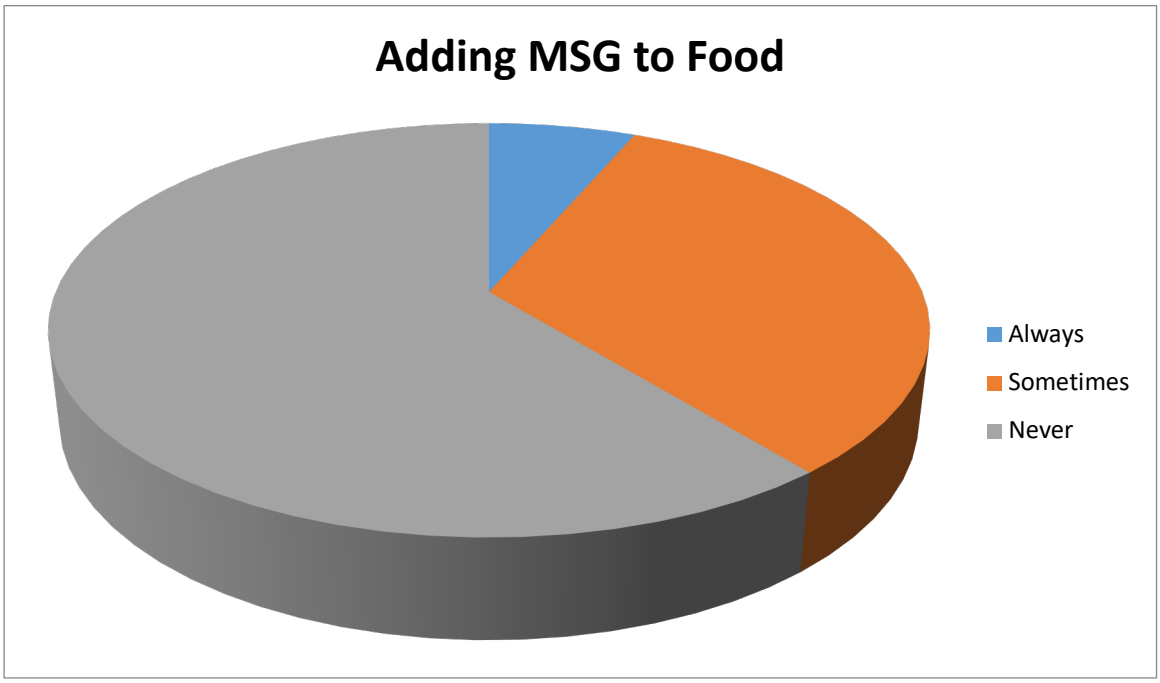

Figure 7: Adding MSG to Food

The findings and results indicate a relatively good knowledge of MSG among people with a culinary background and the general public. Additive consumption has been embraced by some and opposed by others. The latter argue that the flavor enhancer has negative health effects. However, from the reviewed literature, it is evident that MSG is only harmful if consumed raw or in large quantities. All in all, people with allergies to MSG and those with asthma should avoid consuming foods with the MSG flavor enhancer.

In summary, 60% of the professionals are in favor of using MSG in food that they produce within their establishment. Moreover, from the general public point of view, 50% are in favor of consuming products containing MSG when eating out. Thus, when comparing both results, it is evident that the Malta population relatively consumes large quantities of MSG in their food. However, underlying research shows some level of misconception towards MSG among people who associate the additive to health problems. Generally

speaking and based on the findings, the use of MSG is healthy when consumed in small quantities.

CONCLUSION

In summary, the Maltese food industry appreciates the value of MSG in food. Previous studies have challenged the government to support the industry to keep it competitive (Juchniewicz and Łukiewska, 2014).The scholars also advocated for Malta enterprises to improve market access and provide training and advisory services. The Maltese government acknowledges the food industry's importance for its economy and has already made some significant efforts to support it. However, there is still room for improvement. Essentially, the industry requires support through public-private collaboration of different entities (Juchniewicz and Łukiewska, 2014). A considerable observation is that the Maltese government has increased awareness regarding the potential health hazards associated with food products (Food Legislation, 2021).

Another element of the popular seasoning and flavor enhancer, MSG, is that it is the purest form of umami. MSG is widely used in the Malta food industry to intensify and enhance umami flavors in sauces, broths, soups, and many more foods (Freeman, 2006). The product can also be used as a partial replacement for salt as it contains one-third of the sodium present in salt. MSG is classed as safe by the United States Food and Drug Administration (FDA) and the World Health Organization (WHO) (Premakumari et al., 2013). Proponents of MSG argue that the food additive reduces people’s tendency to add raw salt to food, thus improving consumers’ health (Stanska and Krzeski, 2016). Further, taking MSG regularly reduces the urge to consume sodium salt, thus retaining the original flavor of different foods. Lastly, MSG is said to make the mouth watery, an aspect that significantly improves food taste.

While MSG probably has huge benefits to the Malta food industry, the ubiquitous use of this food additive could have negative consequences on public health. Over the years, people have proposed many reasons why MSG may harm human health. The reviewed studies show that because MSG makes food taste better, people may be more tempted to overeat. Consequently, the individuals face the risk of health problems such as obesity, headaches, heart palpitations, dizziness, and nausea (Sano, 2009). Other complications may include central nervous system (CNS) disorder, disruptions in adipose tissue physiology, hepatic damage, and reproductive malfunctions.

Sometimes, consuming MSG food can trigger high blood pressure, skin rash, joint pain, inflammation, headache, heart palpitations, heart disease, brain problems, bloating, and a damaged nervous system. According to Williams and Woessner (2009), consuming the raw flavor enhancer excessively can cause some deadly health outcomes. Worse yet, the product may trigger high blood pressure, followed by heart disease. In other cases,

headaches may arise from dehydration, while the nervous system becomes damaged due to inflammations (Hien et al., 2013).

It is believed that professional prefer to enhance their flavor profile of their foods by using fresh ingredients rather using additives or enhancers. Research shows that professionals (Professional Chefs) prefer to use natural fresh products, and reductions to enhance the flavor profile of the product being produced (Tracy, 2016). Thus, based on the findings and the opinion of the professionals, and taking into consideration that the use of MSG level up and intensify the flavor profile of a product when added/incorporated to a product. In Malta, the Maltese chefs, prefer the natural form that of using fresh and natural ingredients and reduction to enhance the flavor of a product.

Further studies must assess the connection between MSG and cardiovascular disorders and hypertension. All in all, there is not enough evidence to suggest that MSG can cause human brain damage. If more evidence of MSG toxicity were provided, there would probably be a total ban on using MSG as a flavor enhancer. Since many prepackaged foods already contain MSG, proper labeling is necessary. Critics of MSG have observed that the product manufacturers disguise the flavor enhancer with the label E621 to blind consumers (Massa, 2008). The critics imply that MSG is dangerous; therefore, manufacturers should label it correctly to help consumers make informed decisions. Nevertheless, there's no compelling reason to avoid MSG if one does not experience side effects when consuming the additive.

The use of MSG in Oriental cuisine has been connected to a complex of symptoms termed Chinese Restaurant Syndrome (CRS) or MSG symptom complex. The most common symptoms are burning sensations in the mouth, facial pressure, chest pain, flushing, headache, tingling, numbness, and generalized weakness (Premakumari et al., 2013). It is thought that one to two percent of the population is sensitive to MSG. However, two extensive scientific reviews by the Joint Expert Committee on Food Additives (JECFA) and another by the Federation of American Societies for Experimental Biology (FASEB) concluded that concentrations of MSG in food are not hazardous to human health (Sano, 2009). The latter source does indicate, however, that there is a subset of individuals who are sensitive and may suffer transient adverse symptoms due to the consumption of large amounts of MSG.

The reviewed research findings show that people with a culinary background and the general public in Malta have a relatively good knowledge of MSG. Consequently, the general public has embraced the consumption of the additive in their meals, and culinary chefs add MSG to foods while serving customers. All in all, the population is concerned about the negative health effects associated with MSG. Luckily, it is evident that MSG is only harmful if

consumed raw or in large quantities (Tracy, 2016). Further, people with allergies to the flavor enhancer and those with asthma should avoid consuming foods with the additive.

Lastly, the reviewed studies have shown a significant effect of MSG on animals. In one study involving mice, the researchers established that MSG caused nerve cell damage and impaired growth among mammals (Regnier-Davies, 2014). However, like humans, the previous researchers observed that the harmful effects only occurred when large doses of MSG were administered simultaneously. According to Miranda et al. (2016), smaller amounts of MSG have no impact on the nervous system of both humans and animals.

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Appendix 1

Survey 1

Monosodium Glutamate (MSG) for the General Public

Analyzing the Use of Monosodium Glutamate

Monosodium glutamate (MSG), also known as sodium glutamate, or by its acronym E621, is a flavor enhancer commonly used within the food manufacturing industry. Despite that, glutamic acid is a chemical that occurs naturally in food commodities such as ripened tomatoes, mature cheese, fermented products, and other commodities. MSG is a fermented product made up of different ingredients, mainly sugar cane, sugar beets, cassava, or corn, and when the protein of these fermented ingredients is added to food intended for human consumption, MSG acts as a food enhancer. In humans, MSG can stimulate specific taste receptors; its main function is to enhance or intensify food's meaty and savory flavor (Tracy, 2016). MSG is commonly used in oriental cooking (Maluly et al., 2017) and other preserves such as canned vegetables, powdered or instant soups, and processed meats.

Aims and objectives

This dissertation aims to analyze the extent of the use of monosodium glutamate in the Malta food industry and how it compares with other countries. The dissertation evaluates the awareness level of monosodium glutamate among Maltese consumers and players in the local food industry.

Other objectives include:

· To establish if there are any local taboos or misconceptions associated with monosodium glutamate and how they compare to other countries.

· Identify how businesses in the local food industry may benefit from better knowledge and awareness of the use of monosodium glutamate.

· To determine respondents' preferences for monosodium glutamate in food preparation.

The survey is divided into three sections;

Section 1: Basic knowledge of MSG

Section 2: Use & taste of MSG

Section 3: Reputation & health concerns of MSG.

Section 1: Basic knowledge of MSG

1. By consenting to participate in this research, you are committing to provide the most truthful responses possible. The researcher and any extra responders will not be able to tell which replies are yours since all responses will be anonymized before they are sent to the researcher. By ticking the agreeing box, you also agree that you do not work in the culinary Industry.

Some of the questions in this poll may be distressing to some people. Any moment you choose, you may shut the window and either end your participation in this survey or take a break from the information.

I, the participant, have read this study's information and understand it. All my questions have been answered to my satisfaction. I understand; I am free to ask for further information at gabriel.catania001@its.edu.mt *at any time.*

I, the participant, know that

1. *My participation in this study is entirely voluntary.*
2. *I am free to withdraw from the Survey at any time.*
3. *Any raw data will be stored securely and destroyed after this study.*

I give my consent to the researcher.

As a participant, you have the right under the General Data Protection Regulation (GDPR) and national legislation to have access to, to request to modify, and, where applicable, request for the data to be deleted.

- o I Agree
- o I Disagree (the *survey ends with a thank you note*)

2. Year of Birth?

1930 ——————————————————2022

3. What are your views on Pringles®/Doritos®?

- o Addictive/Extra Tasty
- o Good
- o Moderate
- o Below average
- o Taste awful
- o Never consumed one of them.
- o Other (please specify)

4. Do you know what MSG is?

- Yes
- No
- Other (please specify)

5. Are you aware that MSG, as an ingredient, is added/incorporated in several different food products?

- Yes
- No never heard of MSG, and I don't know what it is.
- No, But I tasted a product that may contain MSG – [Can you name a product or products]

Section 2 Use & Taste of MSG

6. Do you think MSG in food has the potential to make savory food taste better?

- Yes
- No
- Other (please specify)

7. Do you add MSGto your food? (If yes, please specify the dish)

- No
- Yes (please specify dish)

8. How often do you add MSG to your food?

- Never
- Sometimes
- Most of the time
- Always
- Other (please specify)

9. How much MSG do you add to a single serving? (2.84grams is equivalent to 1/2 a teaspoon)

10. Have you ever consumed raw MSG? If yes, were there any side effects?

- No
- Yes, (please specify)

Section 3: Reputation & health concerns of MSG.

11. Do you think MSG is a dangerous chemical in food?

- Yes
- Yes, it is an artificial additive.
- No
- No, it also occurs naturally in food.
- Other (please specify)

12. Do you prefer buying a product with a 'No MSG' label?

- Yes
- No
- I don't mind
- Other (please specify)

13. Do you think MSG should be banned?

- No
- Yes, (please specify why)

- None of the above.

14. Have you noticed significant fat weight gain after consuming MSG for a while?

- Yes
- No
- Other (please specify)

15. Did your family suffer these reactions/conditions after consuming food with MSG? If yes, please thick boxes.

- No
- High blood pressure
- Skin Rash
- Inflammation
- Headache
- Heart palpitations
- Heart disease
- Brain problem
- Dizziness
- Nausea
- Damaged Nervous system
- (Are there any other reactions that you would like to include and that are not listed in the above list, please specify.)

16. Do you feel one of these symptoms after consuming Oriental food?
(Damaged nervous system, High blood pressure, Skin Rash, Inflammation, Headache, Heart palpitations, Heart disease, Brain problem, Dizziness or Nausea)

- No
- Yes, (please specify)

17. Have you ever reacted negatively to Monosodium glutamate (MSG)?

- Yes – Question 18
- No – End survey with thank you note.

18. Which reaction/condition did you suffer after consuming food with MSG?

- Damaged nervous system

- High blood pressure
- Skin Rash
- Inflammation
- Headache
- Heart palpitations
- Heart disease
- Brain problem
- Dizziness
- Nausea
- (Are there any other reactions that you would like to include and that are not listed in the above list, please specify.)

Survey 2

Monosodium Glutamate (MSG) for individuals with a Culinary Background

Feedback on Monosodium Glutamate (MSG) from individuals with a culinary background

Monosodium glutamate (MSG) is also known worldwide by its acronym E621. This popular flavor enhancer is used in various food industry sectors for human consumption. Its wide use lies in its capability to stimulate specific taste receptors, enhancing the meaty or savory flavors in many foods (Tracy, 2016). MSG is mainly used to enhance the flavor of foods, especially in Oriental cooking (Maluly et al., 2017).

MSG is made by fermentation, the same process used to make beer, vinegar, and yogurt. Carbohydrates from maize, sugar beets/cane, and cassava are fermented to create glutamate, which is then purified and crystallized before being dried (FDA, 2012).

Previous data on MSG in Malta is limited; therefore, this survey aims to help throw light on the use of MSG in the local context. This Survey is intended for Maltese people working/studying in the culinary industry.

Aims and objectives

The primary aim of this dissertation is to analyze the extent of the use of monosodium glutamate in the Malta food industry and how it compares with other countries. The dissertation evaluates the awareness level of monosodium glutamate among Maltese consumers and players in the local food industry. Other objectives include:

· To establish if there are any local taboos or misconceptions associated with monosodium glutamate and how they compare to other countries.

· Identify how businesses in the local food industry may benefit from better knowledge and awareness of the use of monosodium glutamate.

· To determine respondents' preferences for monosodium glutamate in food preparation.

The survey is divided into four sections;

Section 1: Information of participant.

Section 2: Use and perspective of MSG.

Section 3: Health of consumers and reputation of MSG

1. Consent

By consenting to participate in this research, you are committing to provide the most truthful responses possible. The researcher and any extra responders will not be able to tell which replies are yours since all responses will be anonymized before they are sent to the researcher. By ticking the agreeing box, you also agree that you have a culinary background, worked/worked in the culinary industry, or studied culinary arts.

Some of the questions in this poll may be distressing to some people. Any moment you

choose, you may shut the window and either end your participation in this survey or take a break from the information.

I, the participant, have read the information concerning this study and understand what it is about. All my questions have been answered to my satisfaction. I understand; I am free to ask for further information at gabriel.catania001@its.edu.mt at any time.

I, the participant, know that

1. My participation in this study is entirely voluntary.
2. I am free to withdraw from the Survey at any time.
3. Any raw data will be stored securely and destroyed after this study.

I give my consent to the researcher.

As a participant, you have the right under the General Data Protection Regulation (GDPR) and national legislation to have access to, to request to modify, and, where applicable, request for the data to be deleted.

- o I Agree
- o I Disagree

Section 1: Information

2. Year of Birth?

1930 ——————————————————————2022

3. What is your Nationality?

- o Malta (Maltese)
- o Other (please specify)

4. Duration of time working in the Culinary industry?

- o Less than 1 Year.
- o (If more than one year, please specify)
- o

** 5. Which type of Culinary Industry do you work/worked in?*

- o Agriculture
- o Bakery
- o Casual dining restaurant
- o Fast food restaurant
- o Fine dining restaurant

- Food Science
- Food Truck
- Hotel
- Lecturer
- Pastry
- Pizzeria
- Other (please specify)

** 6. What is your job position? (You can choose two boxes) 0*

- Owner/Ceo
- Head Chef
- Sous Chef
- Chef Tournant
- Chef de Partie
- Commis Chef
- Pastry Chef
- Lecturer of a culinary module
- Student in a culinary Institute
- Baker
- Other (please specify)

Section 2: Use and perspective of MSG

7. Have you ever used MSG at work?

- Yes
- No

8. Have you ever used MSG alone without adding salt?

- Yes
- No
- Other (please specify)

9. Do customers ask more for food owing to the MSG flavor in their food?

- Yes
- No

- Other (please specify)

10. Would you consider eliminating MSG from your list of flavors if many customers complained of allergic reactions?

- Yes
- No
- Other (please specify)

11. Would you promote using MSG in food in a catering establishment?

- Yes
- No
- Other (please specify)

Monosodium Glutamate (MSG) Culinary Background

Section 3: Health on consumers and reputation of MSG.

12. Do you think MSG is a dangerous chemical in food?

- Yes
- No
- Other (please specify)

13. Do you think MSG should be banned?

- Yes
- No

14. Do you think MSG is a dangerous chemical in food?

- Yes
- No
- Other (please specify)

15. Do you think MSG should be banned?

- Yes
- No

16. Why do you think MSG should be banned?

17. Do you think MSG in food has the potential to enhance the taste of savory food?

- Yes
- No

18. Which food item has a flavor that compares to MSG in the kitchen at your work?

19. Do you think MSG can replace salt as a raw food additive?

- Yes
- No
- No, but MSG can substitute for some salt.
- Other (please specify)

20. Do you think the cons of MSG could harm a restaurant/company's reputation?

- Yes
- No
- Other (please specify)

21. Have there been reports of MSG image loss due to negative stereotypes surrounding the product?

- Yes
- No
- Other (please specify)]

22. What is your take on the health effects of MSG?

- No effect whatsoever on the consumers' health

- Negatively affect the consumers' health
- Positively affect the consumers' health
- Other (please specify)

23. Have you ever reacted negatively to Monosodium glutamate (MSG)? If yes, what happened?

- No
- Yes (please specify)