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RESEARCH ARTICLE

Surveying Level of Awareness among Caregivers of Preschool Children about Food Additives Risk Management: Survey Evidence of Recommendations for Practitioners

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ABSTRACT

This study aims to determine the degree of awareness among caregivers of preschool children of food additives associated risks. It also highlights important concerns that contribute to higher risk and advice for better practices. The study relied on quantitative survey approach to assess the level of awareness of caregivers regarding food additives and the potential risks they pose to preschool children. It explores relationship between level of education as a measurement of knowledge to different issues of awareness about food additives risk management practices. The study also utilizes Risk Heat Map in order to define most concerning areas of risk. The study results revealed the need of educating caregivers of preschool children about potential risks associated with food additives. It showed that there is no significant relationship between the level of knowledge and different areas of food additives risk. Despite of that 64.47% of people were unaware that locust bean gum in additives may contribute to angioedema. The level of awareness in different issues varies showing that there is a gap in knowledge. The study revealed that 70.25% do not understand the information about food additives on the label, which raises the importance of transparency in food labelling practices. The findings of the study show the essential role of caregivers of preschool children in shaping the dietary habits and health outcomes of these children. They emphasise the need to initiate targeted educational programs, embrace transparent food labelling practices, advocate for on-going surveillance of food safety levels, and have continuous scientific investigation to minimise health risks related to food additives. This study extends the knowledge in this field as it focuses on caregivers of preschool children. It highlights the need to educate caregivers of preschool children on food additive risks, advocate for transparent labelling, and emphasise on-going surveillance and education to mitigate health risks associated with food additives.

1. INTRODUCTION

Food additives are widely used in almost all types of foods to improve taste, safety, appearance, freshness, nutritional quality, and other desired attributes (Arias et al., 2022). Martyn et al. (2013) defined a food additive as any substance that is not typically eaten by itself or is not usual food ingredient, regardless of its nutritional value. Witkowski et al. (2022) identified that some common food additives include preservatives, antioxidants, dyes, emulsifiers, acid regulators, sweeteners, thickeners, anticaking agents, stabilisers, starches, flavor enhancers, and gases.

In the United States (US) and the European Union, there are 4,000 and 1,500 food additives, respectively (Zhou et al., 2023). The number of food additives has grown considerably in recent times. In medieval times, people used salt for preservation for centuries, and spices not only enhanced flavor but also helped extend shelf life (Polak and Osmala-Kurpiewska, 2024).

Promoting food safety through the determination of the maximum acceptable intake level for each food additive is crucial for health dafety. Despite this, concerns exist about the potential health effects of certain food additives (Polak and Osmala-Kurpiewska, 2024). For instance, tartrazine, a yellow dye, has been linked to allergic reactions like itching and inflammation, as well as sleeping issues, mood changes, and sensitivity to pain medication. According to Amin and Al-Sheri (2018) and Ameur et. al. (2020), some studies link tartrazine and benzoates with increased attention-deficit/hyperactivity disorder in children.

From this perspective, this study seeks to ascertain the level of awareness among caregivers about food additive associated risks in preschool children.

2. LITERATURE REVIEW

Existing literature on food additives brings forth numerous themes, as discussed below.

2.1 Parental/caregiver awareness and understanding of food additives

In their study, Polak and Osmala-Kurpiewska (2024) assessed parents' understanding of certain food additives and their potential impact on young children's health. Using a questionnaire that assessed their awareness of food additives and their health effects, the researcher interviewed more than 100 parents of preschoolers in March 2022. Study findings showed that many parents (55%) found information about food additives confusing. Additionally, over half (more than 52%) were unaware that some additives, like benzoic acid, might trigger allergic reactions in people with asthma or allergies.

Jacquier et al. (2016) study done in Switzerland examined how caregivers (19 interviewed) shape young children's (1-5 years old) eating habits, focusing on portion sizes and drink choices. The findings revealed caregivers use routines to promote healthy choices and limit unhealthy ones for food and drinks. Although some caregivers struggled to explain portioning methods, they could estimate beverage amounts. Perceptions of drink health benefits influenced choices. Time and budget constraints affected food purchases and meal preparations. Knowledge drawn from this study can inform healthcare professionals advising on early childhood nutrition.

A study by Motebejana et al. (2022) sought to establish the link between caregivers' nutrition knowledge, feeding practices, and children's nutritional status in South Africa. Researchers surveyed 120 caregiver-child pairs. The findings revealed that caregivers depended primarily on healthcare professionals for nutrition information. although most children were breastfed, many started solid foods too early. Diets were often high in starches like maize porridge and bread, with low fruit and vegetable intake. Nearly half the children showed signs of stunting (height for age). Family income positively impacted children's weight and height. Interestingly, longer breastfeeding duration correlated with healthier practices like consuming more milk alternatives and fruits, and having more meals daily. The study suggests caregivers' knowledge and feeding practices need improvement to ensure better child nutrition.

2.2 Research on food additives and children's health/ behaviour

In their study, Sadighara et al. (2023) assessed the role of food additives, both synthetic and natural compounds, as potential triggers for food allergies, particularly concerning children. The authors conducted a comprehensive review, searching databases from 1984 to 2020 for studies on allergic reactions, hypersensitivity, food additives, and children. Out of 327 initial studies, seven were meticulously chosen based on predefined criteria. These selected articles focused on exploring the relationship between food additives and hypersensitivity reactions. Sadighara et al. (2023) review highlighted various clinical factors, such as urticaria, eczema, rhinitis, and gastrointestinal symptoms, indicating increased exposure to additives like artificial colours, sweeteners, preservatives, and monosodium glutamate. Significant evidence emerged linking certain food additives to allergenic adverse reactions. Notably, artificial colours, sweeteners, preservatives, and monosodium glutamate were identified as primary culprits for hypersensitivity in children, estimating a prevalence of approximately 1.2% based on extracted data.

A study by Kano et al. (2020) examined the link between parents' perception of their child's diet and the child's actual food intake in Japan. Researchers surveyed 136 parents of 4-year-olds. Parents

categorized their child's diet as good, normal, or poor. Children whose parents perceived their diet as poor consumed significantly less vegetables, beans, fish, and more fat, sweets, and sugary drinks. These findings suggest a gap between parental perception and reality.

Lemoine et al. (2020) explored the outcomes of oral food challenges (OFC) in paediatric patients assumed to have allergies to food additives, specifically food dyes or sodium benzoate. In particular, the study aimed to assess whether OFC results influenced families' feeding behaviours regarding food additives. All patients subjected to an open OFC with specified additives were enrolled, with post-testing surveys sent to families. Among the 23 included patients, candy was the most commonly suspected food. Only one OFC yielded a positive result, while the majority were negative (Lemoine et al., 2020). Interestingly, despite negative challenges, a portion of families reported perceived allergic reactions to additives, leading some to continue avoidance of the suspected additive. The study concluded that allergies to food additives are rare, and despite negative OFC results, familial suspicion persists, underscoring the need for reassurance among healthcare providers and parents regarding the minimal risk of food dye intolerance or allergies.

2.3 Food safety knowledge and practices

Ovca, Jevšnik and Raspor (2014) study examined food safety knowledge and practices in 1272 children aged 10-12 years. The goal was to see if they were prepared for increased involvement in food preparation. While most children participated in some food prep at home, the study identified gaps in their knowledge. Children generally overestimated the severity of food risks but underestimated their own vulnerability. There were specific knowledge weaknesses around temperature control and preventing foodborne illness. Self-reported practices also revealed risky behaviours, including poor hand hygiene, improper handling of leftovers, and unsafe reheating methods. These findings show the importance of teaching basic food safety principles to children as early as elementary school.

Haney et al. (2019) study aimed to develop a reliable tool to measure teachers' confidence in handling food allergies and allergic reactions (anaphylaxis). In particular, the authors used 282 teachers to test a Turkish version of "School Personnel's Self-efficacy in Managing Food Allergy and Anaphylaxis" (SPSMFAA-T). The findings revealed SPSMFAA-T as valid and reliable. Notably, teachers with allergy training recorded higher scores on scale; hence, showing SPSMFAA-T's ability to difference between prepared and unprepared tutors. Overall, these findings implied that SPSMFAA-T is a valuable tool to ascertaining teacher's confidence in managing food allergies and anaphylaxis.

2.4 Consumer awareness and perception

Koyratty, Aumjaud and Neeliah's (2014) study sought to provide insights into consumer knowledge and manufacturers practices associated with food additives. The researchers interviewed 12 food manufactures and 180 consumers. The findings revealed a low consumer awareness of food additives, with a significant number of them not reading food labels. Again, consumers had mixed attitudes towards food additives, with some showing indecision and misconceptions towards them. Manufacturers held positive views on additives and identified issues with outdated regulations and lax enforcement. This study offered valuable insights for future research, potential legislative updates, and consumer education initiatives to improve food control system.

Findings from qualitative online survey involving 2,708 consumers showed that participants had limited knowledge about chemicals in food, with 66% indicating they were not well-informed. Most participants focused on man-made additives, while natural chemicals were rarely considered. Discussions challenged initial perceptions, reducing concern about deliberate additives but increasing worry about naturally occurring ones. After forums, categories were refined to three based on consumer reactions. Participants showed uncertainty about chemical risks, with perceptions shifting based on information provided. While trusting in regulatory oversight, concerns about keeping pace with food technology emerged. Participants preferred limited, actionable information about food chemicals to avoid overwhelming them. The research aimed to explore consumer awareness, understanding, and perceived risks regarding chemicals in food and optimal communication strategies.

2.5 Regulatory and educational strategies

In their study, Savin et al. (2022) reviewed food additive and their roles to preserve, enhance safety, taste, texture, or appearance. Indirect additives originate from packaging, storage, or food processing materials, while direct additives serve specific purposes like canning. Their use must adhere to legal standards and not endanger consumers. Children, due to metabolic differences, may be more vulnerable to additive effects. To address concerns, the authors reviewed recent literature via PubMed, Scopus, and Google Scholar, supplemented by expert insights from reputable sources. Common additives in children's food include bisphenols, phthalates, artificial colours, and sweeteners. Educating parents and youngsters and regulating additives can mitigate health risks effectively.

2.6 Healthy food choices and the environment

Ravikumar et al. (2022) study analysed studies exploring how parents from disadvantaged backgrounds perceive their food environment and how it affects their food choices. The findings highlight several barriers: children's preferences, limited budget and time, and difficulty accessing healthy options. While parental education and feeding strategies can play a role, these efforts have limited impact without addressing the root causes like poverty and high costs of healthy foods. The review suggests that social support programs can provide temporary relief, but long-term solutions require broader policy changes focused on income inequality, food access, and affordability of healthy choices.

A study by Bellows et al. (2022) reviewed food diets in the US by focusing on parents and the home environment. Researchers reviewed 17 studies that used dietary assessment tools in home-based interventions for preschoolers. These interventions targeted overall diet, specific foods, mealtimes, and weight management. The review found some inconsistencies: not all studies used tools that aligned with their goals, and some didn't measure food intake precisely. This highlights the difficulty of accurately assessing what young children eat. The authors recommend exploring alternative methods and strategies for measuring children's diets in future studies.

A study by Monalisa (2020) sought to: 1) identify parents' purchases for their households and 6-11-year-olds; 2) understand how parents decide what to buy; and 3) explore children's influence on these decisions. Qualitative interviews with 40 parent-child pairs revealed that satisfying children's desires drove food purchases, leading to conflicts between various values like healthfulness and convenience. Children employed numerous strategies, with parents often complying, particularly with sons. Parents recognized children's significant influence, suggesting interventions to promote healthier choices.

2.7 Summary and study gap

The existing body of research on food additives encompasses various dimensions, including parental understanding, caregiver practices, consumer knowledge, regulatory perspectives, and the impact on children's health and behaviour. Polak et al. (2024), for example, reviewed knowledge of parents on food additives showing substantial confusion and absence of awareness regarding possible health effects, especially among caregivers of preschool children. On the other hand, studies by Jacquier et al. (2016), Motebejana et al. (2022) analysed the role of caregivers in influencing eating habits and nutritional status of children; hence, underlining the need of caregiver education and promoting healthier diets.

Despite broader research on food additives, a significant gap exists relating to the awareness of caregivers of preschool children on food additive risk management. Although these studies assessed parental behaviours and perceptions, none of them specifically paid attention to this demographical understanding of managing risks related to food additives. This gap is vital since preschool children tend to be vulnerable to the impact of food additives because of their developing physiology. Knowing caregivers' awareness and knowledge gaps may inform targeted educational interventions and regulatory measures to minimise potential health risk relating to food additives of preschool children. From this perspective, this study assesses the awareness of caregivers of preschool children on food additive risk management.

3.0 METHODOLOGY

Methodology section is subdivided into study design, data collection, data analysis, and ethical considerations.

3.1 Study design

The study design relied on modified research design (Polak et al., 2024) study that used Chi-Square as a measure of relationship between food additives and health risks of preschool children. In particular, this study relied on quantitative survey approach to ascertain caregivers' awareness levels concerning food additives and their possible risks to preschool children. Quantitative survey approach was preferred in this study because it provides a structured method to collect numerical data from a large sample size; hence, allowing for statistical analysis and generalization of findings to the broader population of preschool children's caregivers (Babbie, 2016). By using a quantitative survey approach, and in line with Bryman's (2016) observation, a researcher can systematically gather information on caregivers' awareness levels regarding food additives and their perceived risks to preschool children in a standardized manner; therefore, facilitate comparisons and identification of trends of patterns across varied demographic groups.

Quantitative surveys empower to measure variables precisely, such as caregivers' knowledge levels, attitudes, and behaviours related to food additives, using validated scales or closed-ended questions (Creswell and Creswell, 2022). This methodological approach, therefore, is appropriate to explore the degree to which awareness among caregivers and identifying any gaps or misconceptions that could exist in their knowledge of food additives and associated risks. Again, quantitative surveys allow for efficient data collection and analysis; thus, making it feasible to reach a large and diverse sample of caregivers within a reasonable timeframe and budget (Needham et al., 2015). Overall, quantitative survey approach is suitable for this study because if its ability to provide systematic, reliable, and generalizable insights into perceptions and knowledge of caregivers associated with food additives and their impact on preschool children's health.

3.2 Data collection

3.2.1 Target population and sampling

The target population of this study was caregivers of preschool children. A caregiver of preschool children is an individual whose responsibility is to take care, supervise, and up-bring young children (two to six years old). Further, caregivers included parents, foster parents, grandparents, day-care providers, guardians, nannies, and other individuals (family members or professionals) whose responsibility is child's daily care and well-being.

Caregivers for the study were recruited from Online parenting forums from kindergartens, and through social media. As such, samples obtained had different attributes of caregivers of preschool children from different geographical areas.

A sample obtained from these forums included caregivers with diverse demographics and from different geographical locations, which in line with Creswell and Creswell's (2022) observation aligns with the principles of purposive sampling in quantitative research. Babbie (2016) defined purposive sampling as an intentional choosing of participants who represent numerous demographic features or geographical locations so that the study's results apply across various population groups.

Consistent with Bryman's (2016) observation, having caregivers with varied demographic backgrounds, such as age, gender, socioeconomic status, and educational level will enable this study to capture a profound spectrum of perspectives and experiences associated with food additives and their potential risks to preschool children. A consideration of geographical location in sampling strategy enabled this study to account for possible regional variations in caregivers' knowledge and perceptions regarding food additives and related health risks (Creswell and Creswell, 2022). Overall, variations in dietary habits, access to information, and cultural aspects has substantial influence on caregivers' awareness levels, hence making it imperative to include participants from diverse geographical locations.

4.2.2 Data collection instrument and procedure

The researcher used existing literature to develop a structured questionnaire to ascertain knowledge and awareness level of caregivers of preschool children about food additives, and their perceptions of associated risks. Consistent with Ahmed's (2023) observation, structured questionnaire were suitable for the study as they gathered standardized information on the studied phenomenon. Notably, structured questionnaire entails predetermined questions with fixed responses options that facilitate comparability and consistency in data collection from study participants.

In line with Roberts and Priest's (2006) observation, a pilot test (validity and reliability) was done to ascertain any potential shortcomings of research questionnaire and procedures use to collect data. Notably, a pilot study is a preliminary study done to ascertain the effectiveness of data collection instruments. As Roberts and Priest (2006) recommends, validity, which was done by seeking expertise on content validity of the questionnaire, of the data was interpreted as the degree to which the structured questionnaire in the study accurately measured the meant metric. Data reliability, which seeks to determine if a research instrument provides same data when subjected to different people (Roberts and Priest, 2006), relied on Cronbach alpha coefficient (α), which is measured as a percentage. A Cronbach alpha coefficient (α) that lied between 0.8 and 0.9 was interpreted to mean data was reliable. In particular, pilot study was done on six caregivers of preschool children obtained from Reddit-Parenting to obtain feedback on clarity, comprehensiveness, relevance, and contest of questions. Appropriate adjustments were done on the questionnaire to make sure that data is reliable and valid.

Email was used to invite caregivers of preschool children as potential participants to the study. Questionnaires were sent to respondents who responded with intend to participate. Email was preferred as it allowed efficiency and was cost-effective mode of communication and data collection as it reached large number of potential participants – it reached caregivers dispersed across different geographic locations or online platforms (Fritz and Vandermause, 2018). Overall, Email enabled the researcher to cast a wider net of caregivers of preschool children with varied demographics and from different geographical backgrounds.

3.3 Data analysis

Data analysis to generate descriptive statistics, including frequencies and percentages of demographics (age, gender, education level, and household income level) was done using International Business Machines Statistical Package for the Social Sciences 27 (IBM SPSS 27). Consistent with Creswell and Creswell (2022) observation, an analysis of demographics offered insights to demographic features of caregivers of preschool children taking part in the study. Categorical data analysis (Cross-Tabulation and Chi-Square test) was used to determine differences in knowledge and education of caregivers of preschool children. According to (Field, 2018), the Chi-Square test is a statistical method for ascertaining whether there exists a significant association between categorical variables. In this study, the researcher sought to ascertain differences in knowledge on food additives and educational levels among caregivers of preschool children, where p value less than 0.05 indicates that results are significantly different. (Field, 2018).

Further analysis was conducted by presenting a Risk Heat Map in order to assess the level of risk among food additives in order to identify major areas of high risk so as to identify areas of concern that need more focus and follow up.

3.4 Ethical considerations

Before invitation of caregivers to participate in the study, a written ethical approval was obtained from the University's Review Board. This was to ensure data collection and handling thereafter followed ethical procedures. The researcher obtained informed consent from all participants to participate in the study. Again, and as Salazar, Crosby and DiClemente (2015) recommended, measures, such as saving participants in passwords enabled folders and withholding private information such as names, residential location, email address, and name of preschool centres, were taken to ensure confidentiality and anonymity of caregivers of preschool children participating in the study.

4.0 FINDINGS

Out of the targeted caregivers of preschool children, 134 took part in the study. However, only 121 participants filled in the questionnaire as required and hence 13 incomplete questionnaires were not considered in the analysis.

4.1 Characteristics of studied group

Demographic Characteristics are presented in percentage of the sample including gender, age, Level of education, Place of residence, Professional status (Table 1)

Gender		**Place of residence**	
Male	27.3%	Rural	32.2%
Female	72.7%	Urban	67.8%
Age		**Professional Status**	
Below 25 years	5.8%	Unemployed	13.2%
26-35 years	28.1%	Employed	84.3%
36-45 years	37.2%	Student	2.5%
46-55 years	24.0%		
Above 55 years	5.0%		
Level of education			
Elementary	5.0%		
High school	28.9%		
College	33.9%		
Graduate	26.4%		
Post Graduate	5.8%		

In a survey or dataset encompassing a total of 121 individuals (Table 1), the distribution of gender reveals that 33 respondents, constituting 27.3% of the total sample, identified as male. On the other hand, the majority of participants, with a count of 88 individuals, representing 72.7% of the total, identified as female. This data shows noticeable disparity in gender representation within the surveyed population, with females comprising a significantly larger proportion compared to males.

The age distribution within the surveyed population of 121 individuals showcases a varied demographic profile. Among the respondents, Below 25 years, 26-35 years, 36-45 years, 46-55 years, and Above 55 years comprised of 5.8% (7), 28.1% (34), 37.2% (45), 24.0% (29), and 5.0% (6), respectively. This breakdown emphasizes the diversity in age groups represented within the dataset, illustrating a spread across various stages of adulthood, with the highest concentration falling within the 36 to 45 years age range.

The dataset regarding the level of education among the surveyed population of 121 individuals reflects a diverse educational background. Among the respondents, those who have attained elementary, high school, college, graduate and post graduate education comprised of 5.0% (6), 28.9% (35), 33.9% (41), 26.4% (32), and 5.8% (7), respectively. This disparity underscores the diversity in educational attainment within the dataset, highlighting significant representation across various educational levels, with college-educated individuals forming the largest segment.

The data regarding the place of residence among the surveyed population of 121 individuals reveals an interesting distribution. A significant proportion, constituting 32.2% of the total sample, resides in rural areas, with a count of 39 individuals. In contrast, the majority of respondents, comprising 67.8% of the total, reside in urban or city environments, with 82 individuals falling into this category. This disparity emphasizes the urban-rural divide within the surveyed population, indicating a higher concentration of respondents in urban areas compared to rural areas.

4.2 Food additive risk management

Table 2: Questions and responses of the study group, taking into account differences in the level of knowledge of participants depending on education (N = 121; 100%).

Questions and responses	N(%)	Test results for higher and non-higher education		
		X^2	Df	P
1-When buying foods, Do you read labels on the container?				
Yes, before each purchase	36 (29.75%)	11.139	12	0.517
I read sometimes	57 (47.1%)			
Rarely	19 (15.7)			
Never	7.4 (82.6%)			
2-Do you know food products may have additives that affect their shelf life, color or taste?				
Yes	115 (95.04%)	6.928	8	0.544
Maybe yes	4 (3.31%)			
No	2 (1.65%)			
3-As a consumer, do you understand the information on food additive on the label?				
Yes	36 (29.75%)	5.790	8	0.671
Maybe yes	19 (15.70%)			
No	66 (54.55%)			
4- Do you think food additives have adverse effect on Children's health?				
Yes	94 (77.69%)	6.287	8	0.615
Maybe yes	23 (19.01%)			
No	4 (3.31%)			
5-Of these additives, which one causes Chinese Restaurant Syndrome?				
Monosodium Glutamate (MSG)	79 (65.29%)	13.833	12	0.312
Sodium Carbonate	4 (3.31%)			
Sodium Benzoate	24(19.83%)			
Benzoic acid	14 (11.57%)			
6-Of these food additives, which ones cause angioedema in children after consumption?				
Xanthan Gum	33 (27.27%)	3.196	12	0.994
Guar Gum	46 (38.02%)			
Locust Bean Gum	17(14.05%)			
Gellan Gum	15 (12.40%)			
7- Do you know that people suffering from Bronchial asthma, allergic rhinitis and skin allergies may experience increased hypersensitivity reactions due to consuming product that have benzoic acid?				
Yes	61 (50.41%)	5.669	8	0.684
No	13 (10.74%)			
I don't know	47 (38.84%)			
8- Do food sweeteners cause dental cavities among preschool children?				
Yes	67 (55.37%)	5.218	8	0.734
Maybe yes	13 (10.74%)			
No	41 (33.88%)			
9- How many additional grams of sugar do preschool children consume from food with additives?				
Up to 10g	80 (66.12%)	11.228	12	0.509
Up to 15g	5 (4.13%)			
Up to 20g	24 (19.35%)			
Up to 25g	12 (9.92%)			
10- Does Sodium Benzoate affect preschool children's Body Mass Index (BMI)?				
Yes	65 (53.72%)	6.318	8	0.612
Maybe yes	15 (12.40%)			
No	41 (33.88%)			
11-Do food preservatives lead to gastrointestinal issues e.g. diarrhea, constipation, or bloating among preschool children?				
Yes	70 (57.85%)	8.212	8	0.413
Maybe yes	11 (9.10%)			
No	40 (33.05%)			
12- Do food additives affect physical growth and development among preschool children?				

Yes	75 (61.98%)	5.033	8	0.754
Maybe yes	12 (9.92%)			
No	34 (28.10%)			
13- Do food additives affect cognitive growth and development among preschool children?				
Yes	79 (77.69%)	5.264	8	0.729
Maybe yes	14 (19.01%)			
No	28 (3.31%)			
14- Do food additives affect behavioral growth and development among preschool children?				
Yes	76 (62.81%)			
Maybe yes	15 (12.40%)			
No	30 (24.79%)			
15- Do flavors and colors affect the dietary quality and nutrient intake?				
Yes	71 (50.41%)	7.006	8	0.536
Maybe yes	16 (10.74%)			
No	34 (28.01%)			
16- Do artificial sweeteners affect taste preferences in later Life of preschool children?				
Yes	76 (50.41%)	4.860	8	0.772
Maybe yes	18 (10.74%)			
No	27 (38.84%)			
17- Does Monosodium glutamate (MSG) cause frequent headaches among preschool children?				
Yes	69 (57.02%)	8.370	8	0.398
Maybe yes	20 (16.53%)			
No	32 (26.45%)			

From Table 2 question 1 and consistent with Frankfort-Nachmias and Leon-Guerrero's (2020) and Wagner's (2020) suggestions on interpretations of cross-tabulations, 36 (29.75%), 57 (47.11%), 19 (15.70%), and 9 (7.44%) of caregivers of preschool children read labels before buying food, read food labels sometimes, rarely read food labels, and never read food labels, respectively. The variations in percentages regarding reading food labels and education level of caregivers of preschool children indicate presence of some relationships between these two variables. The associated p-value of Chi-Square is 0.517, which is above the conventional alpha (α) value of 0.05. Hence, the relationship between level of education (as measure of level of knowledge) and reading labels before purchasing food products is not statistically significant. The p-value for all the parts of the questions was less than 0.05 which indicates no significant relationship between the level of education and the knowledge of each part of the questionnaire. Nevertheless, the percentage of respondents who showed positive answers varied in every part, indicating that the level of awareness is not necessarily dependent on level of education and that people have more knowledge on certain issues than other issues. This shows variation of general knowledge and alarms the need to improve awareness in other issues.

In table 2 part 2 it was found that 115 (95.04%), 4(3.31%), and 2 (1.65%) of caregivers of preschool children responded Yes, Maybe Yes, and No, respectively on whether they know food products may have additives that affect their shelf life, colour or taste.

In table 2 part 3, the question about understanding information on food label only 29.7 % responded by positive answer whereas the remaining was not sure or negative.

In table 2 part 4 regarding the knowledge on the impact of food additives on children's health the percentage of caregivers who responded positively was 77.69% and the remaining was maybe yes and No (19.01%), and (3.31%).

From Table 2 part 5, the question about the main additive that causes Chinese restaurant syndrome, it was found that 65.29% of respondents realize that it caused by Monosodium Glutamate. In part 6, shockingly only 27.27% realized that Locust bean gum additive causes angioedema, reflecting a serious gap of knowledge in this component.

The percentage of respondents who indicated that they know people suffering from Bronchial asthma, allergic rhinitis and skin allergies related to benzoic acid additive in food intake experience

(50.41%). This shows the seriousness of the problem associated with Food additives and lack of high awareness about it.

Investigating the awareness about food sweeteners and their role in dental cavities only 55.37% realized this fact whereas the remaining people were unaware about it. Again this shows a moderate gap of knowledge in this component. Not only sweeteners in food cause dental cavities, but also they add sugar, calories, increase hyperactivity and increase BMI.

A number of 66.12% agreed that food additives mainly sweeteners add up to 10 grams of sugar to the diet. This reflects the about two third of respondents are aware, but yet the number is not enough.

In the question about food preservatives and gastrointestinal issues e.g. diarrhoea, constipation, or bloating among preschool children a number of 57.85% responded positively.

Whereas 61.98% respondents showed awareness about the relationship between food additives and physical and developmental growth and 77.69% respondents are aware about causative effect of food additive on cognitive growth.

Not only developmental growth and cognitive growth are affected by high intake of food additives, also 62.81% of caregivers claimed that they believe that food additives affect behavioural growth and development among preschool children.

In addition to all of the above mentioned effects, caregivers were asked about the impact of food colorants and additives on diet quality and nutrient intake and the responses showed that only 50.41% are aware about this effect.

Moreover, only 50.41% of caregivers of preschool children responded positively about the effect of artificial sweeteners on taste preferences in later life of preschool children.

The study revealed also that only (57.02%) are aware about the role of MSG in developing headache, whereas the remaining are in doubt of negative about it.

4.3 Risk heat map

Further analysis was conducted in order to evaluate the most important areas of concern. For this reason a Risk Heat Map was developed based on the food additives associated risks. This tool can be used to improve risk management among caregivers of preschool children. In Risk heat map, the impact of risk is plotted against probability of occurrence.

In order to establish Risk Heat Map, the associated risks mentioned in the questionnaire were categorized according to their impact on health into three levels as follows:

1. **Low impact** on health (indirect harm, affects BMI, easy recovery, etc.)
2. **Medium impact** on health (causing allergy, nausea, diarrhea, etc.)
3. **High impact** (causing severe illness, worsen Asthma…etc.)

On the other hand probability of occurrence was based on the percentage of respondents who were not aware of the food additives' risks, those who answered a wrong answer or were in doubt. This assumption is based on the logic that, if a person is not aware of a danger, it is supposed that he/she will not address it. Based on that, the probability levels were divided into three categories:

1. Less than 40% were not aware (low probability)
2. Between 40%-60% were not aware (moderate probability)
3. Above 60% were not aware (high probability)

In order to draw the Risk Heat Map, Risk Severity Score was calculated as shown in table 3.

The calculation of Risk Score included the following steps:

1- Setting the Percentage of unaware people for every component of risk.
2- Followed by evaluating Probability level into three levels as mentioned above.
3- The Risk impact was evaluated based on symptoms and effects on health as discussed earlier.
4- A Risk score was calculated as: Impact * Probability.
5- Finally Risk Severity Score was calculated as Impact *Probability level

6- Finally the Impact is plotted against probability level where the Risk Severity Score is tinted in colours ranging from yellow to red based on severity as shown in figure 1.

Table 3: Estimating risk severity score for food additives based on probability of occurrence (evaluated as % of people not aware about the danger), Probability level ranging from 1-3 ascending, Risk Score calculated (Probability*Impact), Risk Severity (Impact* Probability level.

	Impact	Probability (% of unaware people)	Probability level	Risk Score	Risk Severity Score (Impact * Probability level)
Risk of developing Chinese Restaurant Syndrome due to consumption of foods containing MSG.	2	34.7	1	69.4	2
Risk of developing dental cavities due to sweeteners	1	44.68	2	44.68	2
Effect of Artificial sweeteners on taste preferences.	1	49.58	2	49.58	2
Effect of Sodium benzoate on BMI	1	46.28	2	46.28	2
Risk of impairment in physical growth due to high consumption of food additives	2	38.02	1	76.04	2
Risk of impairment in cognitive growth due to high consumption of food additives	2	22.32	1	44.64	2
Effect of food additives on behavioral growth	2	37.19	1	69.43	2
The risk of developing Gastrointestinal issues due to consumption of preservatives in foods.	2	42.15	2	84.3	4
Risk of developing headache due to consumption of MSG.	2	42.98	2	59.43	4
Effect of food colors and flavors on dietary quality and nutrient intake	2	44.62	2	89.24	4
Allergic issues in people with Asthma associated with consumption of Benzoic acid in foods.	3	49.58	2	148.74	6
Developing angioedema in people with Asthma due to consumption of foods containing locust bean gum.	3	77.69	3	233.07	9

Impact				
	High (3)	3	6	9 Angioedema due to Locust bean gum.
	Medium (2)	2 Chinese restaurant syndrome due to MSG, Impairment in physical growth, Cognitive growth, behavioral growth)	4 Gastrointestinal issues, Headache due to MSG, Reduce dietary intake due to colors and flavors in food.	6 Allergic issues in people with Asthma due to Benzoic acid.
	Low (1)	1 (green)	2 (yellow) Developing dental cavities, effect of sweeteners on taste preference, effect of Sodium Benzoate on BMI.)	3 (orange)
		Low probability (1)	Moderate Probability (2)	High Probability(3)

Probability

Figure 1: Risk Heat Map where the colors show the following: green is the lowest Risk Severity Score (value =1), yellow is higher Risk Severity Score (value=2), Orange is higher than both green and yellow (value =3 and 4), Red is the highest Risk Severity Score (value= 6 and 9)

The Risk Heat map shows that areas tinted in orange and red represents the hottest zones tested in the study that need further awareness and need more focus. Gastrointestinal issues related to certain food additives and preservatives are a serious risk that needs to be addressed and tested. The presence of MSG in food produces headaches and makes it an impactful risk that must be highlighted in future studies and awareness campaigns. The impact of food colorants and flavors on health and dietary quality needs also to be highlighted. On the other hand, the allergic issues and their impact on people with bronchial problems and Asthma is considered most hot zones of concern, along with improving the knowledge on the role of locust bean additive in food in developing Angioedema.

5.0 DISCUSSION

5.1 Nutrition and food additives in childhood development

Nutritious diet during childhood is essential in influencing long-term health and development in adulthood. According to Piekara et al. (2020), adhering to sound nutritional principles facilitates the provision of optimal levels of essential micro- and macronutrients. The prevalence of food additives has surged, constituting a pivotal aspect of contemporary food production (Amin and Al-shehri, 2018; Louzada et al., 2018; Kang et al., 2021). In the last decade, the increase of processed food has been notable, with food additives playing a major role in their production and preservation (Mwale, 2023). These trends are in line with changing tastes and preferences of consumers and increasing population of the world. Although particular food additives emanate from natural foods, synthetic ones are mostly used; hence, posing potential health risks to consumers.

The quality of diet during childhood substantially shapes successive health outcomes and development in adulthood. The contemporary food industry depends highly on food additives to meet consumer demands, thus culminating to widespread use of food additives (Amin and Al-shehri,

2018; Piekara et al., 2020). A global trend towards inclusion of food additives in most foods is associated with shifts in global population dynamics and evolving consumer preferences. Notwithstanding the availability of naturally obtained additives, synthetic ones are widely utilized, raising concerns about their possible effects on health.

A study by Gil-Campos et al. (2015) observed that replacing food additives especially sweeteners may not necessarily lead to lower intake of calories and it might encourage unbalanced dietary habits that entail high consumption of low-calorie products with sweeteners, and others with excessive calories. In another study, Savin, Vrkati´cvrkati´c, et al. (2022) showed that bisphenols, phthalates, perfluoroalkyl chemicals, perchlorates, pesticides, nitrates and nitrites, artificial food colours, monosodium glutamate, and aspartame are the most frequently consumed additives in food by children. In this study, 61.15% of respondents affirmed previous studies by noting that flavors and colours affect the dietary quality and nutrient intake of preschool children. All in all, it is imperative to increase the literacy among caregivers of preschool children about presence and potential risks associated with food flavors and colours.

5.2 Food additives and health concerns

In a study undertaken by Fung et al. (2018), the findings showed that food additives raise primary concern regarding food safety. Likewise, studies conducted by Kim et al. (2018) and Landrigan and Straif (2021) identified food additives as main components that affect the quality of food. Also, a study by Baker et al. (2020) underscores consumers' perception of additive-free food as healthier, further emphasizing the apprehensions surrounding additives. All in all, these studies identified preservatives as the most worrisome among food additives, aligning with broader concerns regarding their potential health implications. These findings are in line with this study that revealed that 96.70% of caregivers of preschool children believe that food additives pose potential risks to health of children.

In this study, the author focused comprehensively on caregivers of preschool children on specific health risks associated with additives, particularly focusing on bronchial asthma, allergic rhinitis, and skin allergies induced by benzoic acid preservatives. Notably, over one-half (50.41%) were aware that eating foods with additives potential health consequences. These observations are in line with Witkowski et al. (2022) observation, there is a heightened hypersensitivity among individuals with asthma toward food additives, as well as other chemical compounds like acetylsalicylic acid, compared to non-asthmatic individuals. This highlights the importance of educating the public about the potential health risks associated with additives, especially for vulnerable populations with pre-existing health conditions. Understanding these concerns and addressing gaps in knowledge regarding food additive-related health risks is essential for promoting informed consumer choices and mitigating potential health hazards associated with food additives (Zhong et al., 2018). Overall, disseminating accurate information and fostering awareness will enable consumers to make more conscious decisions about their dietary habits; hence, contributing to improved public health outcomes.

Benzoic acid, an additional food additive, acts as a collaring agent that has potential adverse effects, such as insomnia, depression, allergic responses, and inflammation (Hall et al., 2019; Arias et al., 2022). These observations are consistent with this study's findings who associated Benzoic acid with insomnia, depression, allergic responses, and inflammation symptoms. In particular, more than one-half (50.41%) correctly identified all these symptoms as being linked to tartrazine ingestion.

5.3 Food additives and children's dietary habits

Children lack autonomy in purchasing decisions, placing the onus on caregivers of preschool children or guardians to oversee their nutritional intake. Consequently, the knowledge and awareness of parents regarding food additives wield significant influence over children's dietary habits and overall health outcomes (Fung et al., 2018). Increased processed foods, augmented by industrialization and globalization, has significantly led to increased consumption of food additives in the last two decades (Adams and White, 2015; Steele et al., 2016; Baker et al., 2020). Despite convenience and other benefits associated with processed foods, Steele et al. (2016), Hall et al. (2019) and Mwale (2023) associate them with a plethora of xenobiotics and food additives that harbour considerable health risks on consumers.

Study by Trasande et al.(2018) showed that synthetic food additives influence child behaviour and their role in exacerbating attention attention-deficit/hyperactivity disorder symptoms. This study confirms previous studies as 75.21% of respondents (caregivers of preschool children) observed that food additives affect behavioural growth and development among preschool children. Therefore, removal of synthetic food additives from the diets of preschool children may be beneficial to children with attention-deficit/hyperactivity disorder.

5.4 Sweetened products, dental health and taste preferences

In a study by Gil-Campos et al. (2015) noted that early intake of sugar-sweetened products in young children may influence their self-regulation of eating and references and tastes for sweet flavors. There is likelihood that this taste preferences may be maintained during childhood and adolescence. In this study, 61.15% of respondents noted that artificial sweeteners affect taste preferences in later life of preschool children. Overall, food additives have substantial impact on the tastes and preferences of preschool children and later in their life.

Study by Gupta et al. (2013) revealed sweeteners such as fermentable carbohydrates constitute risk factors of initiating and progressing dental cavities and caries. Likewise, a study by Caren showed that commercial sweeteners containing aspartame and stevia are cariogenic as sucrose, which could be due to other components since in their pure forms they are not cariogenic. The findings of these studies are in line with this study whose 66.11% of caregivers of preschool children to some degree believe that food sweeteners cause dental cavities among preschool children.

The intake of sweetened food and soft drinks is high is among preschool children. As such, and consistent with Gil-Campos et al. (2015) observation, food additives (especially sweeteners) tend to have higher levels of sugar than foods without them. These observations are consistent with this study that revealed that preschool children who consume food with additives are like to ingest at least 10 grams of sugar. From this perspective, foods with additives will tend to have higher levels of sugar than unprocessed foods.

5.5 Food additives and body mass index (BMI)

This study has shown that 66.12% observed that food additives such as Sodium Benzoate affect preschool children's Body Mass Index BMI. These findings support existing literature that associated food additives with Sodium Benzoate. For instance, Gil-Campos et al. (2015) study established that consumption of sugars via sweetened beverages may have substantial impact on increase in BMI. In the same vein, Neumann study showed that added flavors in food tend to be potential contributions of weight gain and obesity epidemic, as well as cardiovascular, morbidity, and mortality. Likewise, a study by Bonnie associated BMI with intake of sodium benzoate.

5.6 Food additives and human growth and development

Numerous food additives tend to lead to lead to gastrointestinal issues, such as diarrhoea, constipation, or bloating among preschool children. In this study, 66.95% of caregivers of preschool children associate food preservatives with gastrointestinal issues, such as diarrhoea, constipation, or bloating among preschool children. A study by Jarmakiewicz-Czaja et al. (2022) showed that food additives, especially sweeteners may alter the composition of intestinal microflora and hence lead to intestinal blockage. Again, this study revealed that food additives may predispose to cytotoxic and genotoxic and lead to inflation in the intestines. Some food preservatives may lead to intestinal dysbiosis.

Poor nutrition, which encompasses substandard diet quantity or a quality leading to over-nutrition or under-nutrition, and lack of early learning opportunities contribute to the loss of development potential and life-long health among millions of children aged (Hurley et al, 2016). In this study, 71.9% of respondents associated food additives affect physical growth and development among preschool children. In particular, some food additives are likely to contribute to poor nutrition which is likely to have adverse effects on the physical growth and development of children.

In their study, Buka et al. (2021) established that food additives, particularly preservatives and artificial colours together with consumption of essential nutrients, are linked closely with hyperactive behaviours and poor attention among children. On the other hand, a study by (Walczak-

Nowicka & Herbet, 2022) revealed that Sodium Benzoate tends to have a positive impact on cognitive function. From this perspective, some food additives seem to have positive effect on cognitive growth and development. In this study, 76.86% of caregivers of preschool children think that food additives affect cognitive growth and development among preschool children.

5.7 Awareness of food additives and transparency

This study sought to ascertain the level of awareness of caregivers of preschool children regarding food additives and their potential implications for the health of this vulnerable population. Most caregivers of preschool children taking part in this study acknowledged their watchfulness toward monitoring the levels of food additives present in the items they buy, with 76.86% observing that they read food labels before purchasing or sometimes. As such, food labels are principal resources of information for consumers, as they furnish them with crucial insights into product contents, including additives. These findings are in line with Kim et al.'s (2018) study that revealed that respondents primarily prioritized factors, such as product origin and primary ingredients over the consideration of food additives when selecting processed foods.

Improving the transparency and comprehensibility of food additive information on labels was depicted as paramount from consumer empowerment and health protection perspectives (Kim et al., 2018; Kang et al., 2021). Therefore, providing reliable and easily understandable information will enable consumers to circumnavigate product choices more confidently, thus fostering a healthier consumption pattern. Again, promoting clarity relating to food additives on labels plays an important roles in maintain consumer trust and anchoring a culture of informed decision-making within the food industry (Kim et al., 2018; Lanero et al., 2021). Therefore, there is a need to prioritize refining of food labelling practices to improve consumer welfare and facilitate healthier dietary habits.

5.8 Surveillance and education and parental knowledge and child susceptibility

There has been limited scientific exploration into caregivers of preschool children's comprehension of food additives, with most studies primarily focusing on the general perception of these additives among adult consumers. However, and in line with Fung, Wang and Menon's (2018) observation, given the elevated susceptibility of children to the health risks posed by chemical agents compared to adults, it is imperative to direct research efforts towards understanding parental knowledge in this realm. The adequate growth and development of children hinge upon the provision of optimal nutrient levels (Adams and White, 2015; Piekara, Krzywonos and Kaczmarczyk, 2020). Moreover, children exhibit distinct eating patterns and consume more food per unit of body weight than adults, necessitating tailored dietary considerations. Additionally, and as Piekara et al. (2020) observed, children undergo unique metabolic processes responsible for the biotransformation of active substances, further emphasizing the importance of scrutinizing their dietary intake.

Given that the study findings and reviewed literature have linked food additives with potential health risks, it is imperative to maintain continuing surveillance of food safety levels. Again, this a need for continuous scientific investigation into potential health implications emanating from exposure to food additives. Also, educating caregivers of preschool children and other relevant stakeholders consistently is imperative to mitigate health risks relating to food additives.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study has brought forth insights into essential role of caregivers' awareness of food additives in shaping food intake habits and health outcomes of preschool-aged children. The results have emphasised on the need of educating caregivers of preschool children and other relevant stakeholders about the potential health risks associated with food additives and the importance for transparent food labelling practices. For example, the study results revealed presence of high level of awareness among caregivers regarding food additives and their potential health implications for preschool children. Mainly, this awareness shows the need for targeted educational programs to empower caregivers of preschool children to make informed dietary choices. Also, transparent and easily understandable food labelling practices are needed to enable consumers and buyers to navigate product choices with confidence. Enhancing the clarity and directness of food additive

information on labels will promote consumer trust and facilitate healthier consumption trends. Again, caregivers expressed their concerns associated with health risks that relate to food additives.

The findings from various studies underscore the significant impact of food additives on the health and development of preschool children. From dental health risks associated with sweeteners to potential effects on BMI, gastrointestinal issues, and cognitive development, the evidence highlights the multifaceted implications of these additives. Moreover, the association between food additives and behavioural issues, including ADHD symptoms, raises concerns about their widespread consumption among young children. Additionally, the observation that certain additives may influence taste preferences and dietary habits underscores the need for increased awareness and education among caregivers. All in all, these findings call for the need of continuing observation of food safety levels and consistent scientific investigation into potential health risks.

This study highlights the awareness level as a major risk factor that contributes to food additives choices. Further studies may highlight other risk factors such as economic status, food accessibility, child psychology in picking foods,..etc.

6.2 Addition to human knowledge

This study adds to already existence human knowledge on food additives and their potential health risks by proving insights into the levels of awareness of caregivers of preschool children of food additive risk management. The study's focus on caregivers of preschool children's awareness of food additives and their possible health risks for preschool-aged children emphasises on the importance of educating them and other stakeholders to make informed dietary choices, such as reading food labels before making purchases and making sure that they know information found in these food labels. Again, the study provides insights into on the importance of improved transparency and clarity of food additive information on labels particularly the one fed on preschool children to empower them and promote healthier consumption trends. All in all, this study calls for ongoing surveillance of food safety levels, continuous scientific investigation into potential health risks, and consistent education of caregivers and stakeholders to mitigate health risks relating to food additives.

6.3 Recommendations to practitioners

Based on study findings, the following recommendations are made to practitioners.

- The study recommends for the development and implementation of educational programs that target caregivers of preschool children to raise awareness about the potential health risks associated with food additives.
- The study recommendation for advocacy for clearer and more transparent food labelling practices, especially regarding additives present in foods marketed for children. Practitioners should work with regulatory bodies and food manufacturers to ensure that labelling information is easily understandable and readily accessible to consumers.
- The study encourages regulatory agencies to maintain vigilant surveillance of food safety levels and continuously assess the potential health repercussions stemming from exposure to food additives. They should advocate for stricter regulations on the use of additives, particularly in foods intended for children.
- The study calls for support of ongoing scientific research into the health effects of food additives, particularly in vulnerable populations such as children. There is a need to encourage collaboration between researchers, practitioners, and policymakers to address gaps in knowledge and develop evidence-based strategies for mitigating health risks associated with additives.

6.4 Recommended further studies

- This study recommends researcher to conduct longitudinal studies to track the long-term health outcomes of children exposed to various types and levels of food additives during early childhood. Primarily, this would provide valuable insights into the cumulative effects of additive exposure on health and development throughout the lifespan.
- There is a need to conduct future studies that assess the specific health effects of commonly used food additives, particularly focusing on those identified as most worrisome by

caregivers in this study, such as preservatives. This research could probe deeper into the mechanisms underlying these effects and explore potential interventions to mitigate risks.

- Future studies can explore factors influencing parental knowledge and behaviours regarding food additives. Qualitative studies could offer in-depth insights into caregivers' decision-making processes regarding food choices for their children and their perceptions of risks associated with additives.

BIBLIOGRAPHY

Adams J and M White, 2015. Characterisation of UK diets according to degree of food processing and associations with socio-demographics and obesity: Cross-sectional analysis of UK National Diet and Nutrition Survey (2008-12). International Journal of Behavioral Nutrition and Physical Activity, 12(1): 1–11.

Ahmed LKF,2023. Political science - Research methodology. Success Publications.

Ameur F Z, N Mehedi, CS Rivas, A Gonzalez, O Kheroua, and Dl Saidi, 2020. Effect of tartrazine on digestive enzymatic activities : in vivo and in vitro studies. *Toxicological Research*, 36(2):159–166.

Amin KA and FS Al-shehri, 2018. Toxicological and safety assessment of tartrazine as a synthetic food additive on health biomarkers : A review. African Journal of Biotechnology, 17(6): 139–149.

Arias A, G Feijoo, and MT Moreira, 2022. Exploring the potential of antioxidants from fruits and vegetables and strategies for their recovery. Innovative Food Science and Emerging Technologies, 77: 102974.

Babbie ER , 2016. The practice of social research. 14th edn. Cengage Learning.

Baker P, P Machado, T Santos, K Sievert, K Backholer, M Hadjikakou, C Russell, O Huse, C Bell, G Scrinis, and A Worsley, 2020. Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. Obesity Reviews, 21(12): 1-22.

Bellows LL, Y Lou, R Nelson, LI Reyes, RC Brown, NZ Mena, and RE Boles, 2022. A narrative review of dietary assessment tools for preschool-aged children in the home environment. Nutrients, 14(22): 4793.

Bryman A, 2016. Social research methods. Oxford University Press.

Buka I, A Osornio-Vargas, A and B Clark, 2011. Food additives, essential nutrients and neurodevelopmental behavioural disorders in children: A brief review. Paediatrics & child health, 16(7): e54-e56.

Creswell, JW and JD Creswell, 2022. Research design: Qualitative, quantitative, and mixed methods approaches. 6th edn. SAGE Publications.

Feild A, 2018. Discovering Statistics Using IBM SPSS Statistics | Andy Field |. 5th edn, Sage Publications Ltd. 5th edn. SAGE Publications.

Frankfort-Nachmias C and A Leon-Guerrero, 2020. Social statistics for a diverse society. 9th edn. SAGE Publications.

Fritz RL and R Vandermause, 2018. Data collection via in-depth email interviewing: Lessons From the field. Qualitative Health Research, 28(10): 1640–1649.

Fung F, HS Wang and S Menon, 2018. Food safety in the 21st century, Biomedical Journal, 41(2): 88–95.

Gil-Campos M, MA San José González and JJ Díaz Martín, 2015. Use of sugars and sweeteners in children's diets. Recommendations of the Nutrition Committee of the Spanish

Paediatric Association. Anales de Pediatria, 83(5): 353.e1-353.e7. Gupta, P, N Gupta, AP Pawar, SS Birajdar, AS Natt, AS and HP Singh, 2013. Role of sugar and sugar substitutes in dental caries: a review. *International Scholarly Research Notices*, *2013*(1): 519421.

Hall, KD, A Ayuketah, R Brychta, H Cai, T Cassimatis, KY Chen and M Zhou, 2019.

Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake. Cell metabolism, *30*(1): 67-77.

Haney MO, S Ozbıcakcı, and G Karadağ, 2019. Turkish teachers' self-efficacy to manage food allergy and anaphylaxis: A psychometric testing study. Allergologia et Immunopathologia, 47(6):558–563.

Heinrich R, 2021. Categorical data analysis [Lecture notes]. Walden University Blackboard.

Hurley KM, AK Yousafzai and F Lopez-Boo, 2016. Early child development and nutrition: A review of the benefits and challenges of implementing integrated interventions. Advances in Nutrition, 7(2): 357–363.

Jacquier EF, A Gatrell and A Bingley, 2016. Caregiver experiences, attitudes and perceptions about feeding toddlers and preschool children in Switzerland: A qualitative study.

Biomedic Central (BMC), Nutrition, 2(1): 1–8. Jarmakiewicz-Czaja S, D Piątek and R Filip, 2022. State of the art paper The impact of selected food additives on the gastrointestinal tract in the example of nonspecific inflammatory bowel diseases. Arch Med Sci, 18(5): 1286–1296.

Kang HJ, S Kim and JW Kim, 2021. Trends in korean parents' perceptions on food additives during the period 2014–2018. Nutrition Research and Practice, 15(3),: 346–354.

Kano M, Y Tani, M Ochi, N Sudo and T Fujiwara, 2020. Association between caregiver's perception of "Good" dietary habits and food group intake among preschool children in Tokyo, Japan. Frontiers in Pediatrics, 7 (554): 1–8.

Kim S, Kim JS, Kang HJ, Lee G, Lim HS, Yun SS and Kim JW, 2018. Changes in Korean

Consumers' Perception on Food Preservatives by a Risk Communication Booklet. Journal ofFood Hygiene and Safety, 33(6): 417–426.

Koyratty BNS, Aumjaud B and Neeliah, SA, 2014. Food additive control: A survey among selected consumers and manufacturers, British Food Journal, 116(2): 353–372.

Landrigan PJ and Straif K, 2021. Aspartame and cancer – new evidence for causation, Environmental Health: A Global Access Science Source, 20(42): 1–5.

Lanero A, Vázquez JL and Sahelices-Pinto C,2021. Halo effect and source credibility in the evaluation of food products identified by third-party certified eco-labels: Can information prevent biased inferences? Foods, 10(11):1–19.

Lemoine S, P Pauliat-Desbordes, Challier, and P Tounian, 2020. Adverse reactions to food additives in children: A retrospective study and a prospective survey. Archives de Pédiatrie, 27(7):368–371.

Louzada ML, CZ Ricardo, EM Steele, RB Levy, G Cannon, and C A Monteiro, 2018. The share of ultra-processed foods determines the overall nutritional quality of diets in Brazil, Public Health Nutrition, 21(1): 94–102.

Monalisa NN, 2020. Scholar Commons Scholar Commons Influences on Parents' Food Shopping for Children's Consumption Influences on Parents' Food Shopping for Children's Consumption in South Carolina in South Carolina. University of South Carolina.

Motebejana TT, CN Nesamvuni, and X Mbhenyane, 2022. Nutrition Knowledge of Caregivers Influences Feeding Practices and Nutritional Status of Children 2 to 5 Years Old in Sekhukhune District, South Africa. Ethiopian journal of health sciences, 32(1), pp. 103–116.

Mwale MM, 2023. Health risk of food additives: Recent developments and trends in the food sector. In Arshad MS, and W Khalid (eds) Health Risks of Food Additives - Recent Developments and Trends in Food Sector. pp. 1–28.

Needham D, I Palaiologou, and T Male, 2015. Doing research in education : Theory and practice. SAGE Publications.

Ovca A, M Jevšnik, and P Raspor, 2014. Food safety awareness, knowledge and practices among students in Slovenia. Food Control, 42:144–151.

Piekara A, Krzywonos M and Kaczmarczyk M, 2020. What do polish parents and caregivers think of dietary supplements for children aged 3–12?' Nutrients, 12(10): 1–21.

Polak P, and W Osmala-Kurpiewska, 2024. What do parents of children know about food additives in selected foods?. Polish Annals of Medicine, 31 (1): 1–6.

Ravikumar D, E Spyreli, J Woodside, M McKinley, and C Kelly, 2022. Parental perceptions of the food environment and their influence on food decisions among low-income families: a rapid review of qualitative evidence. BMC Public Health, 22(1): 1–16.

Roberts P, and H Priest, 2006. Reliability and validity in research. Nursing standard (Royal College of Nursing (Great Britain), 20(44): 41–45.

Sadighara P, M Safta , I Limam , K Ghanati , Z Nazari , M Karami, and A Abedini, 2023. Association between food additives and prevalence of allergic reactions in children: A systematic review. Reviews on Environmental Health, 38(1):181–186.

Salazar LF, RA Crosby, and RJ DiClemente, 2015. Research methods in health promotion. Wiley.

Savin, M, A Vrkati, D Dedić, T Vlaški, I Vorgučin, J Bjelanović and M Jevtic, 2022. Additives in children's nutrition: A review of current events, Public Health, 19, p. 13452..

Steele EM, LG Baraldi, ML Louzada, JC Moubarac, D Mozaffarian, and CA Monteiro, 2016. Ultra-processed foods and added sugars in the US diet: Evidence from a nationally representative cross-sectional study. BMJ Open, 6(3): 1–8.

TNS BMRB Ressearch, 2016. Food Standards Agency- Consumer understanding of food risk: chemicals. Topline report, pp. 1–22.

Trasande L, RM Shaffer, and S Sathyanarayana, 2018. Food Additives and Child Health.

Wagner WE, 2020. *Using IBM® SPSS® statistics for research methods and social science statistics*. 7th edn. SAGE Publications.

Walczak-Nowicka LJ and M Herbet, 2022. Sodium Benzoate—Harmfulness and Potential Use in Therapies for Disorders Related to the Nervous System: A Review. *Nutrients.* 14(7): 1497

Warner RM, 2012. *Applied statistics:* From bivariate through multivariate techniques. 2nd edn. SAGE Publications, Inc.

Witkowski M, H Grajeta, and K Gomułka, 2022. Hypersensitivity reactions to food additives—Preservatives, antioxidants, flavor enhancers. International Journal of Environmental Research and Public Health, 19:11493.

Zhong Y, L Wu, X Chen, Z Huang and W Hu, 2018. Effects of food-additive-information on consumers' willingness to accept food with additives. International Journal of Environmental Research and Public Health, 15(11):1–37.

Zhou X, K Qiao, H Wu, and Y Zhang, 2023. The Impact of Food Additives on the Abundance and Composition of Gut Microbiota', Molecules. 28(2): 1–15.