

Adaptability of the Mediterranean Diet to Indonesian Culinary Traditions for Reducing Noncommunicable Disease Risk

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ABSTRACT

Noncommunicable diseases (NCDs) remain a significant global public health concern, with a particularly high burden in Indonesia. The Mediterranean diet has been associated with a reduced risk of major chronic diseases and lower mortality rates. Despite its well-documented health benefits, adopting this dietary pattern in Indonesia can be challenging because of differences in food availability, affordability, culinary traditions, and dietary preferences. This literature review aims to assess the feasibility of adapting the Mediterranean diet in Indonesia while preserving its key nutritional principles.

This review synthesises evidence on the Mediterranean diet's health benefits and its potential cultural adaptation for Indonesia. A search of PubMed, Scopus, and Google Scholar was conducted through June 2026, focusing on systematic reviews, meta-analyses, RCTs, cohort studies, and clinical studies on Mediterranean interventions in non-Mediterranean and Asian populations.

Evidence from Asian populations suggests that Mediterranean-style diets may offer health benefits when key components such as plant foods, whole grains, legumes, fish, fibre-rich foods, and healthy fats are maintained. Adaptation should therefore involve locally available and culturally acceptable foods, taking into account their nutritional characteristics, rather than relying on simple one-to-one substitution. Long-term sustainability also depends on local food production, affordability, cultural acceptance, and environmental considerations. However, evidence specific to Indonesian populations remains limited, and further studies are needed to evaluate the feasibility, nutritional adequacy, and potential role of this approach in reducing the risk of NCDs.

Introduction

Non-communicable diseases (NCDs) remain one of the most significant global health challenges, accounting for approximately three-quarters of deaths worldwide [1]. In Indonesia, NCDs—including diabetes, stroke, heart disease, chronic lung disease, and cancer—contribute substantially to mortality and disability [2,3]. Unhealthy dietary patterns, physical inactivity, excess adiposity, tobacco exposure, and metabolic risk factors are among the major modifiable contributors to NCDs [2,4].

Dietary improvement and the promotion of physical activity are therefore important components of NCD prevention [3]. In recent decades, nutritional research has focused on dietary patterns rather than isolated nutrients, because foods are consumed in combinations that may have synergistic effects [2]. A study reported that the Mediterranean diet is the ideal diet for preventing NCDs and maintaining good health [5]. The Mediterranean diet is among the most widely studied dietary patterns and has been associated with lower cardiovascular and metabolic risk and reduced mortality [5–10].

Although the Mediterranean diet offers many health benefits, its adoption in non-Mediterranean countries, especially in Indonesia, presents practical challenges [11]. Food availability, affordability, cultural traditions, habitual staple foods, cooking methods, and local agricultural systems may all influence adherence [9,11,12]. To ensure long-term adherence to a modified Mediterranean diet, it is important to promote the consumption of locally grown foods, as Asian dietary habits are closely linked to local agricultural systems [13]. Studies from East and Southeast Asia suggest that Mediterranean-style diets can be adapted to local settings while retaining key features such as plant foods, fibre-rich carbohydrates, fish, and unsaturated fat [14–16].

This literature review therefore examines the feasibility of adapting the Mediterranean diet to Indonesian culinary traditions to prevent NCDs. Particular attention is given to whether locally available foods support the main nutritional features of the Mediterranean pattern. Since foods used for similar culinary purposes are not always nutritionally equivalent, the review considers differences in fat quality, protein sources, whole grains, and phytochemicals. It highlights areas needing further validation in Indonesian populations.

Methods

This narrative review synthesises evidence on the health impacts of the Mediterranean diet and explores its potential cultural adaptation to Indonesia. A literature search was conducted in PubMed, Scopus, and Google Scholar for articles published through June 2026. Search concepts included combinations of “Mediterranean diet”, “Mediterranean dietary pattern”, “Asian Mediterranean diet”, “Indo-Mediterranean diet”, “Indonesia”, “South-east Asia”, “East Asia”, “cardiovascular disease”, “diabetes”, “obesity”, “noncommunicable disease”, “dietary adaptation”, “local foods”, “food composition”, “sustainability”, and “cultural adaptation”.

Priority was given to systematic reviews and meta-analyses, randomised controlled trials, prospective cohort studies, and clinical studies evaluating Mediterranean-style interventions in non-Mediterranean and Asian populations. Studies addressing food composition, cultural acceptability, sustainability, and locally available foods relevant to Indonesia were included when they informed the feasibility or nutritional consequences of adaptation. Because the objective was conceptual and translational rather than to estimate a pooled intervention effect, the evidence was synthesised narratively by clinical

outcomes, geographical context, dietary components, and the extent to which the proposed Indonesian alternatives preserve nutritional or functional characteristics.

Due to the high heterogeneity of the included literature in study design, populations, and outcome measures, this review was conducted as a narrative synthesis rather than a systematic review or meta-analysis. No formal risk-of-bias assessment was carried out, nor were the results quantitatively pooled. Instead, the findings were qualitatively synthesised to compare the nutritional and functional characteristics of the traditional Mediterranean Diet and Indonesian foods and to identify locally appropriate alternatives that could preserve the diet's core health-promoting properties.

What is the Mediterranean diet?

The Mediterranean diet refers to the traditional dietary pattern of populations living in countries bordering the Mediterranean Sea. Historically, it was characterised by high consumption of bread, olive oil, vegetables, fruits, legumes, and fish, with relatively limited intake of red meat, animal fats, and dairy products [17,18]. The diet gained

international recognition through the work of Ancel Keys and subsequent studies linking Mediterranean dietary patterns to lower cardiovascular risk [19]. The Mediterranean dietary pattern is characterised by a nutrient profile rich in dietary fibre, monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), vitamins, minerals, and antioxidants.

The traditional framework includes: abundant vegetables, fruits, whole grains, legumes, nuts and seeds; preference for seasonal and minimally processed foods; olive oil as the principal culinary fat; regular fish and seafood; low-to-moderate dairy intake; relatively low intake of red and processed meat; and, in traditional descriptions, moderate wine intake with meals [17,20]. For adaptation to populations in which alcohol is not routinely consumed, wine should not be considered a required component of the pattern. The emphasis should instead remain on the overall food matrix and cardiometabolic nutrient profile. The Mediterranean dietary pattern is characterised by several fundamental features, particularly in its nutrient profile and food composition. A recent review and meta-analysis examined dietary micronutrient and macronutrient intakes (see **Table 1**) and changes in macronutrient supply within the Mediterranean Region [21,22].

Table 1. Selected nutritional and bioactive characteristics of the Mediterranean dietary pattern

Parameter	Reported intake/range
Carbohydrate (% total energy)	45-65
Protein (% total energy)	10-35
Fat (% total energy)	25-35
Energy (kcal/day)	2286.6 (2185.7-2387.9)
Dietary fiber (g/day)	21.8 (19.6-24.1)
SFA (g/day)	29.0 (24.9-33.0)
MUFA (g/day)	31.9 (25.3-38.6)
PUFA (g/day)	22.2 (17.4-26.9)
Calcium (mg/day)	745.8 (656.4-835.2)
Potassium (mg/day)	2451.3 (1903.2-2999.3)
Sodium (mg/day)	3748.0 (3384.1-4112.0)
Iron (mg/day)	14.4 (12.2-16.6)
Vitamin A (µg/day)	708.4 (480.6-936.2)
Vitamin D (µg/day)	3.1 (2.1-4.1)
Vitamin E (mg/day)	10.9 (6.7-15.0)
Vitamin C (mg/day)	111.4 (82.4-140.5)
Omega-3 fatty acids	Characteristic sources include fatty fish, seafood, nuts/seeds; intake depends on dietary implementation
Flavonoids/polyphenols	Characteristic sources include extra-virgin olive oil, fruits, vegetables, legumes, nuts, herbs and spices; no single universal intake value defines the pattern

Data for macro- and micronutrients are retained from references [21,22]. Omega-3 fatty acids and polyphenols are included because they are important bioactive components of the Mediterranean dietary pattern; their intake varies with food choices and cannot be represented by a single universal value.

The updated Mediterranean diet pyramid also emphasises water, physical activity, conviviality, biodiversity, seasonality, and minimally processed foods [20]. Daily fluid requirements differ among individuals and depend on environmental factors; consuming water and unsweetened herbal infusions helps maintain hydration [12,20,23]. In an Indonesian adaptation, herbs and spices may also support palatability and dietary diversity. They can help reduce dependence on excessive salt, sugar, and heavily processed condiments, but should not be seen as direct biochemical replacements for Mediterranean herbs.

Clinical evidence for Mediterranean and Mediterranean-style diets

The rising number of older adults and growing concerns about healthcare sustainability underscore the urgent need for effective prevention strategies to reduce the burden of NCDs [24]. The Mediterranean diet has emerged as a well-established dietary approach, supported by evidence from large randomised trials, secondary prevention trials, prospective cohort studies, and short-term metabolic interventions. In PREDIMED, among adults with high cardiovascular risk, Mediterranean diets enriched with extra-virgin olive oil or nuts were associated with fewer major cardiovascular events than a low-fat control diet [6]. The Lyon Diet Heart Study demonstrated benefits in secondary prevention following a myocardial infarction [7]. These landmark trials support the overall dietary pattern but do not prove every Mediterranean food can be replaced with a familiar alternative without changing biological effects.

The Indo-Mediterranean Diet Heart Study highlights cultural adaptation and reports fewer coronary events with a plant-rich pattern [25]. However, following a subsequent expression of concern published in *The Lancet*, these findings warrant cautious interpretation and should be regarded as hypothesis-generating rather

than definitive evidence [26]. Recent conceptual research on the Indo-Mediterranean pattern highlights the importance of food diversity, including minimally processed plant foods, whole grains, legumes, fruits, vegetables, spices, and antioxidant-rich foods [27]. Several studies (see **Table 2**) have demonstrated that adherence to the Mediterranean diet is associated with health benefits [14–16,28]. **Table 3** presents an overview of the key nutritional and bioactive characteristics of the Mediterranean dietary pattern.

Evidence from East and Southeast Asia is promising, although the number and duration of intervention studies remain limited. Studies in China, South Korea, and Singapore have reported improvements in body weight, glycemic indices, lipid levels, blood pressure, and related metabolic measures with adapted Mediterranean-style interventions [14–16]. Beyond cardiometabolic outcomes, previous research has also associated Mediterranean-diet adherence with a lower risk or better management of diabetes, hypertension, obesity, some cancers, and neurodegenerative disease [29–32]. Importantly, several Asian interventions retained core Mediterranean components, including olive oil, nuts, fish, whole grains, and a favourable profile of unsaturated fatty acids, suggesting that cultural adaptation need not replace all Mediterranean foods.

A study found that following the Mediterranean diet is associated with a lower risk of cardiovascular diseases (strokes and heart attacks) by promoting heart-healthy factors, including improved blood pressure, cholesterol levels, and endothelial function [29]. Numerous studies demonstrate the benefits of the Mediterranean diet for the prevention and management of diabetes [30,33]. Emphasising a dietary pattern rich in fruits, vegetables, whole grains, fish, and olive oil is associated with improved glycemic control, increased insulin sensitivity, and a lower risk of diabetes [34]. The Mediterranean diet should complement—not replace—medical interventions and guidance from healthcare professionals, as it can reduce the risk of various diabetes-related issues [35].

The Mediterranean diet provides a promising way to lower the risk of several NCDs: cancer, neurodegenerative diseases, hypertension, obesity, and osteoporosis [36,37]. The Mediterranean diet emphasises consuming antioxidant-rich

Table 2. Selected clinical trials of Mediterranean and adapted Mediterranean dietary patterns

Author	Setting/ Population	Type of study	Dietary features	Time	Main Outcome
PREDIMED [6]	Spain; adults at high CVD risk	Randomized trial	Mediterranean diet supplemented with EVOO or nuts	Median 4.8 years	Lower major cardiovascular-event rate vs reduced-fat control; strong evidence for pattern-level benefit
Lyon Diet Heart [7]	France; post-myocardial infarction	Randomized secondary-pre- vention trial	Mediterranean-type dietary pattern	Long-term follow-up	Supports secondary-prevention benefit
Indo-Mediterranean Diet Heart Study [26]	India; high risk/estab- lished CAD	Randomized single-blind trial	Plant-rich Indo-Mediterranean pattern	2 years	Reported benefit, but later expression of concern requires cautious interpretation
Luo., et al. [14]	China; adults with pre- diabetes	Parallel-arm RCT	Energy-restricted Mediterranean pattern including EVOO, marine fish, nuts, whole grains	6 months	Weight reduction and improved glucose homeostasis
Son., et al. [15]	South Korea; hypercholester- olemia	Randomized, crossover, open-label study	Korean-style Mediterranean diet retaining olive oil, vegetables, nuts, fish and seafood	8 weeks	Improved lipids and several metabolic/ anthropometric markers
Jin., et al. [16]	South Korea; type 2 diabetes	Open-label RCT	East Asian diet mimicking Mediterranean/DASH principles	12 weeks	Reduced BMI, waist circumference and blood pressure
Chooi., et al. [28]	Singapore; Chinese women	Double-blinded, parallel-design RCT	Asian-adapted high-fiber diet with MUFA/PUFA, whole grains, legumes, fish, nuts, fruits and high-polyphenol EVOO	12 weeks	Reduced body weight; illustrates adaptation while preserving major nutritional features

Table 3. Major Mediterranean dietary components and plausible mechanisms relevant to NCD prevention

Dietary component	Nutritional/bioactive characteristics	Plausible mechanism and outcomes
Vegetables, fruits, legumes, whole grains	Dietary fiber, potassium, folate, vitamins, polyphenols; low energy density	Satiety, improved glycemic response, lower LDL cholesterol, favorable gut-microbiota substrates, lower oxidative/inflammatory burden [35,40,41].
Extra-virgin olive oil and other unsaturated-fat sources	MUFA; phenolic compounds including hydroxytyrosol and oleuropein	Improved lipid profile and endothelial/oxidative pathways; fat quality is a defining feature rather than total fat alone [22,41].
Fish and seafood	EPA/DHA and other PUFA, protein, micronutrients	Supports cardiometabolic health and replaces higher-SFA animal foods; omega-3 exposure depends strongly on fish species and frequency [31,41].
Nuts and seeds	Unsaturated fatty acids, fiber, plant protein, minerals and phytochemicals	Improved dietary fat quality and nutrient density; different nut species are not compositionally identical [6].
Herbs and spices	Diverse polyphenols and other phytochemicals	Potential antioxidant/anti-inflammatory effects and improved palatability; profiles differ substantially among individual herbs/spices [23,27].
Low intake of processed/red meat and refined foods	Lower sodium, SFA, processed-meat exposure and refined carbohydrate load	Supports lower cardiometabolic risk and improves overall dietary quality [41,42].

fruits, vegetables, whole grains, and healthy fats—especially those from olive oil—as they may help lower the risk of various cancers, including colorectal, breast, and prostate cancers [38]. In neurodegenerative diseases such as Alzheimer's and Parkinson's, following the Mediterranean diet is associated with a lower risk, attributed to increased omega-3 fatty acid intake from fish and the antioxidant and protective effects of healthy fats [31]. This low-sodium, high-potassium diet can help prevent hypertension [32]. The Mediterranean diet promotes a sense of fullness, which may reduce calorie intake, and is beneficial for both weight management and the treatment of obesity. The diet's inclusion of dairy products and calcium-rich foods can support bone health and help prevent osteoporosis [3,39]. Existing evidence highlights the Mediterranean diet as a beneficial dietary pattern that provides a broad range of health benefits, making it a strong choice for improving and maintaining overall health.

Critical appraisal of the evidence

The strength and clarity of the evidence vary widely. The most robust evidence for clinical outcomes comes from studies in Mediterranean populations, which provide stronger support for the overall dietary pattern than for individual Indonesian substitutions. Randomized trials in Asian populations show that such diets are feasible and offer short-term metabolic improvements. However, these studies often have small sample sizes, brief intervention periods, and populations with differing baseline diets and cardiometabolic risks. Additionally, many adapted interventions kept key Mediterranean components rather than replacing them completely.

Applying these principles to Indonesia warrants caution. Evidence supports adopting dietary concepts such as increased plant-food diversity, whole or minimally processed grains, legumes, fish, unsaturated fats, and reduced intake of processed meats and refined foods. However, this does not imply that palm oil is nutritionally equivalent to extra-virgin olive oil, peanuts to walnuts, soy foods to dairy, or ginger to rosemary. Recognising the difference between principle-level equivalence and ingredient-level equivalence is crucial for an evidence-based adaptation.

Adapting the Mediterranean dietary pattern to Indonesian culinary traditions

The adoption of Mediterranean dietary principles is feasible in Asia because Asian food cultures are rich and diverse [43]. Indonesia, in particular, has a wide variety of staple foods, vegetables, fruits, legumes, fish, herbs, spices, and cooking practices [44,45]. These foods provide opportunities to adapt the Mediterranean pattern to local culinary traditions. However, adaptation should not be based only on culinary similarity. The nutritional role of each food—including fat quality, fiber, omega-3 fatty acids, plant protein, micronutrients, and phytochemicals—should also be considered.

The concept of an Indo-Mediterranean diet is useful because it allows Mediterranean dietary principles to be combined with protective traditional foods within a culturally appropriate eating pattern [27]. In Indonesia, this may include greater use of a variety of fruits and vegetables, whole or minimally processed grains, legumes, fish, nuts and seeds, and local herbs and spices, while limiting refined grains, added sugars, excess sodium, processed meats, and foods that are repeatedly deep-fried. The following sections cover various food groups where local adaptation is feasible, while also highlighting areas where direct substitution might not yield identical nutritional benefits.

Fat quality: extra-virgin olive oil and locally used oils

Olive oil – particularly extra-virgin olive oil – is a defining fat source of the traditional Mediterranean diet because it combines a high MUFA content with phenolic compounds [22]. Palm oil is widely used in Indonesia and is relevant to culinary feasibility, but it should not be described as nutritionally equivalent to extra-virgin olive oil. Substitution with palm oil increases the relative contribution of saturated fatty acids and removes the characteristic phenolic matrix of extra-virgin olive oil. Consequently, an Indonesian adaptation should prioritize preserving a favorable unsaturated fat profile rather than replacing olive oil solely because of availability. Where extra-virgin olive oil is unaffordable or unsuitable for a specific preparation, locally available unsaturated

oils may be used strategically, while total saturated-fat exposure and cooking practices should be considered [22,46,47].

Nuts, peanuts, legumes and plant proteins

Tree nuts such as walnuts, almonds, and pistachios contribute unsaturated fatty acids, fiber, minerals, and phytochemicals. Peanuts are legumes rather than tree nuts and should not be presented as a direct botanical or compositional substitute. However, peanuts may contribute plant protein, unsaturated fats, fiber, and micronutrients within the overall dietary pattern. Locally available tree nuts, seeds, and legumes can therefore be combined to preserve the broader functional characteristics of this food group rather than assuming one-to-one equivalence.

Whole grains and staple carbohydrates

The relevant Mediterranean principle is not the use of pasta, bulgur, couscous, or quinoa per se, but the predominance of minimally processed, fiber-rich carbohydrate sources. Indonesian options may include brown, red, or black rice; millet; corn; oats, where available; and other intact or minimally processed grains, together with beans and peas. White rice remains culturally important, but calling rice generically a “whole-grain substitute” is inaccurate unless the grain remains intact. Portion size, degree of milling, total dietary fiber, and meal composition should therefore be considered.

Dairy and soy foods

Dairy products and soy foods differ in protein composition, micronutrients, fermentation products, and bioactive components. Tofu and tempeh should therefore be categorized primarily as plant-protein foods rather than dairy substitutes. Fortified soy beverages may be an alternative beverage for individuals who avoid dairy, provided calcium, vitamin D, protein, and other relevant nutrients are considered. Dairy foods may remain in the adapted pattern where culturally acceptable and tolerated [48].

Herbs and spices

Indonesian herbs and spices – including ginger, turmeric, lemongrass, garlic, onion, and coriander – can increase flavor diversity and phytochemical exposure, but they should be

described as complementary to, not biochemical replacements for, Mediterranean herbs such as rosemary, oregano, and basil. Different herbs contain distinct phenolic and volatile compounds; therefore, adaptation should emphasize diversity rather than equivalence of individual phytochemicals [23,27].

Fish, seafood and animal foods

Regular fish intake is readily compatible with many Indonesian food cultures. Local marine fish can potentially provide protein and long-chain omega-3 fatty acids; however, omega-3 content varies by species, so “fish” should not be treated as a nutritionally uniform category. Poultry may be consumed in moderation, while red and processed meats should remain limited. Fresh and minimally processed preparation methods are preferable to preserved meats and repeated deep frying.

Key distinctions between Mediterranean and non-Mediterranean dietary patterns include the primary sources of monounsaturated fatty acids (predominantly olive oil versus animal-based sources), the quantity and preparation of vegetables consumed, the type and consumption patterns of alcoholic beverages (particularly wine versus other alcoholic drinks), and the varieties of meat and dairy products included in the diet [49]. While the traditional Mediterranean diet relies on ingredients native to the Mediterranean region, Asian cuisines offer a wide variety of vegetables, grains, and legumes that can serve as alternatives to the Mediterranean pattern [50]. A study examining the impact of a modified South Asian-style Mediterranean diet on diabetes risk and body fat demonstrated that this dietary pattern could reduce the incidence of diabetes. In this study, the modified Mediterranean diet differed significantly from the traditional Mediterranean diet, which emphasizes greater consumption of fish and poultry rather than red meat, a component more commonly found in conventional Mediterranean diets. In Asian dietary patterns, locally available staple foods may be incorporated as carbohydrate sources while preserving the Mediterranean principle of prioritizing whole or minimally processed, fiber-rich foods. In Indonesia, brown, red, or black rice and other minimally processed grains may therefore be incorporated based on their nutritional characteristics, rather

than being considered direct substitutes for Mediterranean staples [27]. Similarly, tofu and tempeh may contribute to the plant-protein component of an adapted dietary pattern, but should not be considered nutritionally equivalent substitutes for dairy products [48]. The Indo-Mediterranean diet—a modified Mediterranean diet in India—is associated with lower wine consumption. Another difference is that in the Indo-Mediterranean diet, spices are commonly used in amounts of 50-150 grams per day [27]. In contrast, consumption of poultry, red meat, and canned meat is not routinely recommended on the modified Mediterranean diet [51].

Incorporating Asian herbs and spices like ginger, garlic, and turmeric can naturally enhance the Mediterranean diet, boosting both flavour and

health benefits [27]. Below (see **Table 4**), a comparison is presented between the Mediterranean diet and the proposed Indonesian-Modified Mediterranean diet. **Figure 1** also presents the Pyramid of the Indonesian-Modified Mediterranean diet.

Sustainability in adopting a modified Mediterranean diet in Asia involves many factors [43,52]. Traditionally, Asian diets have been shaped by local agriculture and seasonal availability [45]. To achieve long-term sustainability, it is essential to promote the cultivation and consumption of Mediterranean-inspired foods that can be grown locally [51]. Promoting sustainable agriculture and reducing food miles can lessen the environmental impact of importing Mediterranean-specific ingredients [13,51]. Furthermore, cultural accep-

Table 4. Proposed functional adaptation of Mediterranean dietary principles to Indonesian foods

Mediterranean principle	Key nutritional/function characteristic	Potential Indonesian expression	Degree of equivalence	Scientific interpretation
Diverse vegetables and fruits	Fiber, potassium, vitamins, polyphenols	Papaya, guava, citrus, mango, banana in appropriate portions, leafy greens, eggplant, tomatoes, local vegetables	High at principal level	Species need not be identical; diversity and minimally processed intake are central
Tree nuts and seeds	Unsaturated fats, fiber, minerals, phytochemicals	Cashews and other tree nuts where available; peanuts, sesame and legumes as complementary foods	Partial	Peanuts are legumes and not direct substitutes for walnuts/almonds
Whole grains/legumes	Fiber-rich minimally processed carbohydrate, plant protein	Brown/red/black rice, millet, corn, beans, peas, tempeh and other legumes	Potentially high	White rice is not a whole grain; milling and portion size matter
EVOO as principal fat	MUFA plus olive phenolics	Retain EVOO where feasible; use locally available unsaturated oils strategically	Partial	Palm/coconut oil should not be labeled equivalent because of higher SFA and absence of EVOO phenolic profile
Fish/seafood	Protein, EPA/DHA depending on species	Local marine fish and seafood; species selected for nutrient profile and availability	Potentially high	Omega-3 content varies substantially by species
Moderate dairy	Protein, calcium, fermentation products	Dairy where tolerated; fortified soy beverage when appropriate	Partial	Soy is not compositionally identical; tofu/tempeh are better classified as plant proteins
Herbs/spices	Phytochemical diversity and flavor	Ginger, turmeric, lemongrass, garlic, onion, coriander plus Mediterranean herbs when available	Complementary	Not direct phytochemical equivalents; value lies in diversity and culinary acceptability
Low red/processed meat	Lower processed-meat, sodium and SFA exposure	Limit processed meats and frequent fatty red meat; emphasize fish, poultry and plant proteins	High at principal level	Consistent with Mediterranean dietary pattern
Wine optional	Traditional polyphenol source but alcohol exposure	No alcohol requirement; water, unsweetened tea/herbal infusions	Not a substitute	Healthful Mediterranean adaptation does not require initiation of alcohol consumption

Data taken and combined from [10,17,34,41].

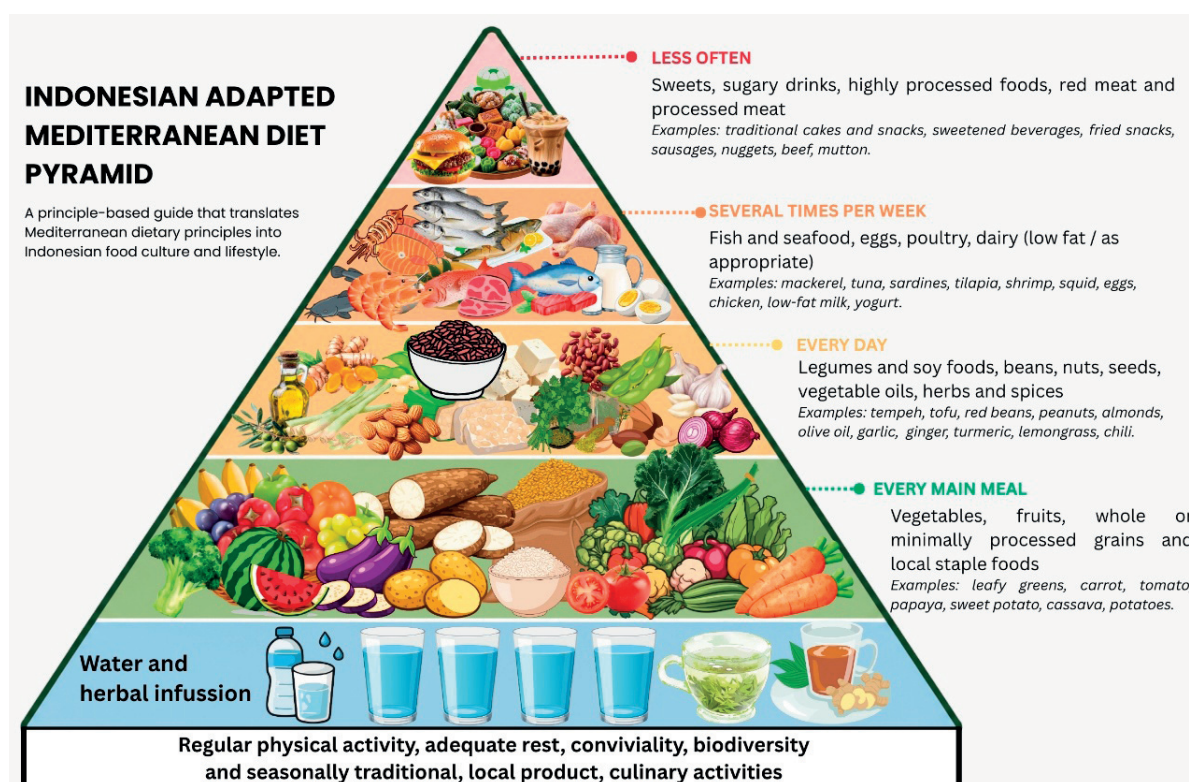


Figure 1. Conceptual locally adapted Mediterranean dietary pyramid for Indonesian cuisine

tance and affordability are crucial for maintaining dietary changes. To support this, public awareness campaigns and educational programs can highlight the health benefits of a modified Mediterranean diet and show how it can be incorporated into popular Asian dishes [53]. Local markets can also be encouraged to provide a broader selection of Mediterranean-inspired ingredients at reasonable prices [51].

The pyramid should be interpreted as a principle-based framework: water, physical activity, plant-food diversity, whole/minimally processed grains, fish, legumes, nuts/seeds, and culinary herbs/spices are emphasised, whereas direct nutrient equivalence among individual foods is not assumed.

However, adopting a Mediterranean-style diet in Asia also requires changes in food choices. In many Asian countries, consumption of red and processed meat is higher than in Mediterranean nations [42]. To follow the Mediterranean diet's emphasis on lean protein sources, it is recommended to increase consumption of seafood, poultry, and plant-based proteins such as tofu and legumes [54]. This change not only aligns

with the principles of the Mediterranean diet but also offers potential health benefits by decreasing saturated fats and sodium intake [27]. To achieve the long-term goals of the Mediterranean diet, cultural adjustments are necessary. With its high benefits, this diet is beginning to be adopted by non-Mediterranean populations.

However, this faces several obstacles, including limited access to Mediterranean diet foods such as extra-virgin olive oil. Therefore, the Mediterranean diet has begun to adapt to various regions worldwide. One example is in Australia, where the Mediterranean diet was reorganised into two steps and implemented in a 2-week food plan [51]. Another study on the modified Mediterranean diet found that it can improve fasting and post-meal glucose regulation. In this study, participants followed a modified Mediterranean diet that limited intake of extra-virgin olive oil, fish, raw nuts, and non-starchy vegetables. It was found that the modified Mediterranean diet significantly improved body composition, anthropometric measurements, glucoregulatory function, and the adipocytokine profile [10].

Table 5. Nutritional targets for future standardised Indonesian Mediterranean-style menus

Domain	Mediterranean nutritional characteristic	Indonesian adaptation target	Main substitution risk
Fat quality	High MUFA/PUFA contribution; EVOO phenolics	Favor unsaturated fats and limit excessive SFA	Replacing EVOO with palm/coconut oil may increase SFA and lose phenolic compounds
Dietary fiber	High contribution from vegetables, fruits, legumes and whole grains	Use intact/minimally processed grains, legumes and abundant vegetables	Replacing whole grains with polished white rice may reduce fiber
Omega-3	Regular fish/seafood; some plant ALA sources	Select local fish species providing meaningful EPA/DHA and include plant ALA sources	Assuming all fish have equivalent omega-3 content
Plant protein	Legumes, nuts and seeds	Tempeh, tofu, beans, peas, nuts and seeds	Treating one food as nutritionally identical to another food group
Calcium/protein	Moderate dairy intake in traditional pattern	Retain dairy or use appropriately fortified alternatives where needed	Unfortified plant beverages may not match calcium/protein content
Polyphenols/flavonoids	EVOO, fruits, vegetables, legumes, nuts, herbs	Maximize diversity of local colorful plant foods and herbs/spices	Assuming specific Indonesian spices reproduce Mediterranean phytochemical profiles
Sodium/processing	Relatively low reliance on highly processed foods	Limit high-sodium sauces, processed meats, instant foods and repeated frying	Cultural adaptation can become unhealthy if processing practices are ignored

Nutritional characteristics to consider in local adaptation

Because this review proposes a dietary pattern rather than a fixed menu with specified gram weights, a precise calculation of its macro- and micronutrient composition would imply a level of standardisation that is not yet available. Future standardised Indonesian Mediterranean-style menus should therefore be nutritionally modelled against explicit targets before clinical testing. **Table 5** summarises the main nutritional characteristics to preserve and the potential risks of poorly chosen substitutions.

Sustainability and cultural acceptability

Sustainability in adopting a modified Mediterranean diet in Indonesia involves several factors [43,52]. Traditional Asian diets are closely linked to local agriculture and seasonal food availability [45]. Using locally produced foods, where appropriate, may reduce dependence on imported Mediterranean-specific ingredients and support affordability and environmental sustainability [13,51]. Simultaneously, local substitution ought to maintain the nutritional principles of the Medi-

terranean pattern rather than rely solely on availability.

Cultural acceptance and affordability are also important for long-term adherence. Public education can emphasise how Mediterranean dietary principles can be incorporated into familiar Indonesian meals, while local markets and food systems can support access to vegetables, fruits, whole grains, legumes, fish, nuts, seeds, and suitable sources of unsaturated fat [51,53]. Thus, the goal is not to reproduce Mediterranean cuisine exactly, but to develop a dietary pattern that is nutritionally sound, culturally acceptable, affordable, and practical within the Indonesian food environment.

Limitations and research priorities

Several limitations should be considered. First, this is a narrative review rather than a systematic review and therefore does not provide exhaustive study identification or quantitative pooling. Second, definitions and adherence scores for the Mediterranean diet vary across studies. Third, the strongest evidence for outcomes comes from Mediterranean populations, whereas Asian studies are fewer and generally shorter. Fourth, evidence of clinical interventions specific to Indone-

sia remains scarce. Fifth, the Indonesian adaptation proposed here is a principle-based framework, not a standardised menu; therefore, direct macro- and micronutrient calculations cannot yet establish equivalence.

Future studies should develop standardised Indonesian Mediterranean-style menus with pre-specified gram weights and analyse the energy, macronutrients, SFA, MUFA, PUFA, omega-3 fatty acids, fibre, key vitamins and minerals, and selected polyphenol indicators using validated Indonesian food composition data. These menus should then be tested for affordability, sensory acceptability, adherence, and clinical outcomes in Indonesian populations. Prospective trials should also evaluate whether locally selected oils, fish species, whole-grain staples, fermented soy foods, and spice-rich culinary patterns preserve the cardiometabolic effects observed in established Mediterranean interventions.

Conclusion

In conclusion, adapting the Mediterranean diet to Indonesia appears feasible when local food culture, availability, affordability, and dietary preferences are carefully considered. The adaptation should emphasise the main principles of the Mediterranean pattern—increased intake of plant foods, whole or minimally processed grains, legumes, fish, and favourable fat sources—while avoiding the assumption that every local food is nutritionally equivalent to its Mediterranean counterpart. Long-term sustainability will also depend on local food production, environmental factors, affordability, and cultural acceptance. Although this approach is promising for NCD prevention, evidence specific to Indonesian populations remains limited. Further studies are needed to evaluate the nutritional adequacy, feasibility, and health effects of a standardised Indonesian-adapted Mediterranean dietary pattern.

Statements

Author contributions

DEA: Conceptualisation and design, made the first draft of the manuscript, and final approval of the version to be published; VAN: Critical revision of the manuscript

and final approval of the version to be published; BCC: Critical revision of the manuscript and final approval of the version to be published; F and DS: Supervision and final approval of the version to be published. All authors have made substantial contributions to the creation of this manuscript. All authors have read and agreed to the published version of the manuscript.

Conflict of interest statement

The authors declared no conflict of interest regarding this article.

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