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REVIEW ARTICLE

Impact of Modern Food Style on Cardiovascular Health in Young Adults

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Abstract

The dietary habits of young adults have significantly evolved in recent decades due to factors like globalization, technological advancements, and lifestyle changes. This review article examines the impact of modern food styles on cardiovascular health among young adults. We explore various dietary patterns, their nutritional compositions, and the resulting physiological effects on cardiovascular systems. Key areas of focus include the rise in consumption of processed foods, the shift towards high-fat and high-sugar diets, and the decrease in the intake of whole foods such as fruits, vegetables, and whole grains. Additionally, we discuss the role of socioeconomic and cultural factors in shaping dietary behaviors and their implications for public health. Through a comprehensive analysis of recent studies, we aim to provide a nuanced understanding of how contemporary eating habits contribute to cardiovascular risk factors such as obesity, hypertension, dyslipidemia, and metabolic syndrome. The review concludes with recommendations for promoting healthier dietary practices to mitigate the adverse effects of modern food styles on cardiovascular health in young adults.

1. Introduction

In recent years, the dietary patterns of young adults have shifted dramatically. The 21st century has brought about a food culture dominated by convenience, speed, and accessibility. The rise of processed foods, fast foods, and sugary beverages has replaced traditional dietary practices, which were rich in whole and minimally processed foods (Baker and Friel, 2014). This shift is largely attributed to the fast-paced nature of modern life, technological advancements in food production and distribution, and the pervasive influence of global food marketing. Young adults, in particular, are at the forefront of this dietary shift, often opting for quick, easy, and palatable food options that fit into their busy lifestyles (Magalhaes et al., 2022). The demanding schedules of young adults, including academic, work, and social commitments, leave little time for meal preparation, leading to increased reliance on ready-to-eat meals, fast food, and take-out options that are typically high in unhealthy fats, sugars, and sodium. Moreover, technological advancements in food processing and preservation have increased the availability and shelf life of processed foods, while innovations in food delivery services have made it easier for young adults to access convenient food options (De Corato, 2020). Aggressive marketing strategies by the food industry, especially on digital platforms, target young adults with appealing advertisements for unhealthy food options (Montgomery and Chester, 2009).

Cardiovascular health is a critical component of overall well-being, influencing the risk of conditions such as heart disease, stroke, and other vascular disorders (Sin, 2016). Young adulthood is a pivotal period for establishing long-term health behaviors, making it essential to understand the factors that impact cardiovascular health in this demographic. Poor dietary choices during this young stage can have lasting repercussions, contributing to the early onset of cardiovascular diseases (CVDs) (Andersson and Vasan, 2018). The consumption of high-calorie, nutrient-poor foods leads to the accumulation of risk factors such as obesity, hypertension, and dyslipidemia, which are precursors to CVD. Furthermore, the habitual intake of sugary beverages and processed foods disrupts metabolic health, increasing the likelihood of developing insulin resistance and type 2 diabetes, which are closely linked to cardiovascular risk (Moradi et al., 2021). As young adults continue to navigate a landscape of dietary convenience, it is imperative to promote awareness and interventions that encourage healthier eating patterns to mitigate the long-term impact on cardiovascular health.

2. Dietary Patterns and Cardiovascular Health

2.1. Processed and Ultra-Processed Foods

Processed foods refer to items that have been altered from their natural state through methods such as canning, freezing, refrigeration, dehydration, and aseptic processing. These alterations are often made to extend shelf life, enhance flavor, or improve convenience (Sharif et al., 2018). Processing can range from minimal (e.g., washing, cutting) to extensive (e.g., adding preservatives, flavor enhancers). While minimally processed foods, like frozen vegetables or canned beans, retain most of their nutritional value, highly processed foods often undergo significant changes that can impact their healthfulness (M. Li et al., 2019). Ultra-processed foods, a subset of processed foods, are formulations of ingredients, often with little or no whole foods, that typically contain additives like preservatives, flavor enhancers, emulsifiers, and colorings (Koios et al., 2022). These products are designed to be convenient and palatable but are frequently high in added sugars, unhealthy fats, and sodium, while being low in essential nutrients. Examples include sugary drinks, packaged snacks, instant noodles, and ready-to-eat meals such as frozen dinners and fast food. Scientific studies have shown that diets high in ultra-processed foods are associated with various adverse health outcomes, including obesity, cardiovascular diseases, and metabolic disorders (Chen et al., 2020).

The mechanisms through which ultra-processed foods contribute to poor health are multifaceted. These foods often have a high glycemic load, leading to rapid spikes in blood sugar and insulin levels, which can promote insulin resistance over time. The excessive intake of sodium in ultra-processed foods is linked to hypertension, a major risk factor for cardiovascular disease (Juul et al., 2021). Additionally, the trans fats and saturated fats commonly found in these foods can increase LDL cholesterol levels, further contributing to cardiovascular risk. Furthermore, ultra-processed foods are usually low in dietary fiber, which is essential for maintaining healthy digestion and regulating blood sugar levels (Gibney et al., 2017). The additives in ultra-processed foods also play a significant role in their health impact. For instance, artificial sweeteners and certain preservatives have been shown to alter gut microbiota, potentially leading to dysbiosis and inflammation. Flavor enhancers like monosodium glutamate (MSG) can stimulate appetite and promote overconsumption (Lim et al., 2021). Colorings and other additives have been associated with behavioral issues in children, such as hyperactivity. Given these concerns, public health guidelines increasingly recommend limiting the intake of ultra-processed foods and instead emphasize the consumption of whole, minimally processed foods (Arnold et al., 2012). Strategies to reduce the consumption of ultra-processed foods include improving food labeling, implementing taxes on sugary drinks and snacks, and promoting educational campaigns about the benefits of whole foods. Research continues to explore the long-term health impacts of processed and ultra-processed foods, aiming to provide clearer guidance for healthier dietary patterns.

2.2 Impact on Cardiovascular Health

The high intake of processed and ultra-processed foods is linked to various adverse cardiovascular outcomes. These foods are often rich in trans fats, sodium, and added sugars, which contribute to hypertension, dyslipidemia, and insulin resistance (Mozaffarian, 2016). Studies have shown a strong correlation between the consumption of these foods and increased incidence of cardiovascular events such as myocardial infarction and stroke (Bechthold et al., 2019). Research indicates that diets high in processed foods lead to chronic inflammation, oxidative stress, and endothelial dysfunction, which are precursors to atherosclerosis (Kellow and Savige, 2013). Moreover, the frequent consumption of these foods displaces nutrient-dense foods from the diet, leading to deficiencies in essential nutrients that support cardiovascular health.

3. High-Fat Diets and their Physiological effects

Dietary fats are categorized into saturated fats, trans fats, monounsaturated fats, and polyunsaturated fats. Saturated and trans fats, found in foods like red meat, dairy products, and processed snacks, are particularly detrimental to cardiovascular health (Islam et al., 2019). In contrast, monounsaturated and polyunsaturated fats, found in nuts, seeds, fish, and plant oils, are beneficial when consumed in appropriate amounts. High intake of saturated and trans fats leads to elevated levels of low-density lipoprotein (LDL) cholesterol, a major risk factor for atherosclerosis (Huang et al., 2009). This condition, characterized by the buildup of fatty deposits in the arterial walls, can result in reduced blood flow and increased risk of heart attacks and strokes. Additionally, these fats promote the development of inflammatory markers such as C-reactive protein (CRP), which further exacerbates cardiovascular risk (Voutilainen et al., 2022).

Added sugars are prevalent in many modern diets, especially through consumption of sugary beverages, sweets, baked goods, and processed foods. High-fructose corn syrup and sucrose are common forms of added sugars. These sugars are often hidden in products marketed as healthy, such as flavored yogurts, granola bars, and even some fruit juices. High-sugar diets contribute to obesity, insulin resistance, and type 2 diabetes, all of which are significant risk factors for cardiovascular diseases (Khan and Sievenpiper, 2016). Excessive sugar intake through processed food leads to increased triglyceride levels, promoting the development of atherogenic dyslipidemia and hypertension (Figure 1). Studies have shown that high consumption of sugar-sweetened beverages is associated with higher incidence of metabolic syndrome and non-alcoholic fatty liver disease, both of which are linked to cardiovascular complications (Meng et al., 2018).

4. Nutritional Deficiencies and Cardiovascular Health

Fruits and vegetables are rich in essential vitamins, minerals, antioxidants, and dietary fiber. These nutrients are crucial for maintaining cardiovascular health. Antioxidants, such as vitamins C and E, help reduce oxidative stress and inflammation, while dietary fiber helps lower LDL cholesterol levels and improve overall lipid profiles (Willcox et al., 2009). Whole grains, such as oats, quinoa, and brown rice, provide important nutrients including B vitamins, magnesium, and dietary fiber. Regular consumption of whole grains is associated with lower risks of coronary artery disease, hypertension, and type 2 diabetes. The fiber content

in whole grains helps in maintaining a healthy weight and reducing the risk of developing metabolic syndrome (P. and Joye, 2020).

Modern diets high in processed foods often lack essential vitamins and minerals, leading to deficiencies that can adversely affect cardiovascular health. For instance, inadequate intake of potassium, magnesium, and calcium can contribute to hypertension (Weaver et al., 2018). Similarly, deficiencies in B vitamins, particularly folate, B6, and B12, can elevate homocysteine levels, increasing the risk of cardiovascular diseases. Omega-3 fatty acids, found in fatty fish, flaxseeds, and walnuts, have anti-inflammatory properties and are known to support cardiovascular health (Psota et al., 2006). Modern diets, however, tend to have a higher ratio of omega-6 to omega-3 fatty acids, promoting inflammation and increasing the risk of atherosclerosis and other cardiovascular conditions. The comparison between the processed and healthy foods are given in the table 1.

5. Role of Socioeconomic and Cultural Factors

Socioeconomic status (SES) significantly influences dietary choices and health outcomes. Lower SES is often associated with limited access to healthy food options due to factors such as food deserts, financial constraints, and lack of nutritional education (A. S. W. Li et al., 2019). This results in higher consumption of affordable, calorie-dense, and nutrient-poor foods. The disparities in dietary habits contribute to varying cardiovascular health outcomes across different socioeconomic groups. Young adults from lower SES backgrounds are at a higher risk of developing CVDs due to poor dietary quality and associated lifestyle factors. Research shows that lower-income groups have higher rates of obesity, hypertension, and type 2 diabetes, all of which are precursors to cardiovascular diseases (Ho et al., 2019).

Cultural background plays a crucial role in shaping dietary preferences and practices. Traditional diets, typically rich in whole foods and balanced nutrients, are being increasingly replaced by Western-style diets high in processed and fast foods. This shift is particularly evident among young adults who are more susceptible to cultural assimilation and peer influence (Halawa, 2021). The pervasive influence of media and marketing significantly affects food choices among young adults. Aggressive marketing of unhealthy food options through social media, television, and other platforms promotes the consumption of high-calorie, low-nutrient foods, further exacerbating the risk of cardiovascular diseases. Marketing strategies often target young adults by appealing to their desire for convenience, taste, and social status, leading to poor dietary choices.

6. Physiological Mechanisms Linking Diet and Cardiovascular Health

6.1. Role of Diet in Inflammation

Diet plays a crucial role in modulating inflammatory responses in the body. Diets high in processed foods, refined sugars, and unhealthy fats promote chronic inflammation, which is a key factor in the development of cardiovascular diseases (CVDs) (Forman and Bulwer, 2006). Chronic inflammation contributes to the formation and progression of atherosclerotic plaques, which can lead to the narrowing and hardening of the arteries. These plaques can rupture, leading to clot formation and potentially causing heart attacks or strokes. Research indicates that certain dietary patterns, such as the Western diet, which is rich in red and processed meats, sugary beverages, and refined grains, are strongly associated with elevated levels of inflammatory markers like CRP (Esmaillzadeh et al., 2007). In contrast, anti-inflammatory diets, such as the Mediterranean diet, which includes high intakes of fruits, vegetables, whole grains, nuts, and olive oil, are associated with lower levels of inflammation and a reduced risk of CVDs.

6.2. Antioxidants and Oxidative Stress

Antioxidants found in whole foods help combat oxidative stress by neutralizing free radicals. Oxidative stress, resulting from an imbalance between free radicals and antioxidants in the body, is a major contributor to endothelial dysfunction and the development of cardiovascular diseases. Free radicals can damage endothelial cells, leading to impaired vasodilation, increased permeability, and a propensity for thrombosis (Fenster et al., 2003). Diets rich in fruits, vegetables, and whole grains provide a wide range of antioxidants, such as vitamins C and E, flavonoids, and polyphenols, which help maintain endothelial health and prevent oxidative damage. For example, studies have shown that high consumption of flavonoid-rich foods like berries and dark chocolate is associated with improved endothelial function and reduced blood pressure, which are critical factors in maintaining cardiovascular health (Shiina et al., 2009).

6.3. Endothelial Function

The endothelium is a thin layer of cells lining the blood vessels, playing a vital role in vascular health. It regulates blood flow, vascular tone, and blood clotting. Healthy endothelial function is essential for preventing cardiovascular diseases, as it maintains vascular homeostasis and prevents atherosclerosis. The endothelium produces nitric oxide (NO), a molecule that facilitates vasodilation, inhibits platelet aggregation, and prevents the adhesion of leukocytes to the vessel wall. Dysfunctional endothelium, characterized by reduced NO bioavailability and increased oxidative stress, is a precursor to atherosclerosis and hypertension (Russo et al., 2002).

Dietary factors significantly influence endothelial function. High-fat and high-sugar diets can impair endothelial function by increasing oxidative stress and inflammation. Saturated and trans fats, prevalent in many processed foods, contribute to the reduction of NO availability and promote endothelial dysfunction. Conversely, diets rich in whole foods, such as the Mediterranean diet, have been shown to improve endothelial function and reduce the risk of cardiovascular diseases (Yubero-Serrano et al., 2020). This diet is abundant in monounsaturated fats from olive oil, omega-3 fatty acids from fish, and antioxidants from fruits and vegetables, all of which support endothelial health. Clinical studies have demonstrated that adherence to the Mediterranean diet is associated with improved markers of endothelial function, such as increased flow-mediated dilation and reduced arterial stiffness, thereby lowering the risk of CVDs (Ray et al., 2014).

6.4. Lipid Metabolism

Dietary habits directly impact lipid metabolism and lipid profiles. Diets high in saturated and trans fats increase LDL cholesterol and triglyceride levels, while diets rich in unsaturated fats and fiber improve lipid profiles by reducing LDL cholesterol and increasing high-density lipoprotein (HDL) cholesterol. For instance, replacing saturated fats with polyunsaturated fats, as found in nuts, seeds, and fish, can significantly lower LDL cholesterol levels. Additionally, soluble fiber from foods like oats and legumes can bind to cholesterol in the digestive system and help remove it from the body, thereby lowering overall cholesterol levels (Soliman, 2019).

Atherogenic dyslipidemia, characterized by elevated triglycerides, low HDL cholesterol, and small, dense LDL particles, is a major risk factor for cardiovascular diseases. High-sugar diets contribute to this lipid abnormality, increasing the risk of atherosclerosis and cardiovascular events. Excessive intake of refined carbohydrates and sugary beverages leads to increased production of very-low-density lipoprotein (VLDL) in the liver, which subsequently raises triglyceride levels (Vancells Lujan et al., 2021). This metabolic disturbance promotes the formation of small, dense LDL particles, which are more atherogenic than larger LDL particles. These small particles can penetrate the arterial wall more easily and are more susceptible to oxidation, further promoting the development of atherosclerotic plaques. Therefore, dietary interventions aimed at reducing sugar intake and increasing the consumption of healthy fats and fiber are crucial for improving lipid profiles and reducing the risk of CVDs.

7. Case Studies and Epidemiological Evidence

Numerous epidemiological studies have highlighted the link between Western dietary patterns and increased cardiovascular risk. The Western diet, characterized by high consumption of red and processed meats, refined grains, sugary beverages, and high-fat dairy products, is associated with higher rates of obesity, hypertension, type 2 diabetes, and cardiovascular diseases. The high intake of saturated fats and trans fats in this diet elevates LDL cholesterol levels, promoting the development of atherosclerosis. Additionally, excessive consumption of refined sugars and sugary beverages leads to insulin resistance and chronic inflammation, which are pivotal in the pathogenesis of cardiovascular diseases. Large cohort studies, such as the Nurses' Health Study and the Health Professionals Follow-Up Study, have consistently shown that adherence to a Western dietary pattern is correlated with an increased incidence of myocardial infarction, stroke, and other cardiovascular events (Harbman, 2014). These findings underscore the detrimental impact of Western dietary habits on cardiovascular health.

In contrast, the Mediterranean diet, which emphasizes fruits, vegetables, whole grains, legumes, nuts, olive oil, and moderate consumption of fish and poultry, is associated with lower cardiovascular risk. Studies have shown that adherence to the Mediterranean diet improves lipid profiles, reduces inflammation, and decreases the incidence of cardiovascular events. This diet is rich in monounsaturated fats and omega-3 fatty acids, which have been shown to lower LDL cholesterol and triglyceride levels while raising HDL cholesterol. The high antioxidant content in fruits and vegetables helps mitigate oxidative stress, a significant factor in endothelial dysfunction and atherosclerosis. The study provided robust evidence that the Mediterranean diet significantly reduces the risk of major cardiovascular events among high-risk individuals (Billingsley and Carbone, 2018). This dietary pattern's beneficial effects on cardiovascular health highlight the importance of promoting traditional dietary habits that prioritize whole, minimally processed foods.

Research indicates that young adults are increasingly adopting dietary patterns that align with the Western diet, leading to a rise in cardiovascular risk factors such as obesity, hypertension, and dyslipidemia (Ruiz et al., 2019). The transition to independent living, busy schedules, and social influences contribute to poor dietary choices in this demographic. Fast food consumption, meal skipping, and the preference for sugary snacks and beverages are common among young adults, exacerbating the risk of developing early cardiovascular disease. Studies have shown that young adults who frequently consume fast food have higher BMI, elevated blood pressure, and adverse lipid profiles compared to their peers who follow healthier eating patterns. These poor dietary habits established during young adulthood can set the stage for long-term health complications.

Longitudinal studies have demonstrated the long-term impact of dietary habits established in young adulthood on cardiovascular health (Mikkila et al., 2004). Poor dietary choices during this stage can lead to the early onset of cardiovascular diseases and increased mortality in later life. For instance, the CARDIA study tracked participants over several decades and found that those who maintained healthier diets in young adulthood had significantly lower rates of coronary artery calcification in middle age, a predictor of future cardiovascular events (Kones, 2011). These studies underscore the importance of promoting healthy eating habits among young adults to improve long-term cardiovascular outcomes. Interventions aimed at establishing and maintaining healthy dietary patterns in this age group are crucial for reducing the burden of cardiovascular diseases in the future.

8. Public Health Implications

Improving nutritional education is paramount in combating the adverse effects of modern food styles on cardiovascular health. Schools, communities, and healthcare providers should emphasize the importance of balanced diets rich in whole foods, including fruits, vegetables, whole grains, lean proteins, and healthy fats. Educational programs should focus on developing skills for healthy eating, such as meal planning, reading food labels, and cooking at home. Implementing comprehensive nutritional education from an early age can instill lifelong healthy eating habits. Additionally, tailored educational interventions for young adults, addressing their unique lifestyle and dietary challenges, can be effective in promoting healthier choices.

Public health policies play a vital role in promoting healthier eating habits. Implementing regulations on food labeling, restricting the marketing of unhealthy foods to young people, and providing subsidies for fruits and vegetables can help shift dietary patterns towards more healthful choices. Policies aimed at reducing the consumption of sugary beverages, such as soda taxes, have been shown to decrease intake and improve health outcomes. For example, cities that have implemented sugary drink taxes have observed reductions in soda consumption and improvements in population-level health markers such as BMI and blood pressure. Furthermore, incentivizing the

production and distribution of healthier food options can make nutritious foods more accessible and affordable, particularly in underserved communities.

Community-based programs that offer support and resources for healthy eating can significantly impact dietary behaviors. Initiatives such as community gardens, cooking classes, and nutritional counseling can empower young adults to make informed food choices that support cardiovascular health. These programs can also address barriers to healthy eating, such as food insecurity and lack of access to fresh produce. For instance, community-supported agriculture (CSA) programs can provide fresh, locally-grown produce to urban areas, enhancing access to nutritious foods. Nutritional counseling and peer support groups can offer practical advice and motivation, helping individuals overcome challenges and sustain healthy dietary practices. Encouraging regular physical activity is also essential in reducing the risk of cardiovascular diseases. Combining dietary interventions with physical activity programs can provide a comprehensive approach to improving cardiovascular health in young adults. Community-based fitness programs, recreational sports, and active transportation initiatives can promote a physically active lifestyle. Studies have shown that regular physical activity improves cardiovascular health by enhancing endothelial function, lowering blood pressure, and reducing LDL cholesterol levels. By integrating physical activity promotion with nutritional education, public health initiatives can more effectively address the multifaceted nature of cardiovascular risk and foster a culture of holistic health among young adults.

9. Conclusion

The modern food style, characterized by increased consumption of processed, high-fat, and high-sugar foods, poses significant risks to cardiovascular health among young adults. Socioeconomic and cultural factors further influence dietary behaviors, contributing to health disparities. Addressing these issues through nutritional education, policy interventions, and community-based programs is crucial in promoting healthier eating habits and reducing the burden of cardiovascular diseases. By fostering a better understanding of the relationship between diet and cardiovascular health, we can empower young adults to make choices that support their long-term well-being.

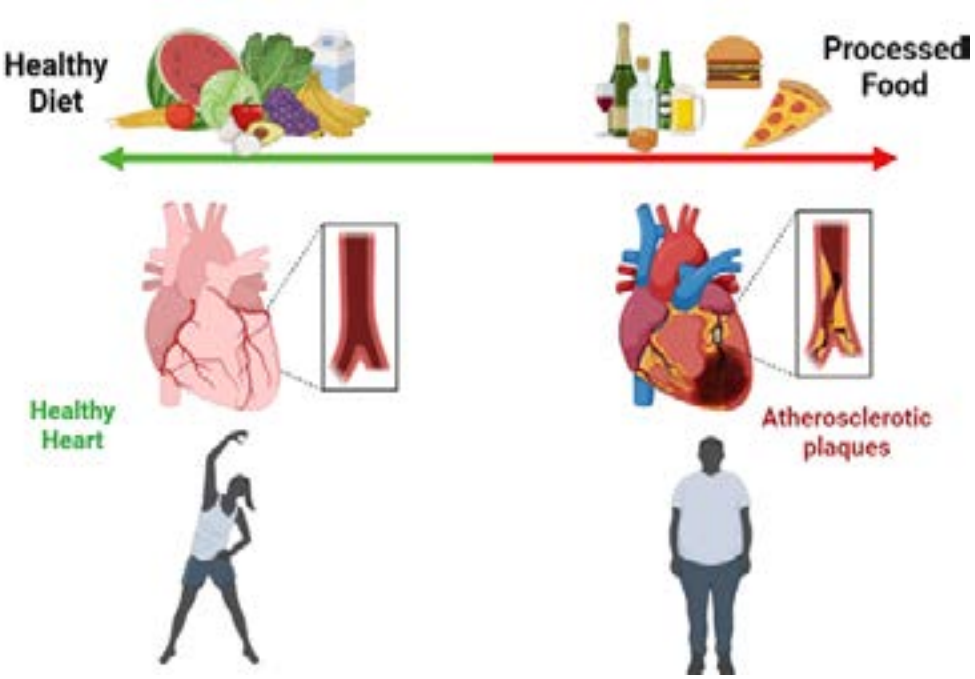

Figure 1: The diagrammatic representation of how the healthy and modern food style affects the cardiovascular health

Table 1: Comparsion between the processed and healthy foods for Cardiovascular benefits

Processed Food	Cardiovascular Health Risk	Heart-Healthy Alternative	Cardiovascular Benefits
Sugary Beverages	Obesity, Insulin Resistance	Water, Herbal Teas	Hydration without added sugars
Packaged Snacks	High in Saturated Fats	Fresh Fruits, Vegetables	Rich in fiber and antioxidants
Fast Foods	High Sodium, Trans Fats	Home-cooked Meals	Controlled sodium, healthy fats
Processed Meats	Nitrates, High Sodium	Lean Meats, Fish	Omega-3s, reduced risk of heart disease
Refined Grains	Blood Sugar Spikes	Whole Grains	Stable blood sugar levels, improved lipid profiles
Baked Goods (Cookies, Pastries)	Insulin Resistance, High Sugar	Nuts, Seeds, Whole Grain Snacks	Healthy fats, fiber, anti-inflammatory properties

Declarations

Ethics approval statement

No ethical approval was required for the current study as it did not deal with any human or animal samples.

Consent to participate

Not applicable

Consent to publish

Not applicable

Data Availability Statement

The data are available from the corresponding author upon reasonable request

Competing Interests

The authors declare that they have no conflict of interest

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Author contribution

N.P and N.A: investigation, formal analysis, writing original draft. M.A.S: conceptualization, writing original draft, and supervision.

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