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The influence of food advertising on childhood obesity from a public health perspective in Mediterranean and emerging countries

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***Abstract*:** Childhood obesity is a growing public health concern, particularly in Mediterranean countries where traditional dietary patterns are increasingly supplanted by Westernized food consumption. This study investigates the cognitive and physiological responses of children to food advertising and their implications for dietary behaviors within the Mediterranean context. Employing a systematic review approach, the study integrates the Elaboration Likelihood Model (ELM) and Social Cognitive Theory (SCT) to examine how persuasive advertising strategies influence immediate food preferences and long-term consumption habits.

Findings reveal that Mediterranean children are highly susceptible to digital and traditional food marketing, with advertising fostering brand recall, impulsive eating behaviors, and conditioned cravings. A comparative analysis highlights regional disparities in advertising exposure and regulatory frameworks, with countries like Spain and Greece enforcing stricter policies compared to Morocco and Lebanon. The study underscores the urgent need for comprehensive regulatory measures, enhanced media literacy programs, and school-based nutritional interventions to counteract the adverse effects of food advertising.

Given the scarcity of region-specific research, future studies should adopt longitudinal and intervention-based methodologies to assess the effectiveness of policy interventions. This research provides actionable insights for policymakers and public health professionals, advocating for culturally tailored solutions to mitigate childhood obesity while preserving the benefits of the Mediterranean diet.

Keywords: ***Digital marketing*; *Food advertising*; *Childhood obesity*; *Unhealthy food*; *Behavioral influence*; *Cognitive responses*; *Mediterranean countries*; *Physiological reactions*; *Public health policy***

I. Introduction

Childhood obesity represents a critical public health issue worldwide, with particularly alarming trends observed across Mediterranean countries. This epidemic stems from a complex interplay of cultural shifts, evolving dietary practices, and the intensification of marketing strategies promoting energy-dense, nutrient-poor foods. Traditionally, the Mediterranean diet, rich in fruits, vegetables, whole grains, legumes, and healthy fats, has been associated with protective effects against non-communicable diseases and metabolic disorders. However, increasing urbanization, changing lifestyles, and the rising popularity of Westernized fast-food consumption have contributed to a gradual decline in adherence to this dietary model, especially among children and adolescents **[1]**.

One of the most pervasive drivers of this nutritional transition is the omnipresence of food advertising. Empirical studies consistently reveal that marketing content targeting children predominantly promotes ultra-processed products high in sugar, fat, and salt. Through the use of vibrant visuals, animated characters, emotional cues, and entertainment-based delivery such as advergames and influencer content, advertising constructs strong psychological associations that influence children's food choices and long-term consumption behaviors **[2-3]**. In Mediterranean countries, this challenge is compounded by the coexistence of traditional and modern dietary influences **[1-2]**.

This context raises a critical research question on how children's cognitive and physiological responses to food advertising contribute to the increase in childhood obesity in Mediterranean

countries and to what extent cultural, socioeconomic, and policy-related factors mediate these effects?

Although the broader literature has extensively explored the psychological and behavioral mechanisms underlying food advertising in Western populations, there remains a lack of region-specific analysis in the Mediterranean context, where dietary norms and regulatory infrastructures differ significantly. This study addresses that gap by synthesizing evidence from peer-reviewed studies through the lenses of the Elaboration Likelihood Model (ELM) and Social Cognitive Theory (SCT), providing an integrated understanding of how food advertising affects dietary habits among children in the region. In doing so, it also examines disparities in regulatory approaches and cultural resilience, offering policy-relevant insights for both Mediterranean countries and emerging economies undergoing similar nutritional shifts.

II. Materials and Methods

This study employed a systematic review design to assess the influence of food advertising on children's eating behaviors, focusing specifically on cognitive and physiological responses within the Mediterranean context. The review process followed a transparent methodology based on the PRISMA framework (Table 1). A comprehensive search was conducted across four electronic databases (PubMed, Scopus, Elsevier, and Web of Science). The search strategy combined Boolean operators with keywords such as "food advertising," "children," "eating behavior," "digital marketing," "advergames," "Mediterranean diet", and "childhood obesity". Only peer-reviewed articles published between 2019 and 2025 were considered.

Studies were included if they focused on children and adolescents up to 18 years of age, investigated the impact of food advertising on eating behaviors, and addressed cognitive and/or physiological responses. Eligible studies could employ quantitative, qualitative, or mixed methods as long as they reported measurable outcomes. Exclusion criteria included studies focused on adults, theoretical articles, or publications with a high risk of methodological bias.

Titles, abstracts, and full texts were screened independently for relevance and quality. Discrepancies between reviewers were resolved through discussion. Data were extracted systematically, covering study design, sample characteristics, type of food advertising, analytical approach, and reported outcomes. Methodological quality was assessed using the Cochrane risk of bias tool.

The analysis drew on two theoretical models, namely the elaboration likelihood model and social cognitive theory. The ELM distinguished between central processing (involving critical thinking) and peripheral processing (based on emotional or visual cues), particularly relevant in children's responses to advertising. SCT was used to examine how repeated exposure to advertising reinforces unhealthy eating behaviors through modeling, social reinforcement, and observational learning. The role of family dietary practices and parental mediation in Mediterranean households was also considered.

A thematic synthesis approach was used to analyze the data. Studies were coded according to advertising format, cognitive engagement, and behavioral outcomes. Qualitative data were categorized manually, and NVivo software was optionally used for thematic coding. Visual representations were created using GraphPad Prism. The strength of the evidence was evaluated using the Oxford Centre for Evidence-Based Medicine (OCEBM) levels of evidence and the GRADE approach. Comparative analysis was used to identify differences in the impact of food advertising and regulatory responses among Mediterranean countries. Ethical considerations were addressed, including informed consent and participant confidentiality when applicable.

Table 1. Systematic analysis of food advertising effects on children using the PRISMA framework

Step	Description	Tools/Frameworks used
1) Database search	Conducted a systematic search of articles published between 2019 and 2025 in PubMed, Scopus, Elsevier, and Web of Science.	Boolean operators (e.g., ("food advertising" AND "children" AND ("Mediterranean diet" OR "childhood obesity"))).
2) Inclusion and exclusion criteria	Applied predefined criteria to select studies focusing on children (0-18 years) and food advertising impacts. Excluded non-English articles and those lacking empirical data.	PRISMA framework for systematic review.
3) Screening process	Screened studies for relevance and methodological quality using abstract and full-text reviews.	
4) Data extraction	Extracted key elements such as study design, sample size, type of advertising, and outcomes.	Custom data extraction forms created in Excel.
5) Quality assessment	Assessed bias and methodological rigor using tools such as the Cochrane risk of bias tool.	Cochrane collaboration guidelines.
6) Thematic synthesis	Synthesized findings qualitatively, identifying patterns in advertising's cognitive and physiological impacts.	Manual thematic coding; NVivo for qualitative synthesis.
7) Data visualization	Created tables and figures to summarize findings and highlight the impact of food advertising across different media.	GraphPad Prism for data visualization and infographic design.

III. RESULTS AND DISCUSSION

1) The cognitive and physiological influence of food advertising on children

A comparative analysis of advertising platforms reveals substantial differences in their influence on children's eating behaviors. In lower- and middle-income Mediterranean countries, traditional television advertising remains dominant. However, digital platforms such as social media, advergames, and mobile applications introduce new challenges by delivering immersive, personalized content that reinforces brand loyalty and behavioral responses. Across the studies reviewed, children in the Mediterranean region exhibited heightened cognitive and physiological reactivity to both traditional and digital food advertisements. These advertisements, particularly those promoting ultra-processed foods, consistently undermine the principles of the traditional Mediterranean diet. In countries like Spain and Greece,

exposure to advertisements for sugary cereals and snacks has been associated with a decline in traditional breakfast choices, contributing to increased consumption of unhealthy products and rising obesity rates **[2-3]**. Despite regional and international regulatory efforts, including WHO recommendations, modern digital marketing tactics such as influencer promotions and gamified content often bypass existing controls. As illustrated in Figure 1, food advertising is linked to a 25% increase in the consumption of energy-dense, nutrient-poor products **[4,5,6-7]**. Digital formats, especially advergames, amplify these effects by embedding brand messages directly into gameplay **[8,9-10]** (Figure 1).

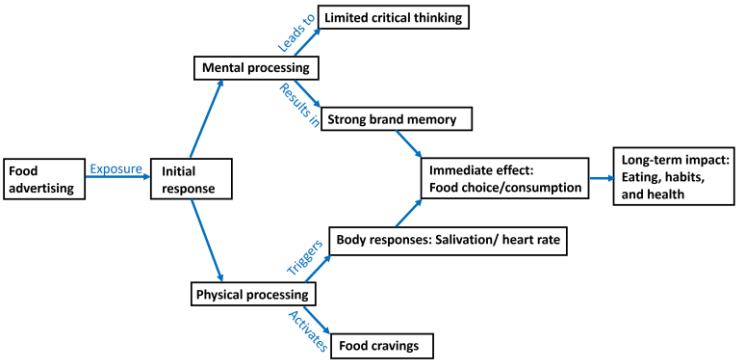

Figure 1. Conceptual framework of the dual pathways through which food advertising impacts children's eating behaviors and long-term health outcomes.

The following table provides a summary of the cognitive and physiological impacts of different advertising media. Traditional television tends to stimulate brand recall and impulsive choices, whereas digital media elicit stronger emotional and physiological responses, leading to immediate cravings and long-lasting food preferences. These findings highlight the importance of regulating not only the quantity but also the format of advertising content directed at children (Table 2).

Table 2. Comparative impact of food advertisements on children's cognitive and physiological responses (Adapted from studies reporting media-specific advertising effects).

Advertising medium	**Cognitive impact**	**Physiological impact**	**Behavioral outcome**
Traditional TV commercials	Limited critical thinking, strong brand recall	Increased salivation and elevated heart rate	Children are 25% more likely to choose advertised products over healthier alternatives.
Social media platforms	High engagement through interactivity, emotionally driven cues	Immediate food cravings and sustained attention	Strengthened brand loyalty and preference for energy-dense, nutrient-poor foods.
Advergames	Seamless integration of brand content, low awareness of intent	Heightened sensory stimulation and conditioned craving	Elevated consumption during and after gameplay sessions.
Mobile applications	Personalized ads reinforce emotional and cognitive biases	Arousal triggered by vivid imagery and gamified features	Persistent positive associations with unhealthy foods and future consumption intentions.

2) Cognitive and physiological responses

Children's cognitive and physiological responses to food advertising expose significant vulnerabilities in their ability to resist persuasive marketing (Figure 1). Research consistently shows that children process advertisements with limited critical thinking, particularly when the content is entertaining or gamified, such as in advergames and influencer-driven campaigns **[11]**. These strategies exploit well-known cognitive biases, reinforcing brand recall and preferences for ultra-processed foods **[7]**. Moreover, children's underdeveloped capacity to recognize persuasive intent increases their overall susceptibility **[12]**.

Physiological responses further amplify the impact of advertising. Exposure to food-related content has been shown to trigger increased salivation, elevated heart rate, and enhanced gastric activity **[9]**. These physical reactions are closely linked to food cravings and greater food intake, particularly among impulsive or overweight children **[10]**. Repeated exposure to these cues also fosters specific neural activation patterns associated with reward and desire, contributing to an estimated 15% increase in childhood obesity prevalence **[13]**.

Digital platforms, especially social media and advergames, intensify both cognitive and physiological responses by integrating promotional content into immersive and interactive experiences. In Mediterranean countries, these advertising mechanisms actively erode traditional dietary patterns, accelerating the rise in childhood obesity **[6]**. Effective countermeasures include the enforcement of stricter digital marketing regulations, the implementation of media literacy education, and public health campaigns that promote healthy and culturally rooted diets (Table 2; Figure 1).

3) Prevalence of childhood obesity in mediterranean countries

Childhood obesity has become a major public health concern across the Mediterranean region, fueled by changing dietary patterns, reduced physical activity, and shifting socioeconomic dynamics **[14]**. As shown in Table 3, countries such as Greece, Italy, and Spain report childhood obesity prevalence rates exceeding 25% among preschool-aged populations. This increase is strongly associated with declining adherence to the traditional Mediterranean diet, growing reliance on ultra-processed, energy-dense foods, and increased screen time **[15-16]** (Table 3).

By contrast, Morocco and Algeria report comparatively lower rates of childhood obesity, likely due to the continued influence of traditional dietary habits and limited consumption of processed foods **[17-18]**. However, these protective trends are gradually being eroded by the effects of urbanization and globalization, which are reshaping food environments and lifestyle behaviors in

both urban and rural settings.

In Italy, the prevalence of childhood overweight has reached levels similar to those observed in the United States, underscoring the urgency of targeted preventive measures. The economic burden on Italy's National Health Service is considerable, with obesity-related healthcare costs estimated at 4% of the national health budget approximately €4.5 million. This estimate is likely conservative, as standard body mass index (BMI) classification systems may underestimate the actual prevalence and severity of obesity in children **[19-20]**.

These regional disparities highlight the need for culturally tailored and country-specific interventions that address both behavioral and structural determinants of childhood obesity. The comparative overview of prevalence rates, dietary patterns, and emerging risk factors across selected Mediterranean countries is presented in the following table (Table 3).

Table 3. Prevalence of childhood obesity in Mediterranean countries

Country	Prevalence of overweight and obesity	Dietary and lifestyle factors	Notable trends
Spain	18.6% obese, 13.5% overweight among children aged 1-14 (with a mean age of 7.5 years) **[21]**	High consumption of sugary snacks and beverages, declining adherence to the Mediterranean diet	Increased marketing of ultra-processed foods targeting children **[22]**
Greece	7.2% obese, 16.7% overweight among children aged 6-9 (mean age: 7.4) **[23]**	A shift away from traditional breakfasts accompanied by a higher intake of processed foods	Aggressive advertising of cereals and fast food
Italy	Approximately 20% obese or overweight in children **[20]**	Low physical activity and increased Western dietary patterns	High exposure to digital marketing campaigns
Morocco	~14% prevalence among children	Gradual shift from traditional diets due to urbanization	Rise of digital food advertising in urban areas
Turkey	Increase from 5.3% (1993) to 11.6% (2013) in children younger than five **[24]**	High sugar intake, low maternal education, and sedentary lifestyle	Influence of social media influencers and processed snack culture
Algeria	14% overweight and 4-7% obese in children aged 5-17 **[25]**	Gender, age, genetics, poor nutrition, and inactivity	Emphasis on early intervention and public health education

4) Impact of food advertising on dietary behaviors and public health

The conceptual framework illustrates the mechanisms by which food advertising affects children's dietary behaviors and subsequent health outcomes (Figure 2) **[26-27]**. This model integrates moderators, mediators, and dependent variables to explain how advertising exerts both immediate and long-term effects on consumption patterns, particularly among vulnerable populations.

Moderators such as impulsivity, food cue sensitivity, and weight status shape children's individual responses to advertising exposure. Studies show that children who are more impulsive or highly reactive to food stimuli are more likely to engage in unplanned eating after viewing food advertisements **[28,29-30]**. Environmental factors such as increased screen time and continuous exposure to digital content further intensify these effects. Regular interaction with integrated promotional media increases children's preference for advertised foods over healthier alternatives **[31,32-33]**.

Mediators explain the internal mechanisms triggered by exposure. As shown in Figure 2, children's limited capacity for critical thinking and media literacy makes them especially vulnerable to persuasive techniques **[34-35]**. Advertisements use emotional and sensory stimulation bright visuals, sound effects, character endorsements to elicit physiological responses such as salivation, heightened attention, and gastric activity **[36-37]**. These reactions enhance food anticipation and reinforce cravings. Neuroimaging studies confirm increased activation in brain regions associated with reward processing during exposure to food marketing **[38]**.

This framework also underscores social disparities in advertising effects. Evidence shows that children from lower socio-economic backgrounds are more exposed to unhealthy food advertising, intensifying health inequities **[39-40]**. These insights highlight the urgent need for policy interventions that not only limit children's exposure to persuasive food marketing but also address structural inequalities in food environments. Comprehensive media literacy programs, culturally adapted public health campaigns, and stricter regulations in digital environments are essential to reduce the long-term impact of food advertising on children's health **[41-42]**.

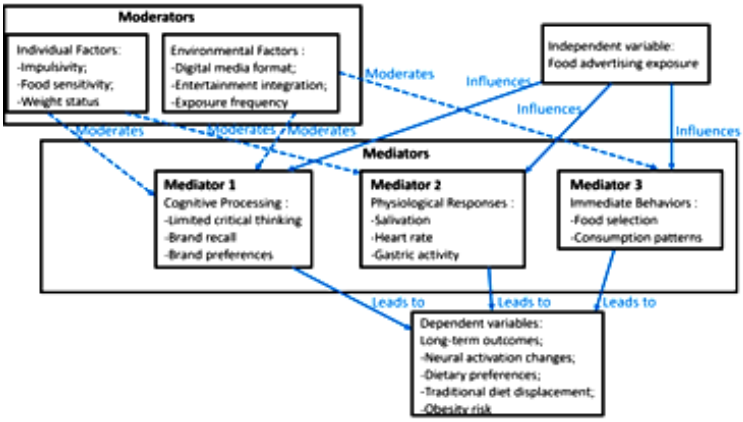

Figure 2. Conceptual framework of the influence of food advertising on children's dietary behaviors and obesity risk

5) Policy and practical implications

For marketing professionals, particularly those operating in emerging economies, these findings highlight the critical importance of adopting ethical communication strategies when targeting children. Rather than relying on manipulative advertising techniques, brands should promote balanced dietary messages that support healthier consumption patterns. Effective collaboration between marketers, educators, and public health authorities is essential to develop advertising frameworks that reconcile commercial objectives with broader public health priorities **[43-**

44].

To mitigate the negative impact of food advertising on children, stricter regulatory measures are urgently needed. National policies should prohibit or tightly restrict digital marketing practices that incorporate entertainment elements or directly target children through social media platforms. These measures should be accompanied by comprehensive public health campaigns that foster critical media literacy among children and parents, empowering them to decode persuasive messages and resist emotionally charged content often disseminated through social media **[45]**.

Additionally, promoting healthy, culturally relevant diets such as the traditional Mediterranean diet can serve as a counterbalance to the widespread appeal of ultra-processed foods. Public campaigns should focus not only on nutrition education but also on reviving traditional food culture through school-based programs and community interventions.

Several studies have identified promising approaches to reduce the influence of advertising on children's eating behaviors. These include increasing advertising literacy, modifying children's physiological responses through behavioral training, and enforcing regulations that restrict unhealthy food promotions **[46- 47]**. The elaboration likelihood model and social cognitive theory continue to provide relevant frameworks for understanding and designing effective interventions.

6) Limited research in Mediterranean countries

This study highlights a significant research gap regarding the impact of food advertising on children in Mediterranean countries, despite the region's unique dietary and cultural characteristics. Most existing studies apply general frameworks developed in Western contexts, without adequately considering regional nuances such as traditional food values, local media consumption habits, and variations in policy enforcement.

The scarcity of region-specific research is partly due to limited academic collaboration and insufficient funding across Mediterranean countries. This has hindered the development of effective, evidence-based interventions tailored to local realities. Furthermore, the lack of longitudinal studies and standardized methodologies makes it difficult to assess the long-term effectiveness of existing policy efforts.

As a result, many national strategies remain reactive and fragmented, lacking the comprehensive scope needed to address the structural and cultural drivers of childhood obesity. This limitation is particularly concerning given the rapid nutrition transition occurring in countries such as Morocco, Lebanon, and Turkey.

To fill this gap, future research should prioritize longitudinal and intervention-based designs, enabling the assessment of causal relationships between advertising exposure and health outcomes. Cross-country comparisons within the Mediterranean region and between Mediterranean and non-Mediterranean countries may also help identify protective dietary and policy factors that mitigate the harmful effects of food marketing.

IV. CONCLUSION

Beyond its implications for public health, this study offers meaningful insights for marketers, brand strategists, and policymakers by examining how food advertising shapes children's cognitive and physiological responses. It calls for ethical marketing approaches that prioritize long-term trust and social responsibility, especially when targeting vulnerable populations such as children.

By integrating the elaboration likelihood model and social cognitive theory, the study provides a comprehensive understanding of how advertising influences short-term food choices and long-term dietary habits among children in Mediterranean countries. The findings underscore the urgent need for robust regulatory frameworks particularly in countries with limited advertising controls to protect children from the persuasive power of unhealthy food marketing.

Effective interventions should include multi-sectoral collaboration, digital marketing restrictions, and culturally tailored campaigns that promote healthy eating behaviors. Educational programs, particularly those focused on media literacy and traditional dietary patterns, can serve as powerful tools to counteract the growing influence of ultra-processed food advertising.

Although this review focused on the Mediterranean region, its conclusions may also apply to other emerging economies undergoing similar dietary transitions, such as India or countries in the MENA region. Future research should emphasize longitudinal and intervention-based studies to assess the real-world impact of policy reforms. Comparative analyses between Mediterranean and non-Mediterranean settings may further clarify the protective role of traditional food cultures in resisting the harmful effects of modern food advertising.

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Conflict of Interest

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