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Research Project on:

How Does the Public Perception of Genetically Modified Foods Influence their Consumption in the United Arab Emirates?

Presented By

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Research log is provided in an excel document.

Two appendixes are provided (1) The Questionnaire (2) Tables of the results.

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How Does the Public Perception of Genetically Modified Foods Influence their Consumption in the United Arab Emirates?

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Abstract

Genetically Modified Foods (GM foods) continue to become more prevalent across different industries as time progresses, with the ongoing discussions gaining more media and public attention as many believe these foods may become the primary solution to providing enough food for the rapidly growing population.

These foods constitute a considerable proportion of the international market and thus by default have also become very common in the United Arab Emirates. The objectives of this research are to examine the public's perception of accessibility to information on GM food, assess public perceptions of the possible benefits versus possible risks of GM food, measure public perceptions of the role of laws and regulations on GM food, identify public perceptions of the future of GM Foods and finally, evaluate the public's perception on GM food consumption.

This research adopted the descriptive analytical approach and a purposive sample was used to collect data from UAE residents via an electronic questionnaire as a primary source of information. Moreover, the available published literature was consulted as the secondary source of information to cover some major aspects of this research. The total number of respondents to the questionnaire reached 508 but 7 questionnaires were deleted due to incompleteness and the final sample consisted of 501 respondents from 37 different nationalities.

The research findings indicated that most of the sample was undecided on: whether there is currently enough information that is easily accessible on GM foods, whether the pros of GM foods outweigh the cons, whether laws are enough to ensure the safety of consumption of GM foods and their level of comfort towards consuming them. The majority of the sample: agreed that GM foods will be dominant in the future, were in favor of labeling all GM foods, believed that the media can shape public opinion, and finally, agreed that people's perception of genetically modified foods influences their consumption

Keywords: *Genetically modified food, Genetically modified crop, perception, UAE.*

1. Introduction

The Grocery Manufacturers Association (2014), stated that around 75% of the foods consumed in the United States had been genetically modified. Recently, it was reported by the US Department of Agriculture (USDA), that in 2022, 93% of all corn planted was genetically engineered, and 95% of all Soybeans planted were genetically engineered.

Genetically Modified crops (GM crops) are defined by the Food and Agriculture Organization (FAO) as "Crops that have the gene(s) inserted from the same or unrelated organism using genetic engineering methods." (Food and Agriculture Organization, 2022). As stated by World Health Organization (WHO, 2014), "Foods produced from or using Genetically Modified organisms are often referred to as GM foods.". Many terms have been used to describe changing the characteristics of food: Genetically engineered foods (GE Foods), genetically modified crops (GM Crops), and genetically modified foods (GM Foods)/products (GM Products). For the purpose of this research, these terminologies will be used interchangeably.

Recent developments in the field of the genetics study sector led to an increased interest in the prospect of a future in genetic modification and yet, people continue to have concerns over their safety, and the debate on the pros and cons of using GMOs (Johnson & Barrell, 2023) as well as whether or not they are safe continues (Cho, 2013).

Gene Zucker (1978) states that the media's influence on public opinion is strong enough to reach even those who do not spend a significant amount of time consuming it. It is argued that the main reason for conducting perception studies among any demographic group is to give first-hand knowledge about the examined group. Moreover, perception studies prove to be an appropriate tool for reading the mental map of a certain group of people (Mudawi, 2017).

With regards to the United Arab Emirates (UAE), it has been reported by the Arabian Business in 2007 that 40% of food products in the UAE were detected as genetically modified, yet were not clearly labeled as such (Walid, & Ferris-Lay, 2007). This indicates that GM Foods are prevalent in the UAE market. Hence, this research will try to achieve the following objectives: To identify the public perceptions of accessibility to information on GM food, to assess public perceptions of the possible benefits versus possible risks of GM food, to assess the public perceptions of the laws and regulations on GM food, to identify the public perceptions of the future of GM Foods and finally, the public's perception on GM food consumption

2. Literature Review

In 1994, the first GM crop had been officially commercialized: Calgene's Flavr Savr tomato (Bruening & Lyons, 2000). upon testing, the genetically modified crop was found identical to the normal tomato, except for thicker paste and longer shelf life (Redenbaugh,1992). The main problem was the increase in concerns of customers due to their perception of these GM products resulting in companies refusing to sell them although no health risks were likely. Further decline in sales was attributed to a British podcast that had gained media attention in august 1999 by reporting that new genetically modified crops resulted in negative effects when consumed by rats. This further caused people to avoid buying them although the statements were later proven to be false as mentioned by Academics Review (a website specialized in disproving false scientific claims and statements through peer-reviewed science).

The public holds reservations against consuming these products, this, in turn, has been a vital factor in countries forbidding the consumption of these foods such as Algeria, Peru, turkey, etc. (Genetic Literacy Project, 2023). This makes it difficult as governments may prohibit GM food consumption due to socio-economic factors, meaning the public's perception of GMOs definitely plays a large role in determining their future and acceptance (Lassoued, et al, 2019).

Many studies have been conducted to assess public perception of GM Foods. According to Cui & Shoemaker in 2018, a study concerning consumers in China found that 88.3% of the sample had a neutral standpoint or were not familiarized with the concept of GM foods. As well as a study in 2014 concluded that two in every US adults did not believe that scientists had enough knowledge to understand the possible health effects of GM crops and that 47% believed that the media was not doing enough in terms of spreading knowledge on the topic (Funk, & Kennedy, 2016).

Once a larger group of people have concluded whether to seek out or circumvent these products, other people tend to form a similar consensus to that of what the majority agrees on due to 'moral obligation' (Sparks, Guthrie, & Shepherd, 1997). It is also revealed that people may tend to gravitate toward acting on intuitive thinking rather than rational thinking (Saher, Lindeman, & Hursti, 2006). This is the same reason why many tend to gravitate towards foods labeled with the phrase 'Organic' although according to pediatricians Dean Blumberg and Lena Rothstein, the nutritional level is nearly identical to conventional crops (UC Davis Health, 2019).

In terms of value & importance of genetically modified foods, the United Nations (2017) estimated that the population will reach nearly 10 billion by 2050, causing food demand to increase by 98% (Elferink & Schierhorn, 2016). So there have to be ways of producing more food without increasing habitat destruction and ecosystem disturbances. Moreover, deficiencies due to undernutrition such as Vitamin A, Iron & Zinc deficiencies in underdeveloped countries could potentially be reduced by increasing the nutritional value of foods that are easier to access (Wiley Online Library, 2006). In accordance with investigations carried out in 2021, around 26 million

children under 5 years old were categorized as low-weight-for-height (Wasting) and were in dire need of treatment in 23 of the 35 major food crises (World Food Programme, 2022) indicating that malnutrition and food crises are still a major problem. In addition, the possibility of implementing oral vaccines for consumption would significantly reduce the costs of vaccination campaigns in third-world countries and boost their immunity (Phillips, 2008). All of these challenges can be handled through the proper introduction and implementation of genetic modification of food.

As for the risk assessment of GM foods, there is a vast amount of evidence indicating that GM foods are safe to consume, and yet the dispute over their usage remains (Freedman, 2013) due to a few risks concerning them. As per the Center for Food Safety (2023), Genetic engineering of food has the potential in transferring allergens from foods that individuals are aware they are allergic to into foods they believe are safe for them to consume. In addition, these new gene alterations could result in new unprecedented allergic reactions. Another risk is the possibility of cancer. Moreover, Surveys conducted by The Organic Farming Research Foundation indicated that 55% of farmers believe not enough guidelines are set to protect non-GMOs from the contamination of GMOs. (Hanson, et al., 2004).

Despite all these debates and discussions, the World Health Organization WHO (2014) provided a clear and positive statement summarizing that there are different types of GM foods and with each of them being engineered uniquely, no general statement on the safety of GM foods can be given and judgment must be made on a case-by-case basis. All GM foods that have been accepted for consumption have passed safety assessments and have a low probability of presenting any negative consequences on human health.

Aside from risk and safety, there have been some discussions related to the consumer's rights when buying GM foods. it had been stated previously that the effects and consequences of genetic engineering are as predictable as cross-breeding (Herman, & Price, 2013); yet many find the concept unethical (Blancke, et al., 2015) although the main difference is the increased reliance on technology (Weale, 2010).

On the other hand, many believe that GM foods should have mandatory labeling that gives the consumer the right to choose whether to buy the products or not and make informed decisions (Lamb, 2020). The USDA implemented a new rule on labeling genetically engineered foods as "Bioengineered" as of the start of 2022 (USDA agricultural marketing service, ND), however, the Organic Trade Association stated that this rule is still lacking as many may not be familiar with the term as well as the fact that this rule exempts products that do not contain a 'detectable' amount of genetic modification (Organic Trade Association, ND).

However, not all have reached the same consensus. The European Union had begun requiring GM food labeling in 1997, at a time when there was significant hostility to them throughout Europe. By 1999, most major European stores had eliminated genetically modified ingredients from their products in order to avoid having to label them as that was turning customers away. (Scientific American, 2013)

From what has been discussed above, it is evident that the public's perception plays a large role in the consumption of gm foods and that this perception is affected by media and the amount of information available. In addition to that, public opinion is heavily swayed by the labeling of products.

To summarise, it is evident from the literature explored that although GM foods prove to be the primary solution to many growing problems such as nutrient deficiencies and increasing food demands, there are communities concerned about the safety of consuming them, indicating that the public's perception plays a definitive role in the consumption of these foods. As cemented by the statistics, the populace believes that the media is currently not doing enough, showing that it is highly possible to sway public opinion through greater involvement of media in favor of GM foods.

3. Research Methodology
3.1. Research Question

This research attempts to answer the question: To what extent do Public Perceptions Influence the Consumption of GM Foods in the United Arab Emirates (UAE)?

3.2. Research Objectives

- To identify the sources of information used by the public to know about GM food.
- To rate the public perceptions on accessibility to information on GM food.
- To assess the public perceptions of the possible benefits versus possible risks of GM food.
- To review the public perceptions on the role played by laws and regulations on GM food.
- To appraise the public perceptions of the future of GM Foods.

3.3. Research Approach

To answer the research questions and to achieve the set of objectives, this research adopts the quantitative methodology, as a field survey was conducted. In addition, the descriptive analytical approach was used.

3.4. Source of Data & Data Collection

For this research project, two sources of data were used. The first was secondary data sources which were available from the published literature from articles, books, and websites. This was used to provide a proper literature review on the topic. The literature review provided some information on GM Foods' background, value, importance, and future. It also tackled public perception and consumer rights. The objective of using literature was to provide the right context for this research work. The second source of data used was primary data, collected via an electronic questionnaire designed using Google Forms. To ensure wider distribution, the questionnaire was provided in two languages i.e. English and Arabic. The questionnaire included two parts, the first part covered the sample demographic e.g. age, gender, education level, and nationality. Part two of the questionnaire used a 5-point Likert Scale (Strongly disagree/ Disagree/Neutral/ Agree/Strongly agree).

This scale was used to measure public perceptions of Genetically Modified Foods, and how that can affect the consumption of those products. The questionnaire was used as a tool since it provides clear and first-hand information on the covered topic. The questionnaire is provided (appendix 1).

3.5. Sample

This research used a purposive sample to distribute the electronic questionnaire among UAE residents from different nationalities. The questionnaire was distributed via different platforms e.g. WhatsApp and Email as a hyperlink and a quick response code (QRC). The questionnaire was circulated among classmates, family members, and friends. The total number of responses received was 508. After sorting, 7 questionnaires were deleted due to incompleteness. The final sample size reached 501 respondents from 37 different nationalities living in the UAE.

3.6. Data analysis and presentation

Frequencies and percentages were used to summarize the results and were shown using graphs or charts. The produced tables were provided (appendix 2).

3.7. Limitations

While exploring available literature, it was found that there was a scarcity of literature covering GM foods in the UAE. Only some technical and scientific articles were found as well as some general news reports. Moreover, it was difficult to ensure the quality of accessible publications and their relevance to the research question as well as their recency. the research question could have been covered in further detail through the use of some qualitative methodology such as a structured interview with some subject matter experts from relevant industries. However, the literature review and questionnaire were sufficient in answering the research question.
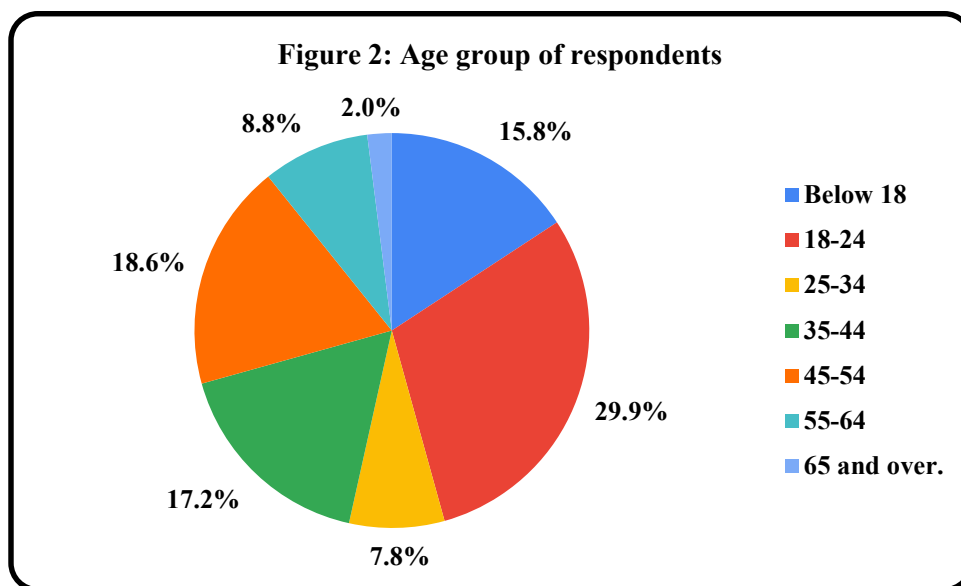
4. Survey Results
4.1. Sample demographics

This section reviews the survey results on the sample's perception of genetically modified foods & its influence on consumption based on the responses received from the sample.

The total number of responses received was 501, out of which, 299 (59.7%) were female and 202 (40.3%) were male (Appendix 2: Table results). The questionnaire was distributed among 37 different nationalities, 18 of which are from Asian countries (319 respondents, which makes up 59.9% of the sample), 10 of which are from African countries (162 respondents, making up 32.3% of the sample), and five European countries (10 respondents). Moreover, 7 respondents were from two North American countries as well as 3 respondents were from two countries in Oceania. The largest number of respondents were from the following 6 countries: Sudan (103 respondents: 20.6%), the United Arab Emirates & India with 72 respondents (14.4%) each. Followed by 47 respondents from Egypt (9.4%), 39 respondents from Pakistan (7.8%) and Jordan making up 6% of respondents. The rest of the countries made up less than 5% each. The rest of the responses were filled out by nationals of the following countries: Bangladesh, Palestine, Saudi Arabia, Syria, Sri Lanka, Yemen, Iraq, Philippines, United Kingdom, America, Lebanon, Somalia, Canada, Australia, Iran, Kuwait, Oman, Tunisia, Algeria, Benin, Burkina Faso, Denmark, Estonia, Ethiopia, Germany, Kazakhstan, New Zealand, Nigeria, Qatar, Sweden, and Tanzania (Figure 1).

Figure 1: Nationalities of respondents
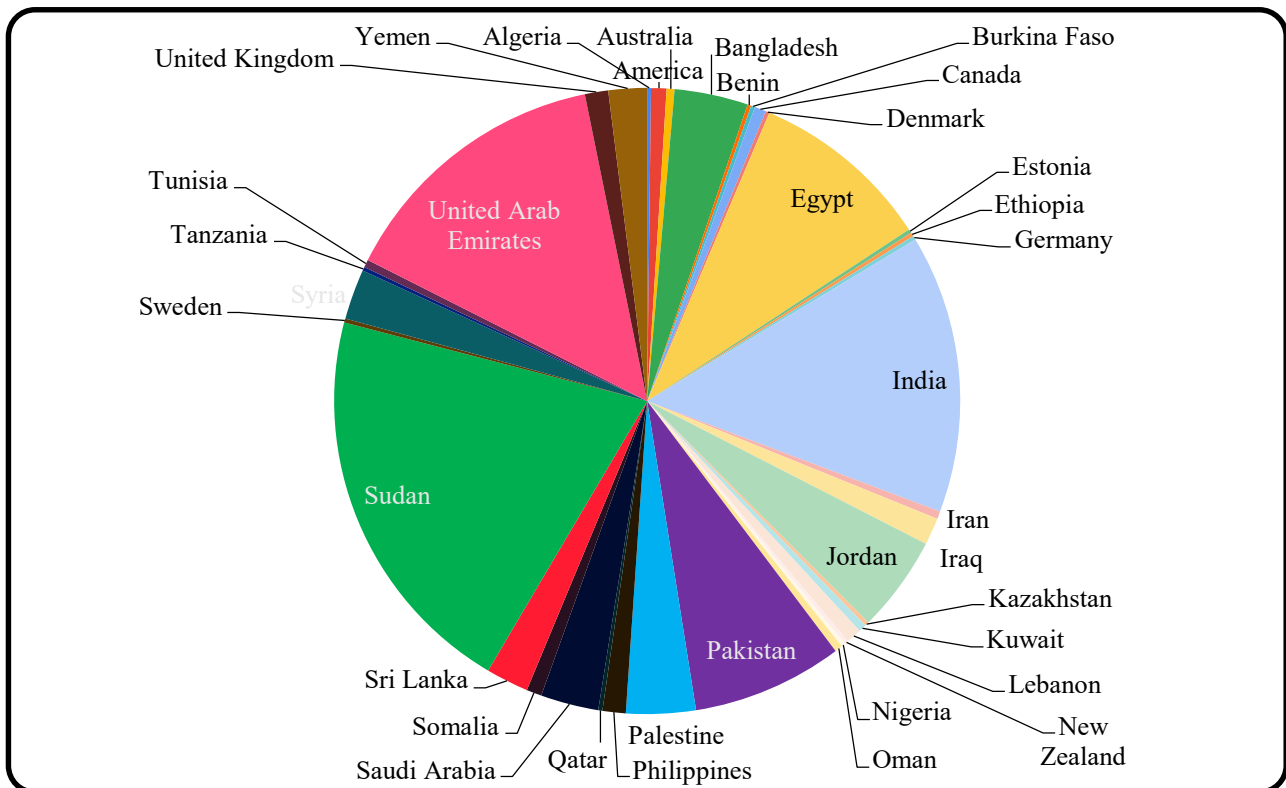
As far as age is concerned, Figure 2 reveals that 29.9% of the sample fell into the 18-24 age group, making up the majority. Followed by 18.6% in the 45-54 age group, 17.2% in the 35-44 range, followed by 15.8% in the Below 18 group as well as 7.8% in the 25-34 age group. As for the 55-64 age range, they only made up 8.8% of the sample as well as the minority being the 65 and above age group only making up 2.0% of the sample.
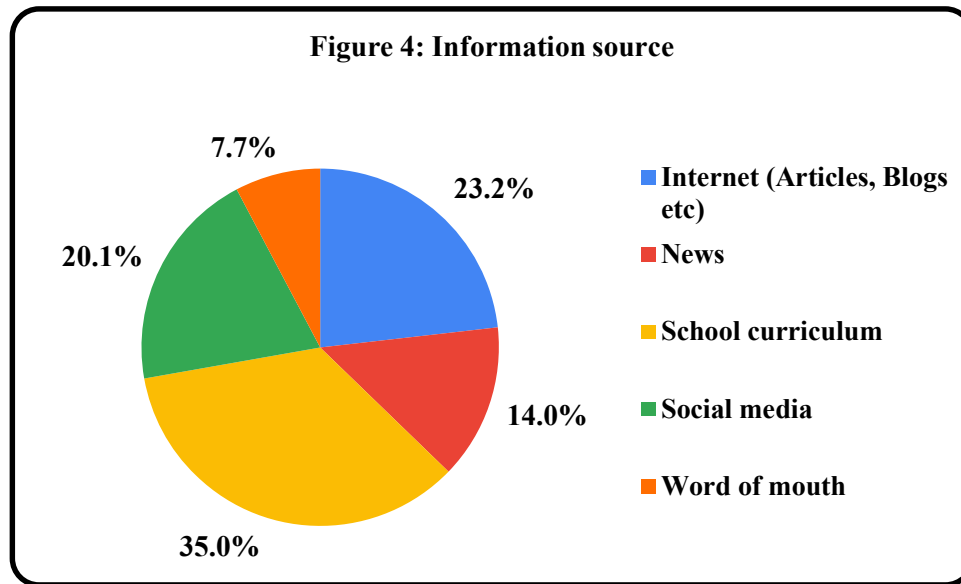

Figure 2: Age group of respondents

Regarding educational level, the field survey results show that the majority (35.5%) of the sample come under the category of High School, followed by those who have obtained their Bachelor's degree making up 33.3% as well as those with a Master's degree making up 17.2% of the sample, and finally, Ph.D. holders making up 14.0% of the sample (Figure 3).

Figure 3: Educational level of respondents
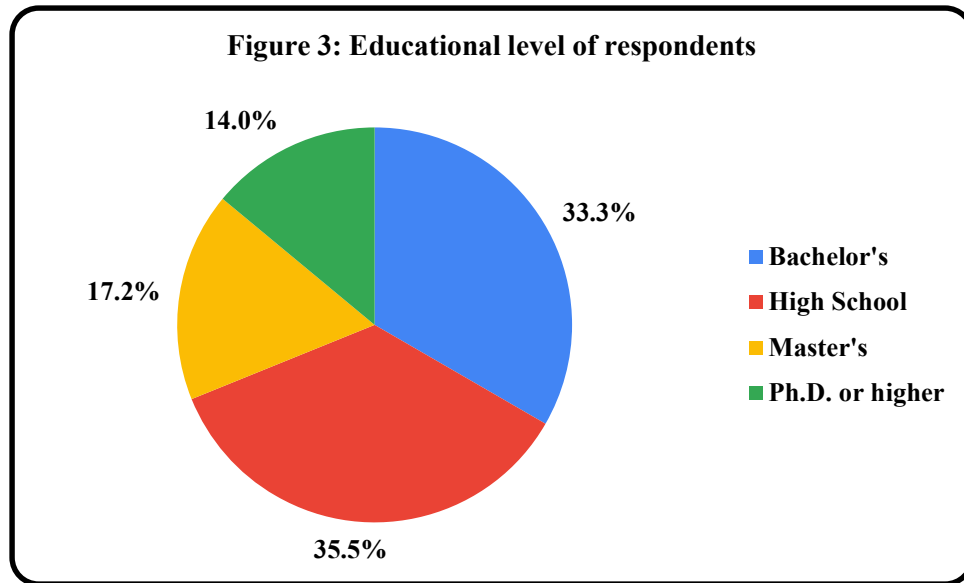
4.2. Perception of GM foods
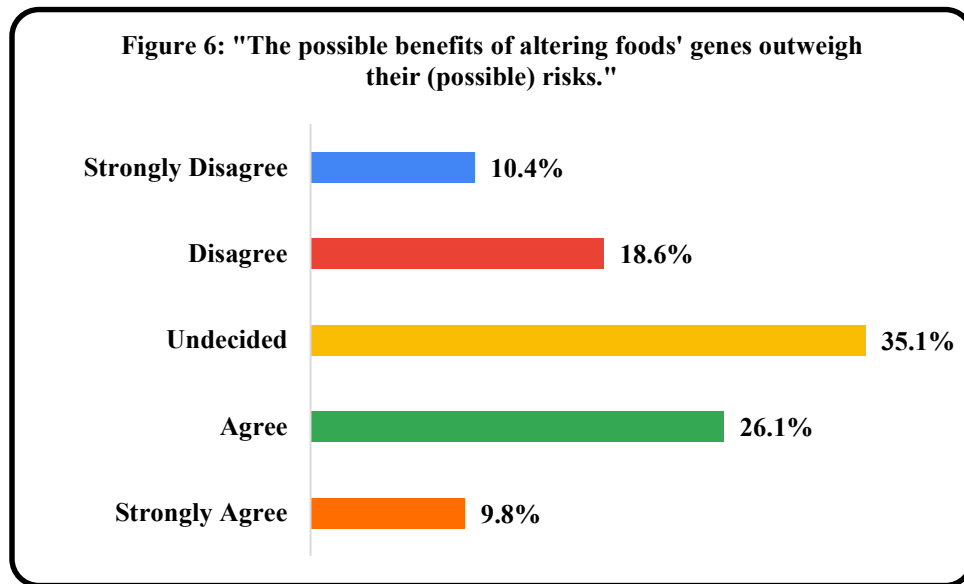
As per the respondents, it is found that almost 70% have previously heard about GM foods, while around 30% did not. When asked about the information source on GM foods, internet sources came 1st in the ranking (articles, blogs, and websites; 23.2% and social media platforms: 20.1%. summing up to 43.3%) followed by curriculum (35%), news (14%) and word of mouth (7.7%) (Figure 4).

Figure 4: Information source

- Internet (Articles, Blogs etc) — 23.2%
- News — 14.0%
- School curriculum — 35.0%
- Social media — 20.1%
- Word of mouth — 7.7%

When the respondents were asked on how they perceive the statement "There is enough easily accessible knowledge on the topic of genetic modification", Research results show that 10.4% of the sample strongly disagree while 25% of the sample disagree with the statement, i.e. 35.4% of the sample are opposing the statement. On the other hand, 8.6% of the sample strongly agree with the statement whereas 25.3% of the sample agree with it (totaling 37.9% that support the statement). An interesting result is that 30.7% are undecided on the mentioned statement (Figure 5).

Figure 5: "There is enough easily accessible knowledge on the topic of genetic modification."

- Strongly Disagree — 10.4%
- Disagree — 25.0%
- Undecided — 30.7%
- Agree — 25.3%
- Strongly Agree — 8.6%
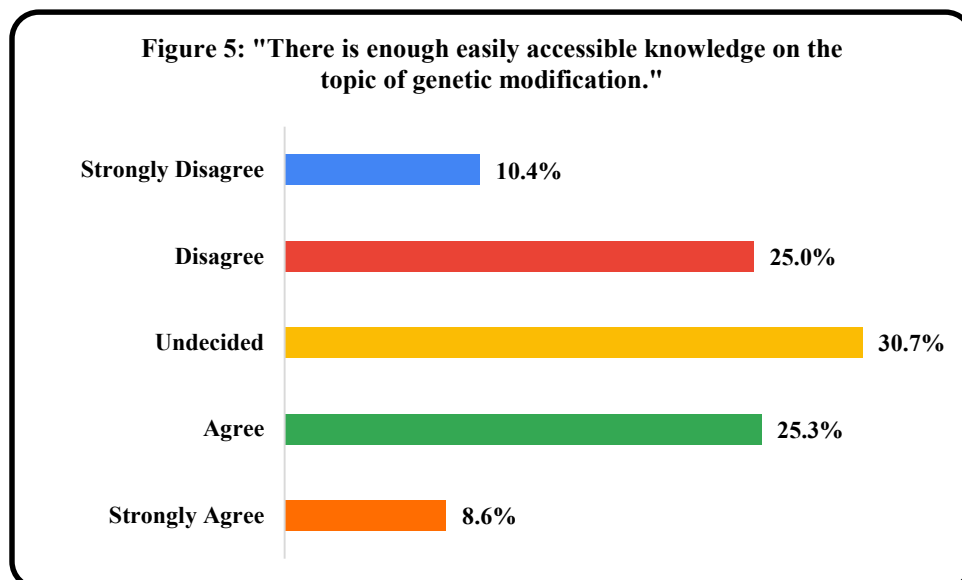
When the survey tried to assess how the sample perceives the weightage of possible benefits against possible risks of genetic modification of foods, results show that 10.4% of respondents strongly disagree with the statement while 18.6% disagree with it, totaling 29% of the sample opposing the statement. Contrary to that, 9.8% strongly agree with the statement and 26.1% agree, i.e. 35.9% support the statement. It is important to note that the majority fell into the undecided group, with 35.1% (Figure 6).

Figure 6: "The possible benefits of altering foods' genes outweigh their (possible) risks."

Category	Percentage
Strongly Disagree	10.4%
Disagree	18.6%
Undecided	35.1%
Agree	26.1%
Strongly Agree	9.8%

As shown in figure 7, The sample was given the statement "Setting laws & legislation alone is enough to ensure the safety of GM foods before they are approved for consumption." And the results showcased the following: 14.8% strongly disagree with the statement while 24.2% disagree, conceding that 39.0% of the sample opposes the statement. Contrastingly, 16.0% of the sample strongly agree with the statements while 20.4% agree, indicating that 36.4% support the statement. Yet again, the Undecided respondents are the majority, at 24.8%.

Figure 7: "Setting laws & legislation alone is enough to ensure the safety of GM foods before they are approved for consumption."

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Strongly Disagree	14.8%
Disagree	24.2%
Undecided	24.8%
Agree	20.4%
Strongly Agree	16.0%
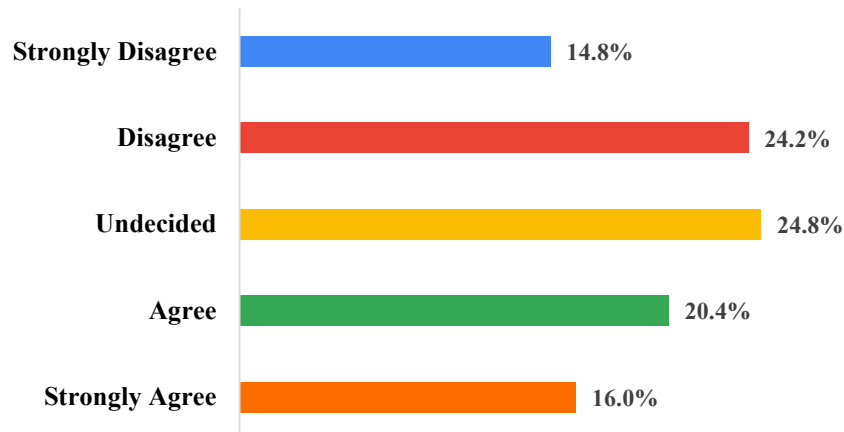
Following that, the sample was provided with the statement "Genetically modified foods will be dominant in the future" and results concluded that 5.6% strongly disagree with the statement and 9.0% disagree with it, (totaling 14.6% opposing the statement). However, the majority of the sample (61.5%) lies on the supporting side with 21.2% that strongly agree, and 40.3% that agree, However, the largest standalone group was undecided (24.8%) (Figure 8).

Figure 8: "Genetically modified foods will be dominant in the future."

|	
Strongly Disagree	5.6%
Disagree	9.0%
Undecided	24.0%
Agree	40.3%
Strongly Agree	21.2%
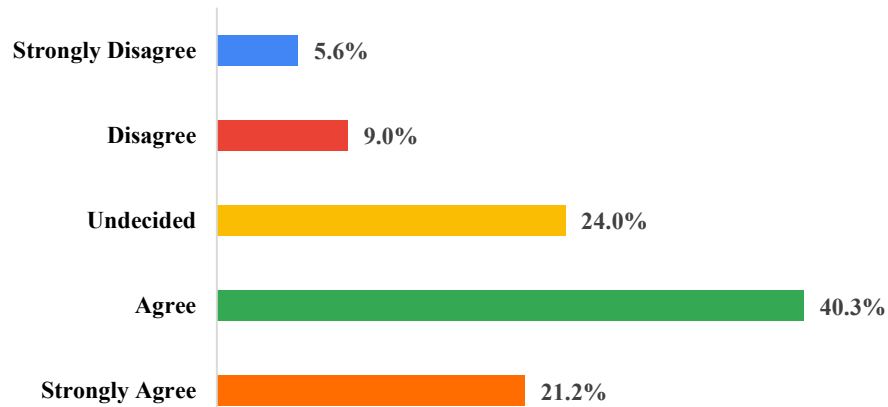
As shown in Figure 9, the sample was asked to reflect on their perception of the following statement:" I am comfortable with the idea of buying/consuming products that are genetically modified.", the results show that the majority of the sample have a neutral standpoint (22.5%),

22.0% strongly disagree and 22.6% disagree, disclosing that 44.6% are not comfortable. In reverse, only 30% felt comfortable with the idea of consuming these products: with 9% that strongly agree and 21% that agree.

Figure 9: "I am comfortable with the idea of buying/consuming products that are genetically modified."

| Category	Percentage
Strongly Disagree	22.0%
Disagree	22.6%
Undecided	25.5%
Agree	21.0%
Strongly Agree	9.0%
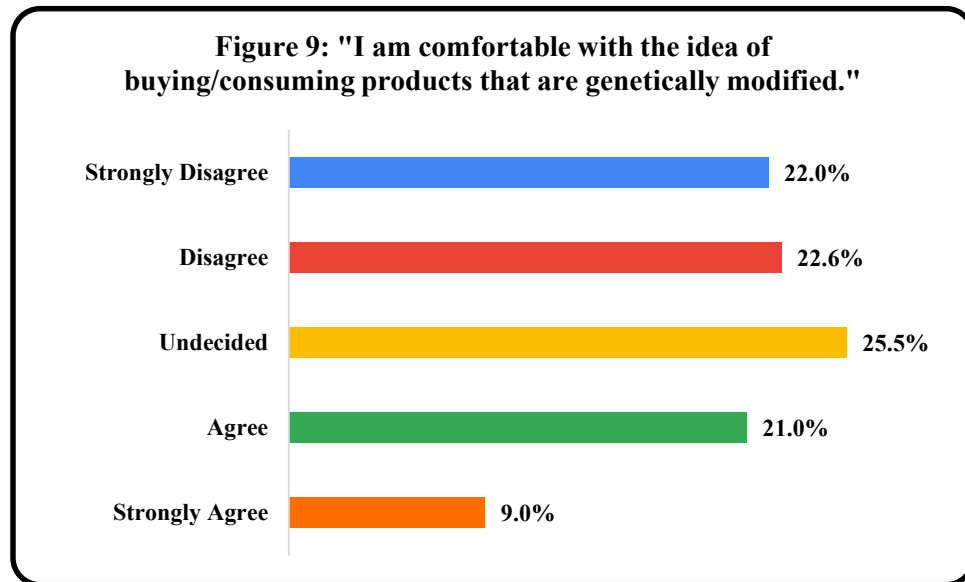
Next, the sample was asked to evaluate the statement "Genetically modified products should always be clearly labeled so people can choose whether to buy or avoid them.". Results indicate that the minority opposes the labeling of GM products, with 5.6% that strongly disagree and 5.2% that disagree, totaling 10.8%. Contrary to that, a significant amount of the sample indicated being pro-labeling, with 62.9% that strongly agree and 14.2% that agree, i.e. 77.1% in favor of labeling. (Figure 10).

Figure 10: "Genetically modified products should always be clearly labeled so people can choose whether to buy or avoid them."

Category	Percentage
Strongly Disagree	5.6%
Disagree	5.2%
Undecided	12.2%
Agree	14.2%
Strongly Agree	62.9%
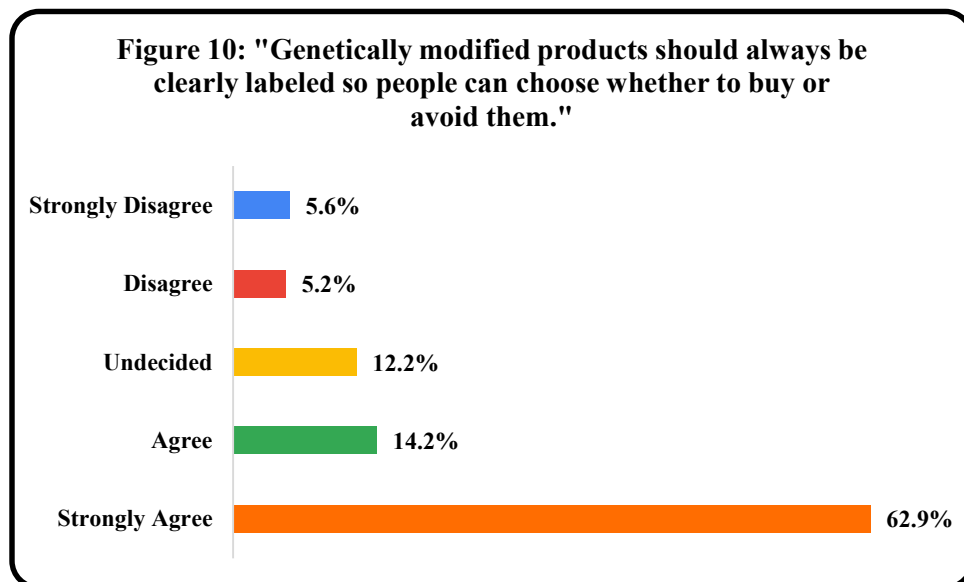
As displayed in Figure 11, the respondents were asked about their evaluation of the statement "Media can be used to shape the public's opinion on genetically modified foods." And the results showed that the minority of the sample (11.2%) argues that media is not effective enough to shape public opinion, with 4.2% that strongly disagree and 7.0% that disagree. In opposition to that, the majority (73%) believe that the media is a useful tool in framing public opinion, with 27.9% that strongly agree and 27.9% that agree. Yet, 15.8% are undecided on the matter (Figure 11).

Figure 11: "Media can be used to shape the public's opinion on genetically modified foods."

Category	Percentage
Strongly Disagree	4.2%
Disagree	7.0%
Undecided	15.8%
Agree	27.9%
Strongly Agree	45.1%
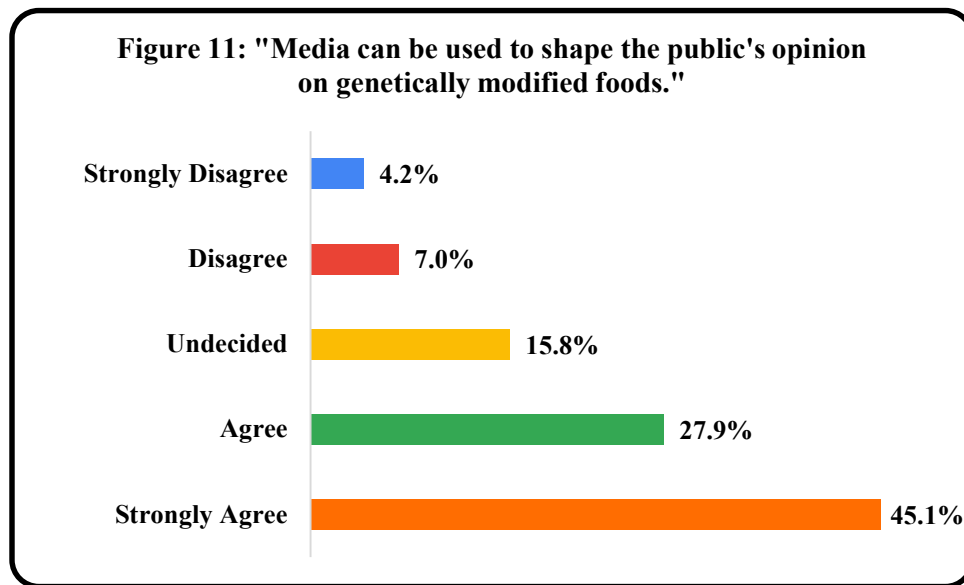
Finally, the sample was asked for their judgment of the statement "People's perception of genetically modified foods influences its consumption". As plotted in figure 12, the minority believed that the public's perception does not influence the consumption of GM foods (11.4%), with 4.2% that strongly disagree and 7.2% that disagree, with a significant amount that has a neutral view on the statement (20.8%). On the opposite end, the majority of the sample does believe that people's perception of GM foods plays role in their consumption (67.8%), with 38.5% that strongly agree and 29.3% that agree.

Figure 12: "People's perception of genetically modified foods influences its consumption."
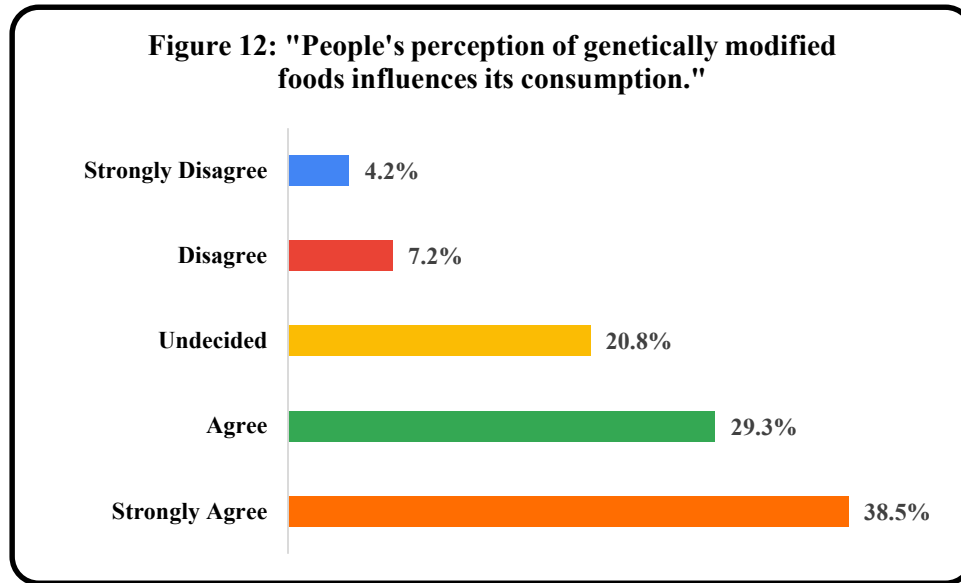
5. Discussion, Reflection and Conclusion
5.1. Discussion

Based on the research results this part reviews the major and outstanding findings. Regarding gender, the majority of the sample was female. This is due to the researcher's direct personal connections mainly being female. With age group, it is evident that the age group dominating the sample demographic is the 18-24 years age range, this is also due to the questionnaire being spread amongst many students in the researcher's school (mainly seniors) and connections outside the school with people within that range. Moreover, this age range consists of the generation that is going to be consuming these products as well as the most affected directly by their consumption. It is also why, as a consequence, the largest two categories in the educational level classification were High school and Bachelor's.

The top five nationalities including Emiratis as well as Indians and Pakistanis is to be expected as Indians and Pakistanis make up the largest percentage of UAE's demographic, as well as Emiratis being the locals of the country.

Although the majority of the sample has come across the term "GM foods" previously, a significant 30% of the sample has never heard of GM products before this questionnaire. This finding indicates that not enough information is currently present in the public if such a significant percentage has still never come across the term before. Regarding those who do have some knowledge of GM foods, it is not surprising that the majority of the sample had heard of them through internet sources and the school curriculum considering the dominating age group, which shows that school curriculums play a vital role in shaping the public's perception as well as the media's ability to provide insight on GM foods.

Although 69.3% have an opinion on whether there is enough accessible knowledge on the topic of GM foods, 30.7% are undecided, this cements that there is yet more work to be done in facilitating the availability of information on GM foods, and in terms of those who are in disagreement, this is an important obstacle to get past as the public's perception is and will continue to be an important factor to consider. This carries further onto the sample's evaluation of the possible risks and possible benefits of genetic modification as the majority was yet again, undecided. Moreover, the difference between the two sides (Strongly agree/agree & Strongly disagree/disagree) is less than 3%, and while this can be swayed by personal feelings, the provision of clearer facts would make this difference greater as people would be able to make more informed decisions.

This is the same for the statement regarding laws & legislation. However, personal feelings may play a larger role in this case as the majority leaned towards opposing the statement, indicating that many believe that even if clear rules were placed to ensure the safety of consumption, consumers would still avoid these products, which indicates that there's a significant amount of people that harbor anxious feelings towards the consumption of these products. However, the overwhelming majority believe that GM foods will dominate industries in the future.

On the other hand, the majority was either opposed to the idea of consuming GM foods or undecided. This is an issue that needs to be addressed, and according to the public that can be done via the use of media to shape their opinion, since 73% agree that the media is effective in shaping public opinion. Finally, the majority (67.8%) of the sample is with the statement "People's perception of genetically modified foods influences their consumption.". This proves that people's perception is very important in deciding what to buy to consume and what to avoid, so large corporations, governmental authorities, and relevant industries must pay more attention to the public's perception.

5.2. Reflection and Conclusion

As per the fieldwork findings, it is evident that the public is aware of the role their perceptions play in consumption. In addition, a significant amount of the sample still feels as though they cannot make informed decisions due to a lack of accessible information on the topic. Furthermore, they still harbor negative feelings towards GM foods and feel as though there is a need to be wary of them. Initially, the researcher had also felt the same and had beliefs based on intuitive thinking rather than rationality. For example, the researcher was hesitant about the idea of consuming genetically modified foods and whether their benefits outweigh the risks. Yet upon delving further into the topic, the opinion has changed. Through the provision of facts, the researcher had become more comfortable with the idea of consuming these foods and is aware of the significant role GM foods will play in the near future. On the other hand, the researcher still believes that easy and reliable information is not very available as well as that the media is not doing enough. It is not easy to get accustomed to the idea of this change to the agricultural industry and the food the human populace will be consuming in the near future. However, if the industries and larger corporations involved in this field provide more support and focus to the general public's

perceptions, it would increase commercialization and consumption. This would also result in a decrease in the number of people who had never even heard of the terms before, reduce the percentage of those undecided and thus unable to make informed decisions and slowly sway their opinion by providing facts and true information to rectify their concerns. A prime example of this is the continuously successful provision of information through schools, showcased by curriculums being the highest in ranking out of all information sources for those who have heard of GM foods before.

As per the findings of this research paper, the topic of perception is very broad with multiple and different aspects for study. Hence, the researcher proposes some further studies to address the question of how media can be used to shape the public's perception of GM foods.

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