

A Study on the Impact, Potential Benefits and Drawbacks of Popular Dietary Trends?

Akansha Naneria¹; Dr. Chaina Trivedi²

¹Student of Masters in Vocation M. VOC Nutrition and Dietetics DAVV DDUKK, Indore 452001

²Devi Ahliya Vishwavidyalaya, Indore, Madhya Pradesh
Under the Guidance of Dr. Chaina Trivedi²

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Abstract: Dietary trends have garnered considerable attention for their potential role in improving health and managing chronic conditions. This paper delves into the advantages and limitations of popular dietary approaches, emphasizing the renal diet. Designed for individuals with chronic kidney disease (CKD), renal diets prioritize controlled protein consumption, reduced sodium, and balanced potassium and phosphorus levels. These practices offer benefits such as slowed CKD progression, better management of metabolic acidosis, and improved bone mineral health. However, challenges like nutritional deficiencies, limited food options, and adherence difficulties remain significant. The review underscores the value of personalized dietary strategies and the necessity of further research to optimize health outcomes while addressing risks tied to dietary restrictions. A healthy eating pattern can reduce the risk of metabolic and cardiovascular diseases. Yet, dietary guidance for kidney transplant recipients is scarce and typically centers on single nutrients like sodium, potassium, and protein rather than holistic dietary patterns. Since individuals generally consume these nutrients as part of their overall diet, transplant patients may struggle to apply isolated dietary recommendations effectively. Moreover, single-nutrient strategies have shown inconclusive results, raising doubts about their ability to significantly affect transplant outcomes. Dietary trends, including plant-based diets, intermittent fasting, low-carb or keto diets, and juicing, have gained substantial media attention. This paper reviews the risks and benefits of these dietary practices for kidney transplant recipients while proposing updated nutritional guidance that incorporates current dietary trends. Evidence suggests that Mediterranean and DASH diets are particularly advantageous for post-transplant patients due to their emphasis on reducing meat and processed foods while increasing fresh and plant-based options. Renal diets and other popular dietary patterns offer notable health benefits, particularly for individuals with kidney conditions, though they also present challenges. A renal diet, typically low in sodium, phosphorus, potassium, and protein, can help mitigate kidney damage and enhance overall health, including cardiovascular health. However, its restrictive nature may lead to difficulties in meeting nutritional requirements.

➤ *Potential Benefits:*

- **Slowing Kidney Damage:** Reduces stress on kidneys, slowing disease progression.
- **Improved Cardiovascular Health:** Supports heart health, lowering the risk of heart disease associated with CKD.
- **Reduced Uremic Toxins:** Diets incorporating plant-based proteins may minimize uremic toxin production in impaired kidneys.
- **Delayed Dialysis:** Certain diets, such as plant-based ones, may postpone dialysis needs for some CKD patients.
- **Enhanced Nutritional Status:** Balanced diets paired with oral bicarbonate supplementation can benefit CKD patients' nutritional status.

➤ *Potential Drawbacks:*

- **Nutritional Deficiencies:** Restrictive diets may lead to deficiencies without careful planning and professional oversight.
- **Adherence Challenges:** Social settings and rigid dietary rules can hinder compliance.
- **Higher Costs:** Recommendations like organic or grass-fed products could increase food expenses.
- **Increased Kidney Workload:** High-protein diets, though beneficial for CKD patients, may strain healthy kidneys.
- **Metabolic Acidosis:** Diets heavy in animal proteins may exacerbate metabolic acidosis in advanced CKD cases.
- **Processed Food Consumption:** Ultra-processed foods, high in sodium, sugar, and unhealthy fats, can worsen CKD-related complications.

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I. INTRODUCTION

Kidney disease affects 1 in every 10 individuals, and kidney transplantation is the best treatment option for patients with advanced kidney disease. Despite many advances since the first kidney transplant, little progress in the improvement of long-term graft survival has been achieved. While many immunological and donor-related factors may affect the expected life of a kidney transplant, the diet and lifestyle of transplant recipients are clear drivers of comorbidities, including cardiovascular disease and diabetes. With that in mind and faced by many different media trends in diet recommendations for the general population, updated dietary information specifically for kidney transplant recipients is crucial. Current evidence-based guidelines recommend dietary interventions for kidney transplant recipients that target single nutrients, such as sodium, protein, phosphorus, and potassium. However, individuals do not typically consume these nutrients in isolation, but as part of a complete dietary pattern. Therefore, it is challenging for the average patient to understand and implement specific dietary recommendations, particularly when multiple restrictions are prescribed simultaneously, an individualized approach is not used, and emphasis is placed on what foods to avoid rather than what foods to consume. In addition, single-nutrient interventions have demonstrated largely inconclusive effects, and it seems improbable that a single nutrient or food could have a strong enough impact to substantially change graft failure rates. However, dietary patterns as a whole, such as plant-based diets, have been associated with improved outcomes for patients with kidney disease, and general healthy eating (consumption of variety of unprocessed foods that helps maintain or improve overall health) is also protective against many chronic diseases, including diabetes, obesity, and cardiovascular disease. (Laura G, Jennie.G, Leonardo.V et al 2021)

➤ Dietary Trends and their Impact on Kidney Transplant Recipients

Over the past decade, several dietary trends - claiming benefits like reduced cardiovascular risk, anti-inflammatory effects, and weight loss - have gained popularity, including plant-based diets, intermittent fasting, low-carb/keto diets, and juicing. Here, the risks and benefits of these diets in the context of kidney transplant patients are analyzed.

➤ Plant-Based Diets

Plant-based diets have gained widespread popularity, with healthcare professionals acknowledging their positive effects on overall health. For example, the Adventist Health study demonstrated that a plant-based dietary approach reduces all-cause mortality (hazard ratio 0.88; 95% confidence interval 0.80–0.97). These diets primarily consist of whole grains, fruits, vegetables, legumes, nuts, and seeds, with minimal or no inclusion of animal-based foods like meat, poultry, fish, eggs, and dairy. As a result, they contain lower levels of animal protein compared to typical Western diets.

Plant-based diets vary in their restrictiveness, with vegetarian and vegan diets excluding all meat-based products entirely.

Evidence suggests that plant-based dietary patterns positively influence kidney function compared to meat-heavy Western diets. High meat consumption is associated with albuminuria and the production of nitrogenous waste products requiring kidney excretion, whereas fruit and vegetable intake shows an inverse association with albuminuria. Among chronic kidney disease (CKD) patients, research highlights a correlation between unhealthy dietary patterns and an increased risk of all-cause mortality. On the other hand, diets emphasizing fish, fruits, and vegetables are linked to decreased mortality risk over time. In patients with an estimated glomerular filtration rate (eGFR) between 30 and 59 ml/min, plant-based diets may delay the progression to end-stage kidney disease (ESKD) and enhance survival prospects. A 24-year study of 14,686 adults revealed that higher adherence to healthy plant-based diets corresponds to a 14% reduction in CKD risk and slower eGFR decline, while lower adherence raises CKD risk by 11%.

Below is an assessment of the benefits and challenges associated with the leading plant-based dietary patterns for post-transplant patients, including Mediterranean, Dietary Approaches to Stop Hypertension (DASH), and vegetarian/vegan diets.

➤ Mediterranean Diet

The Mediterranean diet, originating from the coastal regions surrounding the Mediterranean Sea, emphasizes a high intake of virgin olive oil, vegetables, fruits, whole grains, fish, and low-fat dairy, along with moderate alcohol consumption (primarily wine) and minimal red meat consumption. Research indicates that adhering to this dietary pattern reduces the risk of diabetes, cardiovascular disease, and mortality. It also provides specific benefits by addressing inflammation, oxidative stress, endothelial dysfunction, acidosis, hyperlipidemia, hyperglycemia, and blood pressure levels. Studies across diverse populations, including kidney transplant recipients, highlight the association between a higher Mediterranean Diet Score and positive clinical outcomes such as improved kidney function. A 15-year multiethnic cohort study demonstrated that individuals with a score at or above the median had about 50% lower odds of developing low eGFR. This diet also promotes high intake of vegetables, fruits, whole grains, and low-fat dairy while limiting sodium and processed or red meat consumption. Rich in fiber and monounsaturated fats and low in saturated, trans, and total fats, the Mediterranean diet provides a comprehensive health-focused eating approach. However, sodium consumption remains a concern, particularly in the U.S., where average intake exceeds 3,400 milligrams per day, surpassing the 2,300-milligram guideline. High sodium intake is linked to hypertension and cardiovascular issues, and prior research has shown sodium's role in promoting acute rejection in experimental models.

➤ **DASH Diet**

The DASH (Dietary Approaches to Stop Hypertension) diet is recognized for its ability to significantly improve blood pressure (BP), total cholesterol, and low-density lipoprotein levels. In an 8-week controlled feeding clinical trial involving individuals with and without hypertension, the DASH diet reduced BP by 5.5 mm Hg systolic and 3.0 mm Hg diastolic, outperforming a regular diet or a diet primarily rich in fruits and vegetables. The DASH diet is widely regarded as the most effective dietary strategy for managing hypertension, a condition affecting 50% to 80% of adult kidney transplant recipients. Hypertension contributes to shorter allograft survival and increased cardiovascular morbidity and mortality. Consequently, the DASH diet serves as a valuable

intervention post-transplantation. In a prospective cohort study of 632 adult kidney transplant recipients, stronger adherence to the DASH diet correlated with a lower risk of kidney function decline (hazard ratio 0.95; $P = 0.008$) and all-cause mortality (hazard ratio 0.95; $P = 0.01$). Similar benefits on kidney health have been observed in other studies, likely driven by improvements in serum lipids, BP regulation, insulin resistance, inflammation, oxidative stress, arterial stiffness, and endothelial function. Conclusively, the DASH diet offers an evidence-based approach to reducing sodium intake while supporting overall healthy eating habits. Though low-sodium diets are already recommended for kidney transplant recipients, the DASH diet broadens this framework to encompass a holistic, healthful dietary pattern.

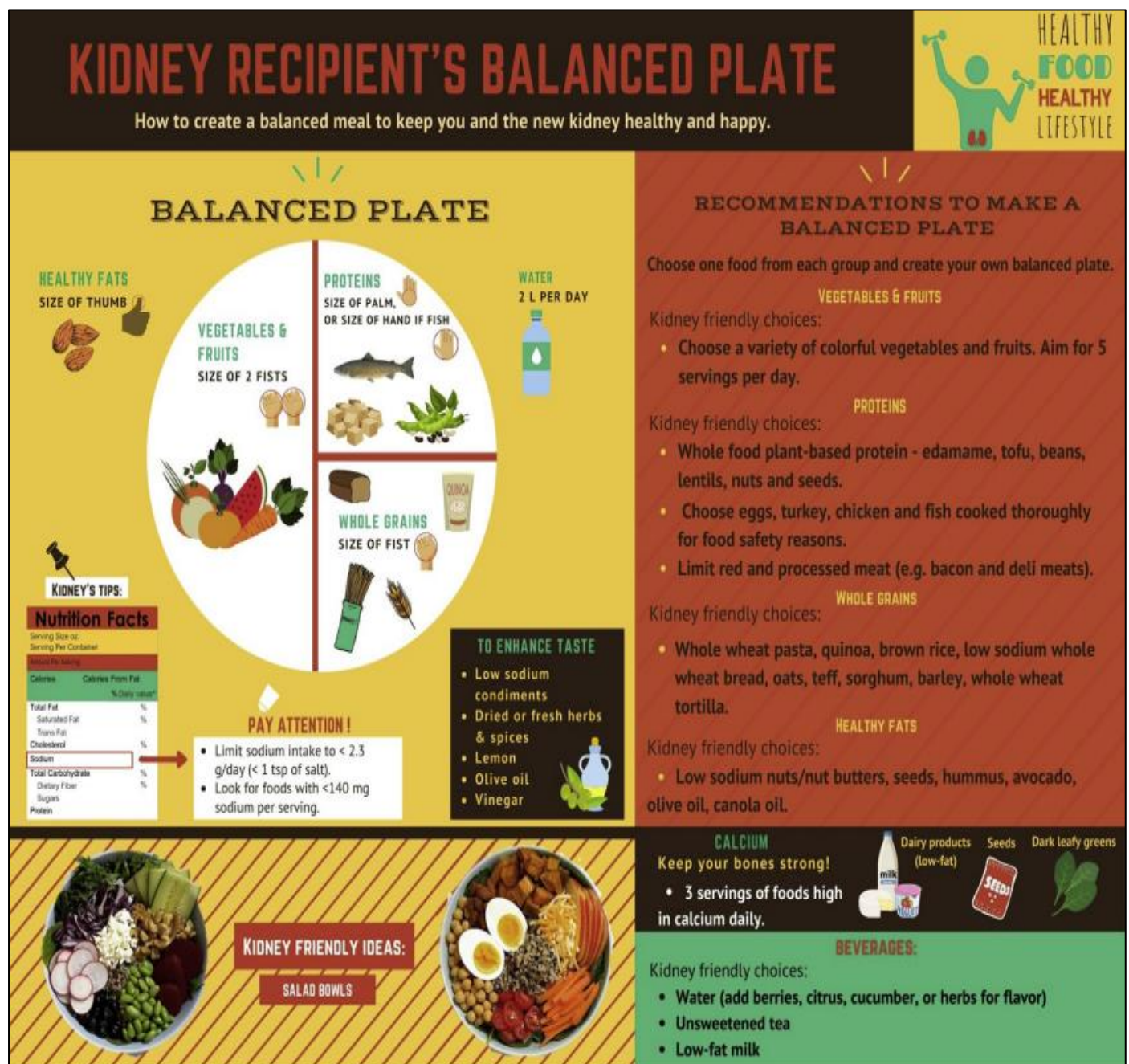


Fig 1 Kidney recipient's balanced plate. Illustration depicting recommendations and balanced plate visuals for kidney transplant recipients. **Goldfarb Cyrino et al.** Dietary Trends and Kidney Transplantation 1766 Kidney International Reports (2021) 1764–1774 Comparison of the Mediterranean and DASH diet is shown on this research.

➤ *Vegetarian/Vegan Diets*

Vegetarian diets have been practiced for thousands of years due to religious, cultural, and ethical beliefs but are now gaining popularity for their health benefits, including disease prevention and treatment. Evidence increasingly shows that reducing or eliminating meat consumption can delay the progression of kidney disease. Studies conducted worldwide have highlighted how vegetarian diets can slow kidney failure progression without compromising clinical or nutritional status. For instance, in a cohort of 63,257 Chinese adults, red meat consumption was strongly linked to an increased risk of end-stage kidney disease (ESKD) in a dose-dependent manner. Individuals in the highest quartile of red meat intake (approximately 48.8 g/day) had a 40% higher risk of developing ESKD compared to those in the lowest quartile (around 12.5 g/day), even after accounting for various factors. Additionally, red and processed meats were identified as risk factors for chronic kidney disease (CKD) in a 23-year follow-up study, while nuts, low-fat dairy, and legumes showed protective effects. In a controlled trial, elderly patients with uremia and low estimated glomerular filtration rates (eGFR of 5–7 ml/min) who followed a vegan diet supplemented with keto-analogues experienced delayed dialysis initiation after one year. Similarly, an observational study involving 14,866 National Health and Nutrition Examination Survey participants found that higher plant protein intake correlated with lower mortality in individuals with reduced eGFR.

➤ *Protein Intake: Plant-Based Versus Animal Protein*

The role of protein intake in kidney health, particularly in CKD patients, remains a debated topic. Most research suggests that vegetarian diets offer better protein quality while reducing overall protein intake. For individuals with CKD or kidney-related risk factors, consuming high-protein foods can dilate afferent arterioles, increasing the glomerular filtration rate but also elevating intraglomerular pressure. Chronic glomerular hyperfiltration can lead to adverse outcomes, including kidney damage and reduced long-term survival, especially in kidney transplant recipients who have fewer nephrons and CKD-related risks. Hyperfiltration triggers mesangial cell signaling, which contributes to fibrosis and kidney damage. On the other hand, lower dietary protein intake constricts afferent arterioles, mitigating glomerular damage and potentially stabilizing or improving kidney function. Studies demonstrate that patients following low-protein diets started dialysis 24 months later than those on unrestricted diets. A Cochrane review concluded that low-protein diets delayed CKD progression and dialysis initiation in non-diabetic adults. In a community-based cohort of 9,226 individuals, high protein intake was associated with faster kidney function decline, and a separate Nurses' Health Study involving 3,348 women linked higher consumption of animal fats (e.g., two or more weekly servings of red meat) with increased microalbuminuria risk.

The collective findings emphasize the significance of a low-protein diet for CKD patients to prevent disease progression and delay the need for renal replacement therapy. Mechanisms include reduced production of nitrogenous waste compounds (uremic toxins) and a lower acid load, contributing to better kidney health and function.

As the modern Western-type diet is deficient in fruits and vegetables with excessive amounts of animal foods, there is increased production of ammonia and acidogenesis leading to the loss of bone and muscle mass. A vegan dietary pattern high in fruits and vegetables Favors alkalization, which improves the metabolic **parameters Goldfarb Cyrino et al.: Dietary Trends and Kidney Transplantation International Reports (2021)** 1767 of acidosis, preserving bone and muscle, and slowing the glomerular filtration rate decline.⁴¹ There are potentially favourable impacts of a vegetarian diet on minerals, such as phosphorus, potassium, and sodium control. Minerals, increasingly being used as food additives in processed, frozen, or packaged foods, were shown to contribute to dietary phosphorus and potassium loads in patients with CKD.

Meat, poultry, and fish products are high in minerals, but detailed dietary information is often inaccessible to consumers. Post-transplant patients typically transition from hyperphosphatemia to hypophosphatemia; however, elevated phosphate levels in cases of graft dysfunction are linked to an increased risk of graft loss and mortality. Phosphorus derived from plants is less bioavailable than that from animal sources. A crossover feeding trial in CKD patients comparing vegetarian and meat-based diets demonstrated that protein sources significantly affect phosphorus balance. Participants on vegetarian diets exhibited lower serum phosphorus levels, reduced 24-hour urinary phosphorus excretion, and decreased FGF23 levels, despite equivalent protein and phosphorus intake in both groups.

Potassium restrictions are generally unnecessary for most post-transplant patients unless hyperkalaemia arises due to calcineurin inhibitors. In such cases, patients are advised to limit high-potassium plant-based foods such as beans, seeds, nuts, and certain fruits and vegetables. Although plants naturally contain high potassium levels, their consumption promotes alkalinizing effects through intracellular potassium redistribution and fecal excretion due to natural fiber content. Research on dietary potassium in dialysis patients has indicated that potassium from different sources is not therapeutically equivalent, with plant potassium posing less risk of hyperkalaemia compared to animal potassium. Fruits and vegetables generally offer more benefits than risks in regulating potassium, whereas meat and processed foods contribute to harmful metabolic conditions, such as oxidative stress, inflammation, metabolic acidosis, dyslipidaemia, constipation, and hypertension.

Simplified dietary recommendations should encourage a balanced intake of vegetables, fruits, grains, and reduced consumption of meat and processed foods, aligning with a healthy eating pattern. Plant-based diets offer additional benefits due to their high fiber content, which is essential for maintaining gut microbiota health. Among CKD patients, fiber-rich diets have been shown to lower the risks of obesity, diabetes, dyslipidaemia, and the production of uremic toxins. Increased dietary fiber intake also helps reduce inflammation, as evidenced by studies in haemodialysis patients where fiber consumption lowered C-reactive protein levels and oxidative stress, potentially benefiting graft survival. Despite

recommendations for a daily fiber intake of 25–35 g, many Americans only consume about half that amount, a shortfall that plant-based diets can help address.

Vegetarian diets may present potential challenges, including reduced intake of vitamin B12, absence of heme iron, and lower iron bioavailability. Eggs and dairy products are the primary natural sources of vitamin B12 in vegetarian diets, and although total iron content in vegetarian diets is similar to non-vegetarian ones, the bioavailability is significantly lower. For patients with anaemia or those at risk of developing it, regular monitoring of haemoglobin and iron levels—at least twice a year—is recommended, and supplementation with B12 or iron should be considered as necessary. While most studies on vegetarian diets focus on CKD patients, limited research exists for kidney transplant recipients. Nevertheless, a carefully planned vegetarian diet can address nutritional needs and support health management in the post-transplant population, even in the absence of extensive specific studies.

➤ *Intermittent Fasting (IF)*

Intermittent fasting (IF) is becoming a widely adopted eating pattern, often recommended by doctors to manage obesity and metabolic disorders. This dietary approach focuses on meal timing, alternating between fasting and eating periods, rather than specific food choices. Popular methods include the 16/8 method, which involves fasting for 16 hours and eating during an 8-hour window each day, and the 5:2 diet, which entails five days of a normal diet followed by two days of restricted calorie intake, typically less than 500 kcal. The primary goal of IF is to allow the body to utilize stored energy by burning excess fat. During fasting, glucose stores are depleted, and triglycerides are converted into fatty acids and glycerol, which are further transformed into ketone bodies. These ketones not only serve as an energy source but also play a role in cellular signaling, potentially offering benefits beyond weight loss.

Research has shown a positive association between IF and improvements in weight loss, body fat, insulin resistance, ectopic and visceral fat stores, adipocyte size, and metabolic flexibility, with no evident harm. Animal studies reveal that IF can prevent metabolic diseases, even under adverse conditions such as high-fat diets or disrupted metabolic functions like those caused by a lack of a circadian clock. For instance, while high-fat diets typically lead to increased serum glucose, cholesterol, triglycerides, leptin levels, and insulin resistance, IF counteracted these effects, preventing metabolic dysfunction. Additionally, proinflammatory cytokines like tumor necrosis factor- α were reduced alongside decreases in adipose tissue.

Human studies have reported lower rates of diabetes and obesity in populations with IF-like dietary patterns, such as the inhabitants of Okinawa. Prediabetic and type 2 diabetic patients also demonstrated improved insulin sensitivity when fasting three times per week. IF likely remodels adipose tissue, aiding in the management of comorbidities linked to excess body fat. This is particularly relevant for transplant recipients, where glucose homeostasis is disrupted in over

75% of cases. With a high prevalence of metabolic diseases and rejection episodes in kidney transplant recipients, IF could potentially be a valuable intervention.

However, there is no substantial evidence-based research on IF in kidney transplant recipients. Key factors such as protein intake, nutritional status, and muscle mass are critical to consider during the transition from end-stage kidney disease (ESKD) to the post-transplant phase, where protein needs can reach up to 1.2 g/kg. No studies have yet assessed the impact of excessive protein breakdown during fasting or excessive protein intake during eating periods on kidney function. Additionally, IF is contraindicated for individuals with genetic metabolic disorders like carnitine deficiency or porphyria and for those prone to electrolyte imbalances, such as hypomagnesemia or hypophosphatemia.

Preliminary insights from studies on kidney transplant patients observing Ramadan fasting, which involves refraining from food and drink for 8–12 hours daily over 30 days, have shown promising results. These studies found no significant changes in serum creatinine, mean arterial pressure, urinary protein excretion, or eGFR during, before, or six months after Ramadan, regardless of baseline eGFR levels. Based on this, IF might not pose major risks for kidney transplant recipients. However, most human studies in this area are small-scale or case studies with short treatment durations, suggesting that the observed benefits may only be temporary and not indicative of long-term effects. Therefore, more extensive research is necessary to evaluate the safety and effectiveness of IF in kidney transplant recipients. Currently, IF is not recommended as a first-line intervention for this population.

➤ *Low-Carb Diets*

Low-carb diets, characterized by reduced carbohydrate intake and typically higher protein and fat consumption, include popular examples like the Paleo, South Beach, and Atkins diets. Among these, the Ketogenic Diet (KD) has gained significant attention in recent years.

➤ *Ketogenic Diet*

The KD normally consists of at least 70% of calories derived from fat, and less than 10% and 20% from carbs and protein, respectively. This composition is drastically different from the 2015 to 2020 US Department of Agriculture dietary recommendations of approximately 45% to 65% calories from carbohydrates, 20% to 35% from fat, and 10% to 35% from protein.

The idea of a low-carbohydrate intake is to promote a ketosis state, in which the body primarily uses fat instead of carbohydrates to produce energy. To achieve this state, an adult needs to restrict net carbohydrate intake to as low as 20 g per day, promoting the conversion of fats into ketones. KD is an established treatment option for reducing the frequency of seizures in children with epilepsy.⁶⁷ Until now, the available literature about KD has been controversial, but the positive effects may be associated with improvements in cardiovascular risk factors, such as obesity, type 2 diabetes, and high-density lipoprotein cholesterol levels.

Studies analysing KD's effect in animals of polycystic kidney disease reported a reduction in cystogenesis and cyst expansion. Ketosis strongly inhibits not only kidney cyst growth, but also inflammation and fibrosis.⁶⁹ This beneficial effect is probably mediated by the fact that during a period of energy restriction, to conserve energy and molecular resources, cells adopt a stress-resistance mode that controls many processes, including protein synthesis and inhibition of the mammalian target of rapamycin pathway, leading to lower cell proliferation and fibrosis.⁶⁹ However, these studies were in animal models and have not been translated yet to humans with polycystic kidney disease. **L Goldfarb Cyrino et al.: Dietary Trends and Kidney Transplantation of Kidney International Reports (2021)** In 1687 overweight and obese individuals with CKD, KD showed a positive effect on kidney function with greater increase in eGFR in the low carbohydrate diet group when compared with a regular diet group.⁷⁰ Another feeding trial in overweight/obese adults showed that a reduction in the glycaemic index increases eGFR ($P < 0.001$).⁷¹ Compared with the high glycaemic index/high carb diet, reducing glycaemic index, % carbohydrates, or both, increased eGFR by 1.9 ml/min per 1.73 m² (95% confidence interval: 1.1–2.7; $P < 0.001$), 3.0 ml/min per 1.73 m² (1.9–4.0; $P < 0.001$), and 4.5 ml/min per 1.73 m² (3.5–5.4; $P < 0.001$), respectively.

Furthermore, reducing the percentage of carbohydrate intake by increasing calories from protein and fat, also increased eGFR. However, the same study highlights that replacing carbohydrates with protein can increase eGFR in the short-term and worsen kidney disease progression later. In another cohort with risk factors of kidney disease, composed of obese adults with type 2 diabetes mellitus, consumption of a low-carb and high-protein diet did not show adverse clinical effects on markers of renal function.

Thus, more research is needed to conclude if the KD benefits kidney function, and caution is required in the posttransplant population, as a higher protein intake can worsen kidney function in the long-term. Side effects of KD also exist, such as non-alcoholic fatty liver disease, insulin resistance, and even increased mortality. This diet demonstrates to be useful for the rapid induction of short-term weight loss. However, after 1 year, the KD's effects became similar to other dietary approaches, such as the Mediterranean diet, which has more scientific evidence. In addition, in cultures in which carbohydrates contribute the highest amount of energy intake, it might be difficult for patients to follow this diet long-term. Prolonged compliance to KD might be associated with several limiting factors, such as high cost of foods and monotony of dietary plan, as well as physical symptoms such as halitosis and constipation.

Moreover, increasing evidence shows that the quantity of carbohydrate intake is as important as quality. The consumption of high-quality carbohydrates (high fiber, slowly digested, and whole grains) was found to be more beneficial for cardiovascular and metabolic health outcomes than the KD, especially when the KD is composed of animal-based foods and processed fats, which are notoriously unhealthy. In the posttransplant context, a quality

carbohydrate food choice is beneficial to combat common comorbidities, such as the incidence of posttransplant diabetes⁷⁹ and obesity, and to reduce the side effects of immunosuppressive medications.

In conclusion, we recommend a diet more focused on high-quality carb intake (e.g., sweet potatoes, brown rice, beetroots, oats, quinoa, bananas) instead of restricting carbohydrate intake.

➤ *Juicing Diets*

Juicing diets, often referred to as juice fasts, cleanses, or detoxes, are increasingly popular for rapid weight loss. These diets involve the exclusive consumption of various juiced fruits and vegetables over a limited period, typically with a low-calorie intake. Fruits and vegetables provide numerous health benefits, including antioxidation and immunomodulation, and are rich in fermentable fiber with prebiotic activity, which supports the growth of probiotics in the gut. They have been shown to positively impact microbiota regulation, cardiovascular health, cancer prevention, obesity management, and even transplant tolerance. Yet, only 10% of adults in the United States meet the recommended daily intake of fruits and vegetables, which is approximately 1.5–2.0 cups of fruits and 2.0–3.0 cups of vegetables.

A study investigating a three-day vegetable and fruit juice diet found it resulted in weight reduction, decreased lipid peroxidation, and increased nitric oxide levels, likely benefiting cardiovascular health. This dietary pattern also caused significant shifts in the intestinal microbiota, including a reduction in Firmicutes (linked to obesity and immune dysregulation) and an increase in Bacteroidetes, which are associated with improved cardiovascular health, reduced obesity, and inflammation regulation—factors that may support transplant outcomes.

Despite the potential benefits, caution is advised as fruits and vegetables contain oxalates, which can act as nephrotoxins and lead to oxalate nephropathy. Juicing also carries risks such as hyperkalemia, excessive vitamin C and vitamin K intake, and complications for individuals on blood thinners like warfarin, since high vitamin K consumption may increase clotting. Certain fruits, such as grapefruit, should be avoided by post-transplant patients due to their interaction with immunosuppressive drugs. Food safety is another concern for immunosuppressed individuals, and it is recommended that juices be pasteurized if not prepared at home. Additionally, cold-pressed juices lack fiber, potentially causing constipation, and it remains unclear whether juicing is superior to consuming whole fruits and vegetables.

For populations with inadequate fruit and vegetable consumption, juicing can offer a convenient way to increase intake and meet dietary recommendations. This diet can provide short-term benefits such as weight loss and microbiota balance, potentially improving inflammatory regulation and transplant outcomes. Juicing may be a practical option for patients who dislike eating fruits and vegetables, offering essential nutrients that would otherwise

be missed. Alternatively, incorporating balanced smoothies made from a mix of fruits and vegetables as part of meals or snacks is suggested. If a juicing diet is pursued, it should be limited to a short duration.

The scientific rationale underpinning what is a healthy and sustainable diet is universal. Everyone shares a physiological need for energy and adequate amounts, types and combinations of nutrients. People source their energy and nutrient needs from foods that are themselves sourced from food systems. The physiological need and food systems' sustainability have been shaped through evolutionary and ecological processes, respectively. This physiological need

can be met, and food systems' sustainability protected, by following three interlinked dietary principles:

- Variety – to help achieve a nutritionally adequate diet and help protect the biodiversity of food systems.
- Balance – to help reduce risk of diet-related non-communicable diseases and excessive use of finite environmental resources and production of greenhouse gas emissions.
- Moderation – to help achieve a healthy body weight and avoid wasting finite environmental resources used in providing food surplus to nutritional requirements. (Hargreaves et al., 2022)



Fig 2 A Healthy and Sustainable Diet for People to Follow

II. LITERATURE REVIEW

According to (Castro-Barquero et al., 2020) Although many observers may consider such diets fashionable, a plethora of scientific literature pointing towards their efficacy in weight loss, together with the improvement of metabolic syndrome markers, including blood glucose levels and insulin resistance, is rather convincing. However, various scientists are discussing the use of these vehicles for an extended duration and the potential risks associated with them, such as depletion of essential nutrients or noticeable signs in cholesterol levels.

According to (O'Neill & Raggi, 2020) Correct supplementation of these nutrients by way of inclusion of fortified foods or supplements is important, but many people may not be able to reach this level of supplementation. Similarly, diets such as keto and low-carb, which limit daily carbohydrate intake to less than 50 grams, may also limit fiber, vitamins, and minerals found in fruits, vegetables, and whole grains. Consuming large amounts of specific nutrients, such as fat in keto diets, increases the risk of cholesterol level problems and even cardiovascular issues.

According to (Magkos et al., 2020) Today's popular trends, such as low-carb diets and ketogenic diets, may have some benefits for weight loss and blood sugar regulation in the short run, but their long-term impact on the prevalence of lifestyle diseases is unknown. Overall plant-based dietary patterns are associated with lower risks of chronic diseases, according to observational cross-sectional evidence. However, it's important to understand that not all plant-based diets are necessarily healthy, as poorly planned plant-based diets may offer minimal protection from disease NAAR, September 2024, Volume 7, Issue 8, 20- 35 23 of 35

According to (Arbour et al., 2021) New nutritional and eating habits are pictures of changes/shifts in the science, technology, and culture of societies in relation to the effects of eating patterns on human health. Of these, plant-based diets, keto and low-carb diets, IF, PN, and FF/S have attracted a significant amount of interest.

According to (Silva et al., 2021) Current and new trends in nutrition and diets pose both a threat and a challenge to the public's health, so they deserve attention. However, these trends create problems, including those arising from nutrient composition, shifts in disease frequency, behavioural and psychological impacts, inequalities in adherence, and the emergence of myths.

According to (Alcorta et al., 2021) Contemporary issues arise from dietary practice mutations, resulting in deficiencies as well as nutritional surpluses. While consuming plant-based products offers numerous benefits, it also carries certain drawbacks and health risks, such as vitamin B12 deficiency, iron deficiency, and omega-3 fatty acid deficiency, compared to consuming animal products.

According to (Frank et al., 2021) Epidemiological observation of disease trends should in turn inform changes

in diets, lest the current patterns foster diseases of priority concern. Behavioural and psychological factors are just as crucial to the public health issue as clinical aspects. Dietary trends influence eating patterns, potentially leading to unhealthy eating habits such as overly restrictive diets or the opposite, binge eating. Although intense intermittent fasting can be useful for some individuals in relation to food choice, it may create adverse attitudes toward food for other people and cause disordered eating behaviours.

According to (Wared, 2022) Such programs as the Food Industry Initiative to Reduce Salt and Sugar in Processed Foods show that synergies between the industry and the government help to promote improvements in manufactured foods. The role of NGOs in public health advocacy is significant. NGOs play several roles in public health and include policy advocacy, research, and community programs. NGOs also serve as intermediaries between the public, governments, and other individuals, aiding in the development of policies and understanding the realities on the ground. For instance, those organizations that deal with food security and nutrition education must ensure that adequate and quality food is available for those disadvantaged populations.

According to (Hobbs & Roosen, 2022) Incorporating up-to-date information on emerging scientific trends into patient care allows for the provision of useful recommendations and advice based on recent discoveries. Another important consumer target that plays a major role in establishing dietary trends is the food industry, which includes product processing, marketing, and labelling. Engaging the food industry to promote healthier cooking practices, such as reducing sugar and undesirable fats in sold food, can significantly align food options with health improvement goals.

According to (Zarzo et al., 2023) Food delivery services must consistently address the issue of dietary fats and misinformation. Social networking and the internet have contributed to an increase in dietary fats and non-evidenced health information. Hypo-realistic trends, such as detox diets, miracle supplements, and extreme eating habits like consuming a lot of meat and avoiding carbs, vegetable fats, or chemicals, frequently lack real-world evidence and can deceive people. Such incorrect information may lead to wrong eating habits, spending money on non-relevant products, and other health complications. There is a need to confront misinformation with scientific advice to enhance the public's understanding and encourage the systematic assessment of food-related information.

According to (Viroli, Kalmpourtzidou & Cena, 2023) Inequalities in the utilization of these diets and compliance with these trends demonstrate important healthcare concerns. Access to the resources required for the adoption or sustenance of certain eating patterns is not equal for everyone. Organic and fresh foods are often cheaper and less available in low-income areas, meaning some groups get to enjoy the health implications more than others.

According to (Forouhi, 2023) This phenomenon has also influenced the prevalence and distribution of diseases, making it a significant factor to consider. Consumption of foods rich in sugars and fats has been associated with new incidences of obesity, type 2 diabetes, and cardiovascular diseases.

According to Saidaiah et al. (2024) The literature review also demonstrates that individuals who incorporate plant foods into their diets typically lead longer, healthier lives and maintain their true weight. However, it is not without some issues, including B12, iron, and omega-3 fatty acids, which are richer in animal food products, as noted by Common diets and foods, such as keto and low-carb diets, are popular due to their numerous benefits, including aiding in weight loss and improving overall metabolic health. The keto diet involves significantly reducing carbohydrates while simultaneously increasing fat intake to induce ketosis, a state in which the body relies more on fats for energy than glucose.

According to (Shukla & Shrivastava, 2024) Functional foods and supplements emphasize the food or product's ability to provide extra health benefits. Some functional foods have vitamins, minerals, or bioactive compounds added to them, such as probiotic yogurt or eggs with omega-3 fatty acids. These products, containing vitamins and herbal extracts, aid in the treatment or prevention of diseases or deficiencies.

III. METHODOLOGY OF STUDY

This study administers an online questionnaire to public health professionals to investigate public health responses to new nutrition and diet trends. The primary goal of this online survey is to evaluate public health practitioners' comprehension of various dietary trends, their effectiveness in addressing these trends, and the practical methods they employ.

➤ *The Present Work also Includes the Following Components:*

The process of survey construction involves formulating survey questions and organizing responses, identifying and recruiting participants, gathering data, and concluding with data analysis.

• *Survey Design Objective*

The survey aims to collect information from the representatives of public health regarding the new trends that are on the rise across the globe in terms of nutrition and diet; these include plant-based diets, keto and low-carb diets, intermittent fasting diets, personalized nutrition, and functional foods and supplements. This way, it seeks to be

central to assessing their attitudes towards health gains and threats connected with these trends, as well as their experiences in dealing with public health activities and measures in the context of these trends. The survey seeks to determine the proficiency of these professionals in addressing the challenges posed by these evolving dietary patterns, identifying the most effective solutions and necessary actions. The data gathered from the survey enables the exploration of the impact of these trends on the population's health, thereby guiding future actions and measures aimed at enhancing public health.

The questionnaire for this survey aims to capture the opinions of public health workers concerning fledgling nutrition trends and dietary patterns. To do this, it uses a variety of question types and covers several key areas. The survey used is a mixture of closed-ended and open-ended questions. Questions that employ multiple-choice options and Likert scale items are examples of closed-ended questions that collect quantitative data about the frequency, pattern, level of agreement, or concern with the responses of the participants. For instance, participants might be required to indicate the level of agreement with a set of statements concerning the efficacy of specific diets, such as strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. In contrast, open-ended questions elicit more elaborate qualitative information based on respondents' experience, barriers or facilitators, and often recommendations. This way, it is possible to get a much more detailed and diverse picture of their opinions and personal situations.

• *Survey Platform*

Google Forms, a reliable and user-friendly platform for data collection and analysis, administers the online survey. This reduces the complexity of the forms for respondents because the Google Forms interface is easy to navigate and compatible with many devices. It offers a variety of life cycle data collection choices by enabling the use of open, closed, and other types of questions (Agbali et al., 2023). Google Forms also makes data collection real-time/immediate and presents summary results automatically, making it easier to analyse the collected data. The survey ensures the confidentiality of participants' data through secure data transmission and limited access by authorized individuals. Furthermore, the integration of Google Forms with Google Sheets makes it quite easy to collect data and analyse it (Grzesik et al., 2022). Public health professionals could use Google Forms to assess responses due to its user-friendly nature, security, and analytical features.

- Target Population- 50

$$\text{Number of samples per group (n)} = \frac{2 \times (Z_{(1-\alpha/2)} + Z_{\beta})^2 \times \sigma^2}{\Delta^2}$$

Where Δ = size of difference, minimal effect of interest
 α = significance level (eg 0.05)
 β = power, probability of detecting a significant result (typically 80%, 90%)
 σ = SD of data
 Z_p = points on normal distribution to give required power and significance

Fig 3 Sample Size Formula

IV. RESULTS AND DISCUSSION

The survey on public health responses to emerging nutrition and diet trends sheds light on the extent of knowledge across various sectors and among professionals regarding these dietary strategies. The findings reveal a significant understanding of plant-based diets, keto and low-carb diets, intermittent fasting, and potentially personalized nutrition among public health staff. This diversity in knowledge highlights critical challenges for education, policy, and practice within public health. Among the 223 respondents, 22% were public health officials, 30% nutritionists, 25.1% dietitians, and 22.9% healthcare providers.

providers. The survey also reflects the variety of perspectives on diets contributed by individuals of different genders, age groups, ethnicities, and sexual orientations.

Professionals, particularly those who are self-employed, were distributed across sectors, with 13.1% in government agencies, 46.4% in non-governmental organizations (NGOs), 9% in private practice, and 31.5% in academic institutions. Notably, the higher representation of participants from NGOs and academic institutions compared to government agencies and private practice suggests that these professionals may have greater awareness of dietary trends and a better understanding of their potential evolution.

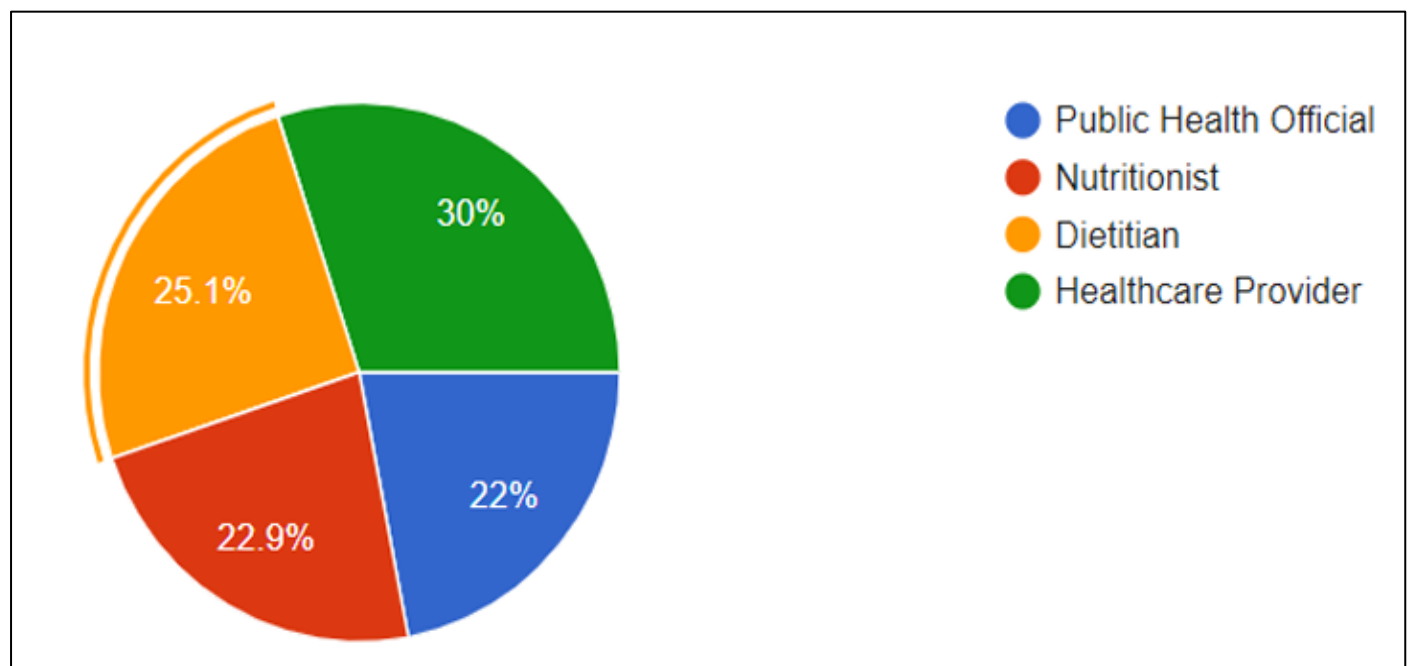


Fig 4 Pie Chart Telling us About providers in these 4 sectors.

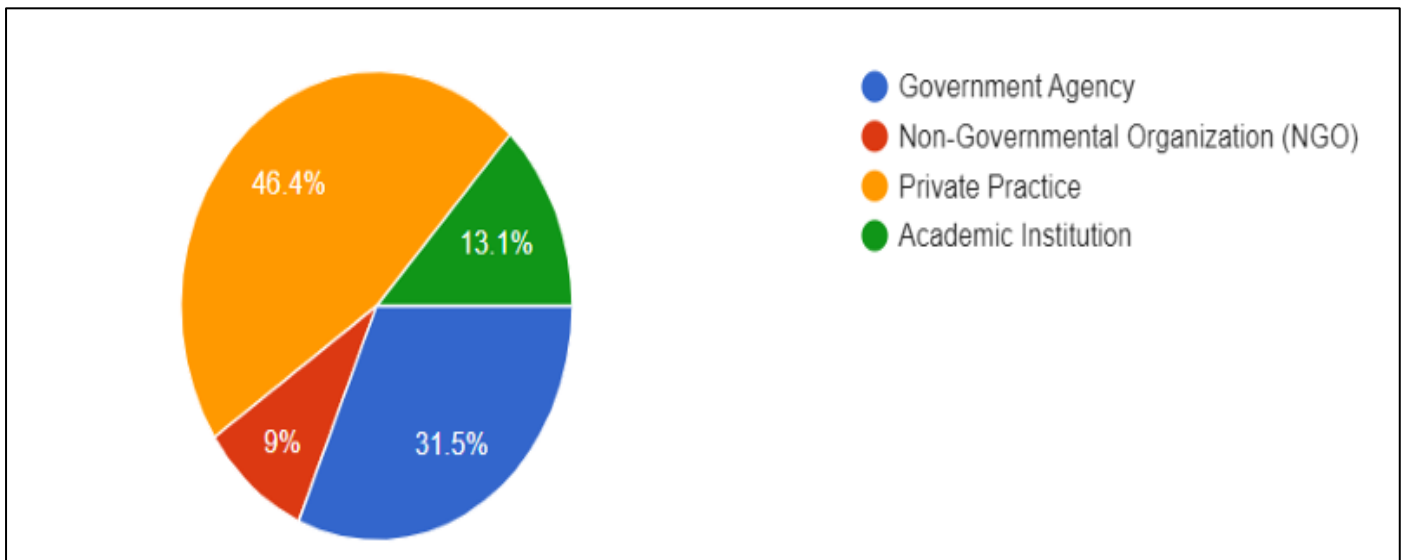


Fig 5 Pie Chart Telling us About Percentage of Awareness of Dietary Trends.

The survey data highlights patterns of awareness regarding plant-based diets. A significant portion of respondents, 46.8%, identified as "Not Very Familiar" with plant-based diets, whereas only 9.5% classified themselves as "Very Familiar," reflecting a notable lack of knowledge among the public health workforce. Plant-based diets, emphasizing fruits, vegetables, beans, and grains while minimizing meat and animal products, are often promoted for their societal and environmental benefits. Nevertheless, the characteristics of the respondents suggest a knowledge gap about these diets even among professionals, underscoring the need to raise awareness among health workers about plant-based diets as healthy, practical, and nutritionally sufficient options.

A similar trend is observed with keto and low-carb diets. Among the respondents, 47.3% reported being "Not Very Familiar" with these diets, while only 7% were "Very Familiar." Researchers have associated keto and low-carb

diets, which prioritize high fat, moderate protein, and very low carbohydrate intake, with benefits like weight loss and improved metabolic health. However, the high percentage of participants unfamiliar with these dietary approaches points to a need for greater understanding of their health effects and appropriate implementation in healthcare and community health settings.

Responses regarding intermittent fasting reveal a slightly different scenario. In this case, 45% of respondents indicated being "Not Familiar at All" with this eating technique, while 8% were familiar with it, and just 1% reported being "Very Familiar," as perceived by consumers. Intermittent fasting, recently recognized for its benefits on weight management and metabolic health, remains poorly understood, with 93% of working professionals unaware of this dietary approach. This highlights the urgent need to enhance professional knowledge and competency regarding intermittent fasting and its applications.

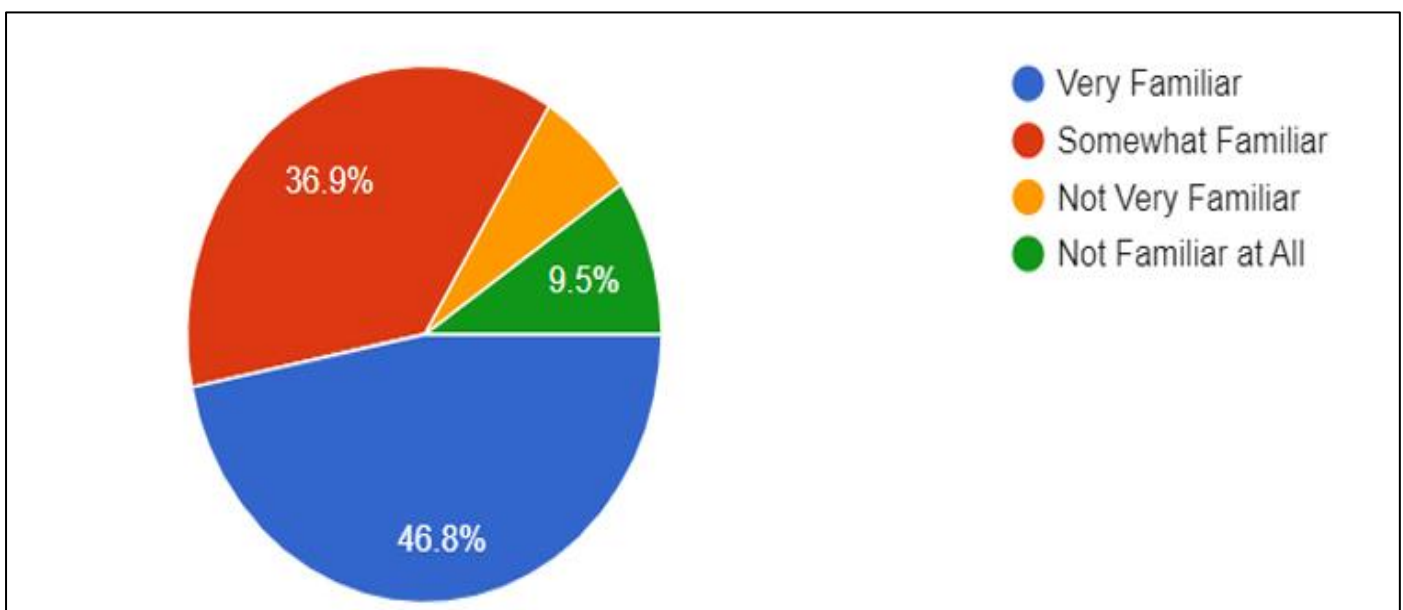


Fig 6 Pie Chart Telling Us About if People are Familiar with Different types of Diets.

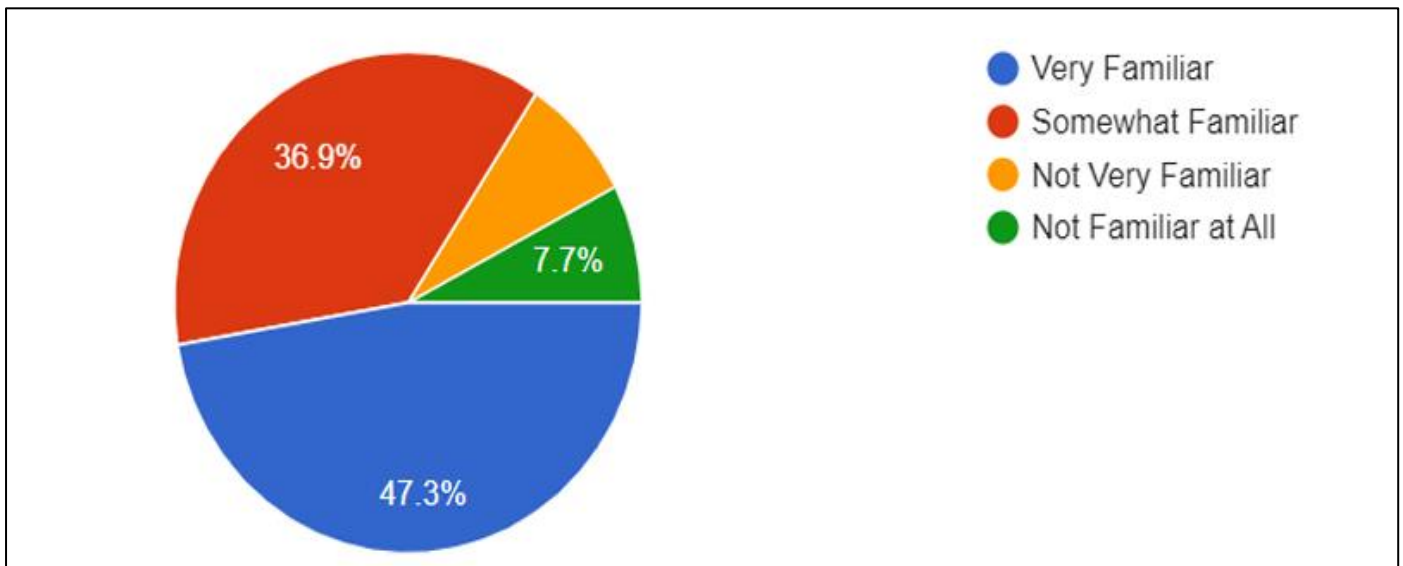


Fig 7 Pie Chart Telling us About Plant Based Diets.

One of the contemporary trends not addressed in the survey details is the concept of personalized nutrition, which involves tailoring dietary recommendations to individuals based on their genetic profile, lifestyle, and health conditions. This approach represents a significant advancement in dietary guidance, as it focuses on the specific factors influencing an individual's health. Exploring how public health professionals currently and prospectively apply personalized nutrition can provide insight into their engagement with recent publications and the trends and developments they encounter in the field.

The survey findings carry important implications for public health practice and policy. A substantial portion of respondents reported being "not very familiar" or "not familiar at all" with emerging dietary trends, reflecting poorly on the current state of education and training. Raising public awareness and offering clear dietary guidance require access to up-to-date and comprehensive knowledge of food choices. Considering the present level of awareness, it is essential to develop and implement professional development initiatives, workshops, and continuing education programs focused on the latest dietary trends, such as plant-based diets, keto and low-carb diets, intermittent fasting, and holistic nutrition.

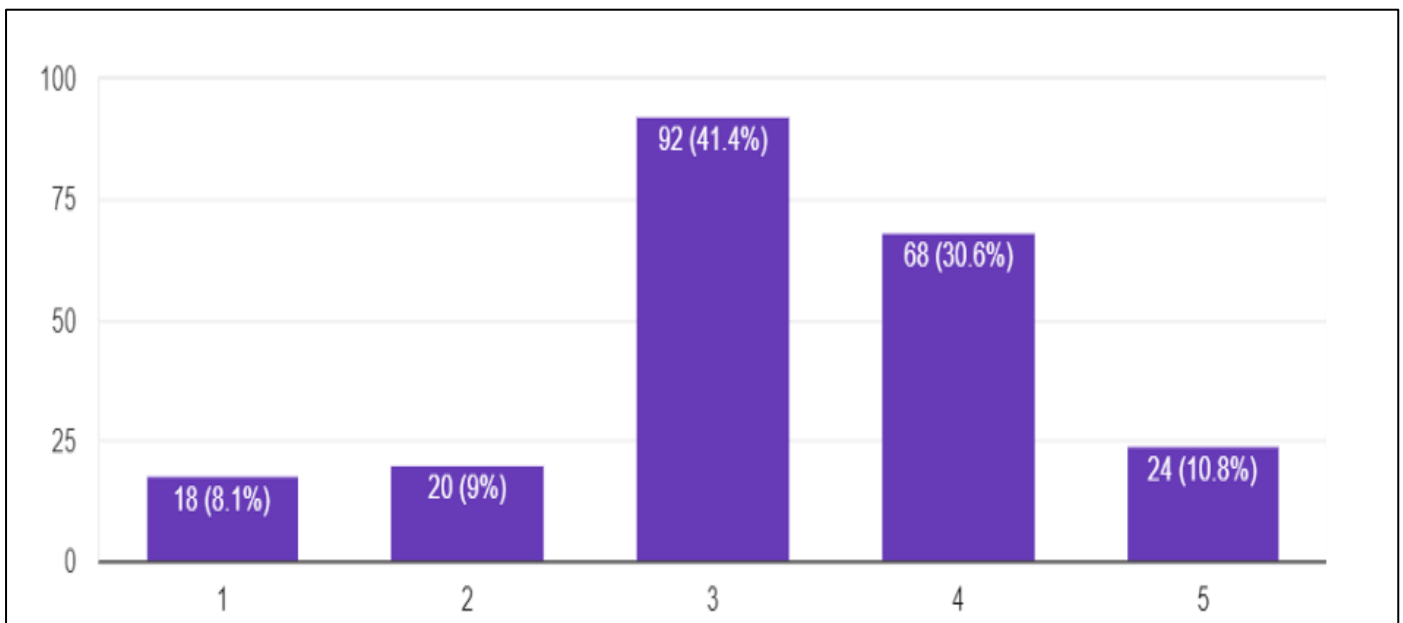


Fig 8 Bar Chart Telling us About Dietary Trends and Low Carb Diets in Percentage.

Second, the findings underscore the importance of interdisciplinary collaboration in addressing emerging dietary trends. Professionals in academic institutions and NGOs, who tend to have higher familiarity with these trends, can play a crucial role in advancing research and disseminating

knowledge. Collaboration between researchers, practitioners, and policymakers can facilitate the development of evidence-based guidelines and strategies that reflect the latest scientific understanding of dietary trends. For instance, academic institutions can partner with government agencies to create

public health policies that incorporate insights from recent research on dietary trends. Additionally, government agencies and public health officials, despite varying levels of familiarity, have a critical role in shaping public health policies and recommendations. To develop informed and effective public health interventions, these agencies should

leverage the expertise of professionals who are well-versed in emerging dietary trends. By integrating evidence from research and practice, public health policies can better align with current knowledge and address the evolving needs of the population.

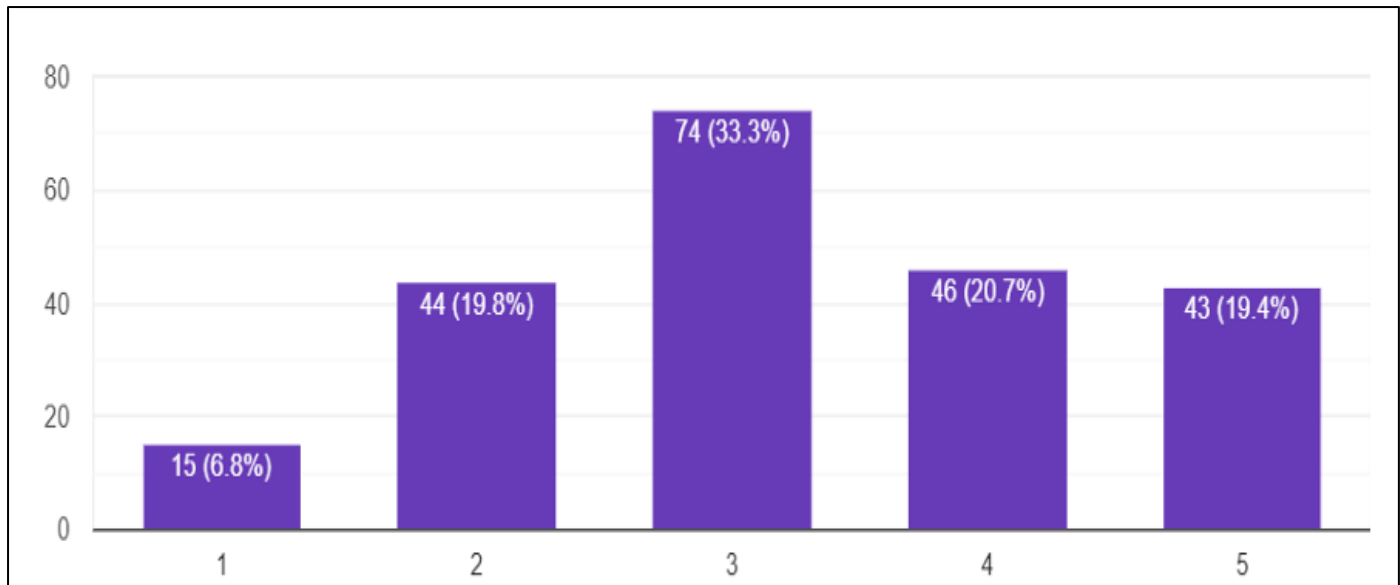


Fig 9 Bar Chart Telling us About Fast Food Eating in Different Diets.

The diversity of familiarity levels across different sectors highlights the need for tailored approaches to public health education and policy. For example, private practitioners, who often work directly with clients, may benefit from practical guidelines and tools for advising on emerging dietary trends. In contrast, government agencies might require policy briefs and research summaries to inform their work. NGOs, focusing on culturally relevant dietary practices or resource-limited settings, may require resources specifically tailored to their contexts. Addressing the knowledge gaps revealed by the survey requires a multifaceted approach. Professional development programs should be designed to provide comprehensive information on emerging dietary trends, with a focus on evidence-based practices. These programs could include workshops, webinars, and online courses tailored to the needs of different sectors. Public health organizations should also work to increase awareness and understanding of plant-based diets, keto and low-carb diets, intermittent fasting, and personalized nutrition through public health campaigns and educational materials.

V. CONCLUSION AND RECOMMENDATION

➤ Conclusion:

Examining public health responses and adaptations to emerging nutrition and dietary trends underscores the dynamic nature of nutrition science and its integration within the public health sector. Functional foods are reshaping the way consumers view health and nutrition, particularly in the context of contemporary diets such as plant-based diets, keto and low-carb diets, intermittent fasting, and personalized nutrition. These dietary trends have diverse implications for

health, ranging from individual to population-level effects. Increased awareness of ecological concerns and animal rights has contributed to the growing popularity of these health-focused diets. However, they also introduce challenges in ensuring adequate intake of essential nutrients, including vitamins and minerals predominantly found in animal-based foods.

While keto and low-carb diets offer benefits like weight loss and enhanced metabolism, they may result in nutrient deficiencies and long-term effects that require further research. Similarly, intermittent fasting has gained widespread attention as a strategy for weight management and metabolic improvements, though its suitability for certain populations and long-term sustainability remains uncertain. Personalized nutrition, which tailors dietary recommendations based on an individual's genetic and metabolic profile, is an innovative approach to dietary management but faces obstacles such as cost and practicality.

The public health sector actively seeks strategies to address these dietary trends, relying on current scientific evidence to develop solutions for the challenges people encounter when making food choices. To effectively navigate the future, public health initiatives must prioritize improved dietary guidance, targeted educational campaigns, and collaboration with various stakeholders to address nutrition in an evolving landscape. Public health professionals need to remain informed about these trends, enabling them to provide sound advice and tailored interventions for diverse populations, maximizing the benefits of these diets while mitigating potential drawbacks.

➤ *Recommendations*

To bridge the knowledge gaps identified in the survey, it is vital to develop and implement professional education programs focused on emerging dietary trends. These initiatives should provide an in-depth exploration of plant-based diets, keto and low-carb diets, intermittent fasting, and personalized nutrition. Workshops, webinars, and online courses can offer both theoretical insights and practical applications, with input from experts ensuring the content is evidence-based and aligned with current public health challenges. Given the diverse roles and sectors represented in the survey, interdisciplinary collaboration is essential. Academic institutions, NGOs, and government agencies should partner to integrate research findings into public health practice. Collaborative efforts could include joint research projects, policy formulation, and educational programs addressing the latest dietary trends. Such partnerships would ensure guidelines and recommendations are grounded in up-to-date scientific evidence and adapted to varied public health contexts.

To promote awareness and understanding of emerging dietary trends among public health professionals, targeted campaigns should be launched. These campaigns can share information on the advantages, risks, and practical considerations of plant-based diets, keto and low-carb diets, intermittent fasting, and personalized nutrition. Effective dissemination can be achieved through communication channels like social media platforms, professional journals, and industry conferences. Public health organizations should also prioritize the regular updating of dietary guidelines to reflect the latest trends and scientific progress. This process should involve not only revising existing guidelines based on new evidence but also creating new ones tailored to innovative dietary approaches. Staying current with scientific advancements will enable public health agencies to provide accurate and relevant recommendations to the public.

The transformative potential of personalized nutrition highlights the importance of further research in this area. Increased funding and support for studies on personalized nutrition's effectiveness and implementation are critical. Findings from such research can be translated into actionable strategies and incorporated into public health practices to better address individual dietary needs and preferences. By adopting these measures, public health professionals can deepen their understanding of emerging dietary trends, thereby improving the quality of dietary advice and interventions available to the public. Tackling the identified knowledge gaps while fostering ongoing education and collaboration will be central to advancing public health in a continually evolving field.

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