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The association of ultra-processed food intake with mental health disorders, cognitive impairment, and insomnia: a literature review

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Abstract

Background

Ultra-processed foods like packaged snacks, instant meals, desserts, and sweetened beverages have become dominant in the modern diet and are now under investigation for their potentially harmful impact on human health.

Aim

This article aims to present current knowledge of the relationship between ultra-processed food consumption and the risk of mental health disorders, cognitive impairment and insomnia.

Material and methods

A literature review was conducted across PubMed and Google Scholar. Keywords included: ultra-processed foods, mental health, depression, anxiety, cognitive function, cognitive performance, cognitive impairment, insomnia.

Results

Multiple studies showed significant connection between high ultra-processed food consumption and elevated risk of mental health disorders such as depression and anxiety. Increased risk of dementia and Alzheimer's disease among adult population was also reported. Moreover, the reviewed studies showed that ultra-processed foods negatively affect sleep and may contribute to insomnia, particularly among adolescents.

Conclusions

High ultra-processed food consumption has multiple adverse health outcomes and harmfully affects human mental health, cognitive functions and sleep. Public health strategies and dietary guidelines that include the avoidance of overall ultra-processed food intake are needed to improve population health. Given the popularity of ultra-processed products, this issue should be addressed by public health organizations without further delay. Further research is required to confirm this association and to clarify its complexities.

Key words: ultra-processed foods, mental health, depression, anxiety, cognitive function, cognitive performance, cognitive impairment, insomnia.

1. Introduction

According to the NOVA food classification system, ultra-processed foods include a large assortment of ready to eat products, including packaged snacks, carbonated soft drinks, mass produced packaged breads and buns, cookies, 'instant' soups, noodles and desserts. [1] Ultra-processed foods are compounds of chemically modified substances extracted from foods, along with additives to enhance taste, texture, appearance, and durability. Processes enabling the manufacture of ultra-processed foods involve several steps and different industries. [2]

Ultra-processed foods are prevalent these days, they already make up more than half of the total dietary energy consumed in high-income countries such as the USA, Canada and the UK and between one-fifth and one-third of total dietary energy in middle-income countries such as Brazil, Mexico and Chile. Their sales are still growing, even up to ten percent per year in middle-income countries. [2]

Popularity of these products contributes to many adverse health outcomes such as obesity, various cancers, cardiovascular and metabolic diseases. There is also association between greater exposure to ultra-processed foods and higher risk of incident all-cause mortality. [1, 3, 4] In addition, poor dietary quality is well established as a potentially modifiable risk factor for mental health disorders, which situate among the leading causes of global burden. [5]

This review aims to systematically analyse and integrate current knowledge about the relationship of ultra-processed food intake and mental health disorders, cognitive impairment and insomnia. This analysis will allow us to better understand how ultra-processed foods contribute to the epidemiology of mental health disorders, dementia and sleep deprivation. It will also enable us to assess the scale of the problem.

2. Research materials and methods

2.1. Data collection and analysis

A review of the literature was completed using the following databases: PubMed and Google Scholar. The search focused on systematic reviews, meta-analyses and clinical

trials. The following keywords were applied: ultra-processed foods, mental health, depression, anxiety, cognitive function, cognitive performance, cognitive impairment, insomnia.

3. Research results

3.1 Mental health disorders

Mental health disorders such as depression, anxiety, and chronic stress have enormous influence on human life and contribute to multiple social and financial consequences. Depression is a common chronic illness affecting more than 300 million people who experience symptoms such as feelings of sadness, loss of interest and happiness, poor concentration, and diminished appetite. Stress (distress or eustress) is a feeling of emotional or physical tension. Chronic distress has negative impact on the health status and affects nearly 264 million people. Anxiety is characterized as persistent worries even in the absence of a stressor and may present as nervousness, restlessness, and irritability. [6, 7]

Between 2007 and 2012 in the USA, a group of researchers analysed 10,359 adults. Individuals who reported a history of cocaine, methamphetamine or heroin use were excluded from the study. The authors assessed three mental health symptoms: mild depression, number of mental unhealthy days and number of anxious days. To evaluate symptoms of depression they used Patient Health Questionnaire-9 (PHQ-9). The number of mentally unhealthy days was obtained from the response to the question: 'During the past 30 days, how many days was your mental health not good?' (range: 1–30). The number of anxious days was obtained from the response to the question: 'During the past 30 days, how many days did you feel worried, tense, or anxious?' (range: 1–30). After adjusting for covariates, individuals with the highest level of ultra-processed food consumption were significantly more likely to report at least mild depression (OR: 1.81; 95% CI: 1.09, 3.02), more mentally unhealthy days (RR: 1.22; 95% CI: 1.18, 1.25) and more anxious days per month (RR: 1.19; 95% CI: 1.16, 1.23). They were also significantly less likely to report zero mentally unhealthy or anxious days. [8]

Another study showed that increased ultra-processed food consumption was associated with a higher risk of elevated psychological distress (aOR: 1.23; 95%CI: 1.10, 1.38, p=0.001). Psychological distress was used as an indicator of depression after 15 years and measured by ten-item Kessler Psychological Distress Scale (K10). The authors used a cut-off point of 20 or above to identify elevated psychological distress among participants. [9]

In The Brazilian Longitudinal Study of Adult Health, the authors recruited 15,105 adults (35–74 years) between 2008 and 2010 and followed them up to 2018. The researchers reported

that for common mental health disorders, non-dairy sweet snacks and desserts, ready-to-eat/heat-mixed dishes, and sweetened beverages were associated with RRs of 1.08 (95% CI: 1.02, 1.13), 1.07 (95% CI: 1.01, 1.12), and 1.10 (95%CI: 1.05, 1.16), respectively. For depressive episodes, results were similar, with a higher risk associated with non-dairy sweet snacks and desserts (RR: 1.13, 95% CI: 1.03,1.22) and sweetened beverages (RR: 1.23; 95% CI: 1.13, 1.34). For anxiety disorders, ready-packaged bread and processed meats individually elevated the risk with RRs of 1.10 (95% CI: 1.03, 1.17) and 1.08 (95% CI: 1.01, 1.15), respectively. [4]

In Australia, a group of researchers focused on older population (≥70 years old). They investigated 11,192 participants (3415 intervention and 7777 control). Greater than or equal to 4 portions of ultra-processed food per day was considered the intervention and less than 4 portions per day the control. The authors reported that high ultra-processed food consumption at time zero was associated with an increased risk of depressive symptoms at follow-ups (RR: 1.10; CI:1.04, 1.18). Furthermore, after excluding participants on antidepressants at time zero, the risk of depressive symptoms in the intervention group was increased by 11% compared to the control (RR: 1.11; 95%CI: 1.04,1.20). Consumption of ultra-processed food adversely affected the mental health quality of life in the study sample. [10]

On the other hand, young population was also analysed. The researchers in Brazil obtained data from National School-Based Health Survey (PeNSE 2019). 94,767 adolescents, from an entire country, were asked about the frequency of five mental health symptoms in the last month and the consumption of ultra-processed food in the last 24 hours. The juveniles were asked the following set of questions: “How often have you felt very concerned about the ordinary things in your daily life such as school activities, sports competitions, homework, etc.?”; “How often have you felt irritated, nervous or bad-tempered by anything?”; “How often have you felt that no one cares about you?”; “How often have you felt sad?” and “How often have you felt that life is not worth living?”. The results showed that the higher the consumption of ultra-processed food was, the higher the frequency of reported symptoms of poor mental health. These findings remained significant regardless of sociodemographic and lifestyle factors, self-perceived body image, and bullying victimization. [11]

Another study demonstrated that increased intake of ultra-processed food is associated with elevated mental distress among university students. The authors obtained data from 595 students using a face-to-face questionnaire. Mental distress was defined as “a significant disturbance in emotional processes, thoughts, or cognitions that impairs judgment, behaviour, or the ability to cope with the ordinary demands of life”. The researchers reported that those

with ultra-processed food consumption above 50.999% had low mental quality of life and those with intake above 40.250% suffered from moderate-to-high mental distress. [12]

3.2. Cognitive impairment

Cognitive performance refers to ability to perform cognitive tasks involving processes such as memory, attention, executive functions, language and perception. [13] One of the most prevalent disorders affecting these functions is dementia. Considered a heterogeneous condition, dementia is characterized by clinical variability as evidenced by differences in aetiology, risk, clinical presentation, pathologic patterns, progression, and prognosis. It has significant health, social, and economic consequences for individuals, families, and society. [14]

In order to analyse the connection between cognitive impairment and ultra-processed foods, American researchers assessed 3632 participants over 60 years old using data from the National Health and Nutrition Examination Survey (NHANES). Cognitive functions were examined using the Consortium to Establish a Registry for Alzheimer's Disease (CERAD), Word Learning test, Animal Fluency test and the Digit Symbol Substitution test (DSST). Dietary intake was assessed using two 24-hours diet recalls. The authors reported that high ultra-processed food consumption was significantly associated with worse performance in Animal Fluency test in older adults without pre-existing diseases ($p<0.05$), while no significant connections were observed for those with pre-existing chronic health conditions. The Animal Fluency test evaluates categorical verbal fluency, which is one of the executive functions. The aim of this test is to name as many animals as possible within a 60 seconds time period. [15]

In meta-analysis from 2023, high intake of ultra-processed food was associated with increased risk of dementia among adults (RR: 1.44; 95% CI: 1.09, 1.90, $p=0.02$). However, moderate consumption was not linked with this condition. Funnel plots demonstrate low risk of publication bias. In the following paper, the authors analysed 10 studies comprising a total of 867,316 participants from the USA, Asia, and Europe. Eight studies were longitudinal, with follow-up period ranging from 6.8 to 22 years, one was case–control, and one was cross-sectional in design. [16]

A systematic review from 2024 included 5 studies comprising a total of 617,502 adults and elderly people. All the reviewed studies had a cohort design and were considered to be of high methodological quality. They were conducted in the USA, the United Kingdom, and Sweden, and were published between 2018 and 2023. The monitoring period in the studies

ranged from 8 to 24 years. Of the included studies, 4 demonstrated a risk association between the consumption of ultra-processed food and the development of Alzheimer's disease, while 1 study showed a risk association only with the development of cognitive decline. [17]

Another study focused on adolescent students (15–18 years old) in Brazil. The authors evaluated participants' cognitive performance using the Non-Verbal General Intelligence Test. Food intake was assessed using three 24-hour dietary recalls. The results revealed that participants with low cognitive performance consumed 26.5% of daily energy intake from ultra-processed foods compared to 22.5% of those with medium or high cognitive performance ($p = 0.17$). Differences between groups were not significant. [18]

3.3. Insomnia

Insomnia is a sleep disorder where people struggle to go off to sleep or to stay asleep, or both. These night-time sleep difficulties cause significant daytime problems that affect the individual's ability to function optimally and significantly decrease the quality of person's life. Daytime fatigue, low mood or irritability, problems with attention or concentration are common insomnia symptoms. To be diagnosed with an "insomnia disorder", these difficulties have to occur at least several times a week over a period of 3 months. [19]

NutriNet-Santé Study investigated the association between ultra-processed food intake and chronic insomnia in group of 38,570 adult participants who had completed a sleep questionnaire and at least two 24-hour dietary records. Chronic insomnia was defined according to the criteria from the ICSD-3 and the DSM-5. In the full sample, ultra-processed food consumption was associated with higher odds of chronic insomnia (OR:1.06; 95% CI: 1.02, 1.09). Moreover, sex-specific OR for chronic insomnia was slightly higher among men than among women. [20]

In Northeastern Iran, a group of researchers assessed 733 adolescent girls between the ages of 12 and 18 years. To evaluate insomnia they used The Insomnia Severity Index (ISI) questionnaire. Assessment of dietary intake was performed by a qualified dietitian using a validated food frequency questionnaire (FFQ) containing 147 food items. The results showed that participants in the highest quartile of ultra-processed food intake compared with those in the lowest quartile had 2.77 higher odds of insomnia ($p < 0.01$). However, there was no significant relation between ultra-processed food intake and daytime sleepiness. [21]

Pourmotabbed A. et al. analysed data from seven studies. All the included studies had a cross-sectional design and were conducted between 2014 and 2024 in France, Iran, Brazil and

Mexico, comprising a cumulative sample of 159,427 participants. A significant positive relationship between higher ultra-processed food intake and an enhanced risk of insomnia was reported (OR = 1.53; 95% CI: 1.20, 1.95; p=0.014). Subgroup analysis indicated that this positive relationship was particularly strong in the context of the NOVA food classification (OR = 1.57; 95% CI: 1.03, 2.40, p=0.009) and snack intake (OR = 1.33; 95% CI: 1.04, 1.71; p<0.001), in contrast to Western dietary patterns adherence. Additional subgroup findings also indicated that elevated consumption of ultra-processed food was significantly associated with a higher risk of insomnia among adolescents (OR:1.55; 95% CI: 1.21, 1.99; p < 0.001), while no significant correlation was found among adults. [22]

4. Conclusions

High consumption of ultra-processed food significantly increases the risk of mental health disorders such as depression, anxiety, and psychological distress. This association have occurred regardless of the age of the study sample. A diet high in ultra-processed foods also affects cognitive functions and may lead to dementia and Alzheimer's disease among adult population. However, no significant relationship between ultra-processed food consumption and cognitive impairment among juveniles has been found. Furthermore, a positive correlation has been observed between ultra-processed food intake and insomnia, particularly among adolescents. These adverse outcomes preclude individuals from functioning optimally and significantly reduce their quality of life.

These findings add to the mounting evidence of adverse outcomes of ultra-processed foods for physical and mental health. They support the view that high consumption of ultra-processed products is a pressing issue and should be addressed by public health organizations without further delay. Public health strategies and dietary guidelines that include the avoidance of overall ultra-processed food intake are needed to improve population mental health and quality of life. Moreover, health promotion activities should particularly target young population, as this is a crucial time for establishing dietary habits. Further research is required to confirm this association and to clarify its complexities.

Disclosure

Supplementary Materials

Not applicable.

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