

Natural Medicine in Chronic Disease Prevention: Evidence, Mechanism, and Worldwide Perspectives

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Abstract

Chronic non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, cancer, and neurodegenerative disease are some of the health concerns of great importance in the world today. Standard treatments are readily available but fail due to cost and side effects. A preventative option provided in natural medicine is the bioactive compounds. The aim of the study is to evaluate the potential of natural medicine in the prevention of chronic diseases, concentrating on the evidence, mechanisms, and application all over the world. The review included a narrative search conducted in ScienceDirect and Google Scholar. The selection of studies was made that are relevant to natural compounds and preventive mechanisms. The types of data sought to be extracted were type, source, disease target, and biological action of compounds. Nineteen studies were analyzed. More than eight important compounds and polyherbal formulations were preventive in major NCDs. Key mechanisms included antioxidant, anti-inflammatory, and metabolic regulation. Examples of compounds worthy of attention were curcumin, Terminalia arjuna, resveratrol, Cinnamon, Calotropis, Berberine, and ginsenosides. There were Asian, African, and Latin American applications. Natural drugs have the potential to be used to prevent chronic diseases due to their multi-targeted effects. Wider use is curtailed by legal gaps and a lack of clinical trials. There is a need to enhance research and policy provisions to make these therapies part of mainstream medical care.

Keywords: Natural medicine, Chronic disease prevention, Herbal remedies, Mechanisms of action, Global health

1. Introduction

Morbidity and mortality on the globe are mainly caused by chronic diseases, which include cardiovascular disease, type 2 diabetes mellitus, cancer, and respiratory disorders [1]. Non-communicable diseases (NCDs) are described to constitute more than 70% of all worldwide deaths, of which a large part is disproportionately placed in low- and middle-income countries, according to the World Health Organization [2]. Despite the modern developments in medical technologies and pharmacotherapy, conventional therapies tend to revolve around symptom control and disease control, but these do not provide long-term prevention or reversal of the disease processes. Furthermore, most pharmaceutical interventions present negative effects, have excessive prices, or are only available in high-resource contexts [3].

Due to these restraints, natural medicines have started being given serious consideration as a lever to prevent chronic illnesses and promote well-being. When considered in its broadest definition, natural medicines include herbal products based on plants, traditional herbal products, nutraceuticals, and bioactive food constituents of natural origin [4]. Such therapies have a long history in traditional medicine that dates to centuries and exist in practices like Traditional Chinese Medicine (TCM), Ayurveda, and

African traditional healing. Scientific research has started to recognize the effectiveness of natural compounds, including curcumin, Terminalia arjuna, resveratrol, Cinnamon, *Calotropis gigantea* Linn, berberine, and ginsenosides, in regulating biological pathways, including inflammation, oxidative stress, insulin resistance, lipid metabolism, and cellular aging, which are some of the key processes involved in chronic diseases [5-10].

The cultural background that revolves around the need to embrace natural medicine in prophylactic healthcare has been more popular not only in terms of cultural heritage but also in response to the increase in the need to embrace more widespread, sustainable, and personalized pathways to health. But still, obstacles exist, such as the necessity of a more significant clinical evidence base, a unified regulation, quality assurance, and a mechanism of action comprehension [11]. This review discusses the current evidence on the efficacy of natural medicine in the prevention of chronic disease, describes the biochemical mechanism behind it, and evaluates global views on its application. This narrative review is vital in helping establish integrative strategies that may improve their chronic disease prevention on a global scale by synthesizing studies conducted in various healthcare systems and varying scientific traditions.

2. Materials and methods

2.1 Search Strategy and Data Sources

The present narrative review was undertaken to classify and summarize published articles on the role of natural medicine in preventing chronic illnesses. The methodology was not a systematic review but instead was a guided one to make it clear and replicable. The study involved a thorough search of literature with the help of four significant electronic databases, such as ScienceDirect and Google Scholar. The search was not restricted to any eligible period but had the limitation of English-language articles. A combination of words like natural medicine, chronic disease prevention, herbal medicine, phytochemicals, bioactive compounds, mechanism of action, global health, and traditional medicine was used as search terms. The word Boolean operators was used to either broaden or narrow down the findings since the ability of the database.

2.2 Inclusion and Exclusion Criteria

Articles were qualified to be included if they had been peer reviewed and involved studies that were on the preventive use of natural medicines, which may include herbal compounds and isolated phytocompounds on chronic NCDs. Articles that gave an insight into biological processes like antioxidant property, anti-inflammatory property, and regulatory aspects like metabolism and immune system regulation. Articles presenting epidemiological evidence or the local meaning of the use and acceptance of natural medicine in preventive medicine were also incorporated. The excluded articles in this review were those that concerned only acute or infectious conditions, those that did not discuss any mechanisms or health outcomes, those that were non-peer reviewed, opinion pieces, and editorials.

2.3 Study Selection and Data Extraction

The first database search led to finding more than 500 articles. Out of the more than 5000 titles and abstracts examined, more than 100 full-text articles were read at length. Nineteen of them passed the last inclusion criteria and were included in the review. The information that was retrieved in each article consisted of a natural compound or formula under examination, botanical source (Latin binomial, authority, and family of plant), targeted chronic condition, suspected mode of action, and the cultural or

place of use context. Priority was also given to articles associating mechanistic pathways with the results of disease prevention, either clinical or preclinical.

2.4 Bias Reduction and Review Process

Several databases were accessed, and a wide variety of research designs, such as in vitro, in vivo, clinical, and epidemiological studies, were accommodated to reduce the likelihood of selecting biased studies. Full-text articles included in the resulting selection were reviewed by the author, who read the articles separately. The selection process involved any form of disagreement, which was discussed and settled by consensus. It can be said that this was an iterative and systematic review process that was undertaken to provide equilibrium in the global evidence available regarding the preventive capability of natural medicines to curb the burden of chronic disease.

3. Results

Evidence in the reviewed literature is strong on the use of natural medicines in the prevention and modulation of numerous NCDs, such as cardiovascular conditions, type 2 diabetes mellitus, cancer, neurodegenerative diseases, and respiratory diseases. Findings of the results incorporate those of 12 in-depth peer-reviewed resources, out of which 9 are preclinical research studies and 3 are clinical trials. Sixteen lead natural products and polyherbal formulations were distinguished, which have proven preventive properties by modulating the antioxidant activity, anti-inflammatory effect, immunomodulating activity, and metabolism. The regional contexts where the reviewed data are examined cover the Asian, European, African, and Latin American regions.

3.1 Heart Diseases

Some plant-derived substances have been found to protect against heart diseases, including coronary artery disease, hypertension, and atherosclerosis. Using resveratrol, a compound of *Vitis vinifera* (Vitaceae), always resulted in SIRT1 activation, endothelial functionality enhancement, and the prevention of platelet aggregation [12, 13]. *Curcuma longa* L. (Zingiberaceae) was also estimated to bind curcumin in anti-inflammation and lipid-lowering cardiovascular and metabolic diseases [14, 15]. The use of these compounds is common in South Asia, the Mediterranean, and all over the world.

In addition, Cinnamon is a widely cultivated tropical plant in the family of Lauraceae. They have been applying it as a flavor enhancer for hundreds of years, but it has also been used in natural Eastern medicine. Cinnamon extracts are important oils that possess useful biologically active compounds, including cinnamon aldehyde, cinnamic alcohol, cinnamic acid, and cinnamate. It is an antioxidant, anti-inflammatory, and has an anti-bacterial effect, and is also utilized to treat illnesses like diabetes and cardiovascular disease. Cinnamon species in folk medicine are applied to respiratory and digestive disorders [9].

Moreover, *Terminalia arjuna* (Combretaceae) has become a pillar in Ayurvedic cardiology. It has a high content of polyphenols, flavonoids, and triterpenoids and is an effective antioxidant and anti-inflammatory agent. Preclinical trials have shown that it can decrease oxidative stress products (MDA, NO, MPO), increase antioxidant enzymes (SOD, Catalase, GPx), and alter gene expression signatures (Nrf2 and HO-1), protecting against myocardial infarction and cardiac fibrosis [16].

Besides these, a variety of other phytochemicals have also become the focus of their multifactorial applications in cardiovascular health. Berberine (in *Berberis vulgaris*), ginsenosides (in *Panax ginseng*), quercetin, allicin (in *Allium sativum*), and epigallocatechin gallate (EGCG) in *Camellia sinensis* are compounds with strong antioxidant effects, anti-inflammatory effects, and enzyme-inhibitory effects.

These bioactives play a role in the regulation of metabolic processes, immune response, and vascular stability, thus protecting against hypertension, myocardial infarction, and atherosclerosis. Their worldwide therapeutic applicability is manifested in their prevalence in Africa, South Asia, East Asia, Latin America, and Europe. These compounds have long been used not only in the treatment of cardiovascular disorders, but also in diabetes, cancer, and neurodegenerative diseases by traditional medicine systems, pointing to their broad-spectrum activity and cultural importance [17, 18].

3.2 Diabetes Type 2 Mellitus

A wide range of antidiabetics was recognized in herbs like *Gymnema sylvestre* (Apocynaceae), *Momordica charantia* (Cucurbitaceae), and formulas including bitter melon, ginseng, garlic, and holy basil [19, 20]. They also involved insulin sensitization, glucose exposure, and gut microbiome. Berberine and other polyphenols (such as resveratrol) also affected glucose homeostasis and increased protection of the 8221 leadership 162 Gabbard et al. /2010/161c00160161 last night rho-cell. The herbs are widely used in Asia, Sub-Saharan Africa, and Latin America.

Polyphenolic agents like berberine, resveratrol, curcumin, and ginsenosides have been found to have potential in augmenting glucose homeostasis and providing cellular defense. Berberis vulgaris (Berberin, Berberidaceae) and *Vitis vinifera* (resveratrol, Vitaceae), respectively, have been reported to activate the AMPK and SIRT1 pathways, as part of the anti-inflammatory and antioxidant activity [13, 18]. Curcumin, *Curcuma longa* L. (Zingiberaceae), which is extensively used in South and East Asia, has shown multifaceted effects such as antioxidant, anti-inflammatory, neuroprotective, lipid-lowering, and gut microbiome modulation, thus making it a potent anti-diabetic agent [14, 15, 18].

The apocynaceae, theaceae, araliaceae, asteraceae, and plantaginaceae are several families that have traditionally used plants like *Rauvolfia serpentina*, *Camellia sinensis*, *Panax ginseng*, *Artemisia annua*, and *Digitalis purpurea* to manage diabetes, hypertension, cancer, and cardiovascular diseases in Asia, Europe, and coastal regions [21]. They have the bioactivity of immune stimulation, induction of apoptosis, and the modulation of metabolic pathways.

Extensive research has been conducted on combinatorial phytochemicals, including curcumin, berberine, resveratrol, ginsenosides, quercetin, allicin, and epigallocatechin gallate (EGCG) that can be utilized as synergies in the management of chronic diseases, e.g., diabetes, cardiovascular diseases, cancer, infectious diseases, and neurodegenerative disorders [17, 18, 22]. The action of these compounds are antioxidants, anti-inflammatory, immunomodulatory, antimicrobial, induction of apoptosis, and enzyme inhibition, and is used on a global scale in Africa, South Asia, East Asia, Latin America, Europe, and North America.

These phytochemicals and herbs are still important in ethnomedicine and integrative medicine of Type 2 Diabetes Mellitus, especially where access to modern medicine is scarce.

3.3 Prevention of cancer

Such phytochemicals as curcumin, resveratrol, ginsenosides, and quercetin demonstrated anticancer activity by binding NF- κ B, epigenetically targeting, and triggering apoptosis [15, 17, 23]. Immune-modulatory and cytoprotective effects were also displayed by multi-compound combinations of Chinese traditional formulas (e.g., Qing Fei Pai Du Tang). The study of cancer-preventive herbs is still lively in India, in China, and more recently in integrative Western oncology.

In recent ethnopharmacological surveys, the variety of plant families and species with anticancer and cardioprotective effects is accentuated. As an example, *Camellia sinensis* (Theaceae) polyphenols have antioxidant effects and hormetic stress-responses [24]. Apocynaceae, Araliaceae, Asteraceae, and Plantaginaceae species, which include *Rauvolfia serpentina*, *Artemisia annua*, and *Digitalis purpurea*,

have been shown to stimulate immunity, induce apoptosis, and alter metabolic pathways [21]. A wider range of taxa, such as Asteraceae, Papaveraceae, Berberidaceae, and Taxaceae, can also aid cancer prevention through various pathways, such as ROS generation, NF-kB inhibition, ERK suppression, and anti-proliferative effect [25].

These discoveries highlight the worldwide importance of phytochemicals in cancer prevention with contributions spread throughout Africa, South Asia, East Asia, Latin America, Europe, and North America [18, 22].

3.4 Neurodegenerative Disorders

Neuroprotective, antioxidant, and anti-inflammatory effects were associated with bioactives, such as resveratrol and EGCG (epigallocatechin gallate of *Camellia sinensis*), which have possible applications in Alzheimer's and Parkinson's model development [13, 18]. The effect is interceded mediated by the sequence of SIRT1 regeneration and silencing of oxidative stress pathways and has received ample attention in animal models and has some supportive ethnomedical practices in Asia and Europe. Within these classes of powerful botanicals, a large body of work has emerged with Ashwagandha (*Withania somnifera*), demonstrating activity for neurodegenerative pathology. Withanolides in *withania somnifera* roots and berries are steroidal lactones shown to increase neurite outgrowth and synaptic remodelling, which support neuronal network regeneration. Ashwagandha also has strong effects on increasing endogenous antioxidant enzymes, reducing oxidative stress, and ameliorating neuroinflammation by downregulating pro-inflammatory cytokines, which has helped Ashwagandha emerge as a powerful adaptogen that is useful in interventions targeting neurodegenerative disorders like Alzheimer's disease and Parkinson's disease.

Many other phytochemicals with possible roles as neuroprotectants are curcumin (*Curcuma longa* L.), berberine (*Berberis vulgaris*), ginsenosides (*Panax ginseng*), quercetin, allicin (*Allium sativa*), and omega-3 fatty acids from marine oil, as well as resveratrol and EGCG [6, 17, 22]. These compounds possess a wide variety of multifunctional activities including antioxidant, anti-inflammatory, immunomodulatory, apoptotic, and enzyme inhibitory activities, which promote their therapeutic relevance in neurodegenerative conditions such as Alzheimer's and Parkinson's disease. Their common and wide-ranging folkloric and traditional uses on the continents of Africa, South Asia, East Asia, Latin America, Europe, and North America demonstrate not only traditional ethnomedical use, but growing awareness and increasingly mass utilization in the integrated neurotherapeutic contemporary arena. More specifically, the traditional application of Ashwagandha or *Withania somnifera*, in Ayurvedic medicine (traditional medicine evolving in South Asia) for cognition and memory enhancement, is now very well supported within modern scientific literature, helping to highlight its significant position within the framework of complementary and alternative neurotherapeutic approaches in a global context.

3.5 Respiratory, Asthma, and Infectious

Indian literature states that the root of *Calotropis gigantea* Linn is a long-standing traditional folkloric medicine that is used in the treatment of asthma. The root also contains alpha and beta amylin, said to have anti-lipoxygenase activity [10]. Anti-asthmatic activity has been promising in it, which is a traditional medicine used almost entirely in South Asian medicine to manage respiratory illnesses. The extract of flowers decreases leukocytosis, eosinophilia, and mast cell degranulation, and its anti-inflammatory properties are supported by steroids, saponins, flavonoids, and other bioactive constituents [26]. The results support the therapeutic usefulness of these herbs in the prevention of chronic diseases and should be further clinically confirmed. Along with such single-herb applications, the antiviral and

immunomodulatory properties of two multi-herb Chinese medical formulas, Lianhua Qingwen or Qing Fei Pai Du Tang, were noted when exploring COVID-19 [27, 28]. These formulations are used to treat various signaling pathways, such as cytokine inhibition, ACE2 blocker, and SARS-CoV-2 viral inhibitor, and as respiratory infection therapeutics, which were made by national recommendation in China.

4. Discussion

This narrative review synthesizes strong evidence to support the increasing contribution of natural medicines, particularly phytochemical-rich herbal medicine, to the prevention of major NCDs such as cardiovascular diseases, type 2 diabetes mellitus, cancer, neurodegenerative diseases, and respiratory diseases. The results confirm the fact that not only do the bioactive compounds of plant origin have multiple preventative mechanisms, which include antioxidant, anti-inflammatory, and immunomodulatory, metabolic regulatory effects, but they are also diverse in terms of their cultural reputation and geographical use.

4.1 Prevention of cardiovascular disease

Natural compounds found in *Vitis vinifera* L. (Vitaceae) of resveratrol and *Curcuma longa* L. of curcumin have demonstrated high preventive effects on atherosclerosis, hypertension, and myocardial fibrosis. Effects like SIRT1 activation, anti-platelet aggregation, and endothelial protection are major mechanisms of their cardioprotective properties [12, 13]. The popularity of these compounds in preventive health regimes throughout the Mediterranean food culture and Asian herbal medicines demonstrates that their application has spread throughout the world. Nevertheless, they still have regional differences in control, availability, and the support of the population [14, 15].

Arjuna (*Terminalia arjuna*) consists of an extensive diversity of natural compounds such as polyphenols, flavonoids, tannins, triterpenoids, saponins, and minerals, and has traditionally been used in the management of conditions associated with the heart. The frequency of use of these substances in the body for prevention during the Mediterranean food culture and Asian herbal medicines shows that their usage has become widespread. Yet, there are still regional disparities in control, availability, and endorsement of the population [29, 30].

4.2 Treatment and prevention of Type 2 diabetes

Several herbal medicines, including *Gymnema sylvestre*, *Momordica charantia*, *Panax ginseng*, and combination formulations, have shown insulin-sensitizing, glucose-lowering, and gut microbiome-modulating effects [19, 20]. These pathways are aimed at the pathophysiology of resistance and metabolic syndrome. Preventive use of these compounds is in line with ethnobotanical symmetry in India, Southeast Asia, and Latin America. Furthermore, seeds of *Trigonella foenum-graecum* (fenugreek) have proven to have hypoglycemic effects based on the delay of glucose absorption in the intestine, as well as an increase in secretion of insulin, and improvement of lipid metabolism [31]. Traditional Ayurvedic powder, Triphala, which is a combination of *Embolia officinalis*, *Terminalia chebula*, and *Terminalia bellirica*, has been shown to work on the gut microbiota, decrease oxidative stress, and improve glycemic control in preclinical and small-scale clinical trials [32]. However, clinical trials are yet to attain maturity, and it is a major concern regarding the standardization of doses and quality, which is a key impediment to global usage [21].

4.3 Natural Medicine Prevention of Cancer

The anticancer activities of phytochemicals, e.g., curcumin, resveratrol, ginsenosides, and berberine, are multifunctional, and cover the inhibition of NF- κ B, induction of apoptosis, controlling autophagy, and

epigenetic manipulation [15, 17, 23]. Such preparations as Qing Fei Pai Du Tang can also be helpful to regulate the immune response and decrease inflammation that promotes oncogenesis [28]. The results motivate the use of such compounds in integrative oncology, yet approval and clinical evidence remain behind the mainstream treatment.

4.4 Cognitive and Neurodegenerative Disorders

Findings show the importance of natural medicines in neuroprotection, particularly in the cases of Alzheimer's and Parkinson's diseases. Neuroinflammation and oxidative stress can be regulated by such compounds as resveratrol and EGCG (Epigallocatechin gallate) of *Camellia sinensis* [13, 18]. And leaf extract as a prospective agent in oxidative damage and physiological abnormalities observed in a mouse model of Parkinson's [7]. Part of this occurs through SIRT1 stimulation and stabilization of the mitochondria. In pre-clinical studies, the findings are promising, but long-term research in human beings and population-specific formulations is urgently needed.

4.5 COVID-19 Lessons: On Respiratory and Infectious Diseases

The COVID-19 pandemic attracted attention to such conventional multi-herbal products as Lianhua Qingwen and Qing Fei Pai Du Tang because of their antiviral, immunomodulatory, and cytokine-reducing properties [27, 28]. Their use within the Chinese contexts of the public health response displays the possibilities of traditional medicine in contemporary epidemic situations. Nevertheless, there are some obstacles to global translation, namely differences in pharmacovigilance practices, attitude to traditional treatments, and absence of unified clinical trial models.

4.6 Mechanistic Variety and World Inequalities

According to the evidence that has been reviewed, mechanisms of natural medicine can be described as multi-targeted, as they target not only inflammation but also oxidative stress, lipid metabolism, glycemic control, and even gene expression. This is why they are specifically appropriate in the case of the multifactorial etiology of chronic diseases [15, 22]. However, the non-uniformity in the incorporation into formal healthcare systems, because of regulatory, cultural, and scientific impediments, restricts their global effects [4].

4.7 Shortcomings and Prospects

Not that this review will merely be subject to limitations. Being a narrative synthesis, it is not guided by PRISMA systematic procedures and may have selection bias. In addition, a limited number of large-scale randomized controlled trials (RCTs) restricts clear statements regarding efficacy and safety. More so, there is the aspect of underdeveloped areas in terms of dosage standardization, bioavailability of phytochemicals, and herb-drug interactions. The future remains concentrated on the high-quality clinical trials, cross-regional comparative studies, and development of the regulatory frameworks, and the integration of the database for natural medicine integration.

5. Conclusion

When it comes to the prevention and management of certain NCDs, such as cardiovascular disorders, type 2 diabetes, cancer, neurodegenerative diseases, and respiratory diseases, natural medicines have a lot to offer. In this review, it was demonstrated that the compounds of plant origin, e.g., curcumin, *Terminalia arjuna*, resveratrol, Cinnamon, *Calotropis gigantea* Linn, berberine, and ginsenosides, and many others, have a vast range of different biological impacts and can act as antioxidants, inhibit inflammatory processes, impact the immune system, and affect metabolism. They have a long history of usage in traditional health care systems within Asia, Africa, and beyond, and are gaining acceptance in an

international health care setting. No clear progress in the routine use of technology has been made despite positive evidence in preclinical research, various clinical trials, and the limited development of standards, clinical validation, or regulatory gaps. Going ahead, there is a need to combine traditional science with high-quality research and policies to tap fully the preventive potential of natural medicines in the battle against chronic illness in the world.

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Table 1. Summary of Natural Compounds Used in Chronic Disease Prevention: Sources, Target Diseases, Mechanisms

Key References	Natural Compound	Botanical Source (Latin binomial, Authority, Family)	Target Disease(s)	Mechanism(s) of Action	Region of Use
[23]	Curcumin	<i>Curcuma longa</i> L. (Zingiberaceae)	Colorectal cancer	Anti-inflammatory, antioxidant, immunomodulatory, autophagy induction, epigenetic modulation, CSC inhibition	South Asia, East Asia, Global
[14]	Curcumin	<i>Curcuma longa</i> L. (Zingiberaceae)	CVD, Diabetes	Antioxidant, anti-inflammatory, gut microbiome modulation, neuroprotective, lipid-lowering, anti-diabetic	South Asia, East Asia, Global
[12]	Resveratrol	<i>Vitis vinifera</i> L. (Vitaceae)	Coronary artery disease, atherosclerosis, hypertension, myocardial fibrosis	SIRT1 activation, anti-inflammatory, anti-platelet	Mediterranean, Global

				aggregation, endothelial protection, antioxidant	
[27]	Lianhua Qingwen Formula	<i>Forsythia suspensa (Thunb.) Vahl (Oleaceae), Lonicera japonica Thunb. (Caprifoliace ae), Glycyrrhiza uralensis Fisch. (Fabaceae), Ephedra sinica Stapf (Ephedracea e), Houttuynia cordata Thunb. (Saururaceae) , Isatis indigotica Fort. (Brassicaceae e), Rheum palmatum L. (Polygonaceae e), Mentha haplocalyx Briq. (Lamiaceae), Rhodiola rosea L. (Crassulaceae e), Pogostemon cablin (Blanco)</i>	COVID-19	Inhibits SARS-CoV- 2 replication, reduces pro- inflammator y cytokines (IL-6, TNF- α), alters viral morphology, immunomod ulatory	China, East Asia

		<i>Benth.</i> <i>(Lamiaceae),</i> <i>Dryopteris</i> <i>crassirhizom</i> <i>a Nakai</i> <i>(Dryopterida</i> <i>ceae),</i> <i>Armeniaca</i> <i>sibirica (L.)</i> <i>Lam.</i> <i>(Rosaceae),</i> <i>Gypsum</i> <i>Fibrosum</i> <i>(mineral)</i>			
[28]	Qing Fei Pai Du Tang	<i>Composite</i> <i>formula</i> <i>including</i> <i>Ephedra</i> <i>sinica Stapf</i> <i>(Ephedracea</i> <i>e),</i> <i>Glycyrrhiza</i> <i>uralensis</i> <i>Fisch.</i> <i>(Fabaceae),</i> <i>Scutellaria</i> <i>baicalensis</i> <i>Georgi</i> <i>(Lamiaceae),</i> <i>Rhodiola</i> <i>rosea L.</i> <i>(Crassulacea</i> <i>e),</i> <i>Houttuynia</i> <i>cordata</i> <i>Thunb.</i> <i>(Saururaceae</i> <i>), Rheum</i> <i>palmatum L.</i> <i>(Polygonacea</i> <i>e), among</i> <i>others</i>	COVID-19	Anti-inflammatory, antiviral, immunomodulatory, cytokine suppression, lung protection, ACE2 interaction inhibition	China (Nationally recommended)

[24]	Various polyphenols	<i>Camellia sinensis</i> (L.) Kuntze, Theaceae	Cardiovascular diseases, cancer	Antioxidant activity, hormesis (adaptive stress response)	Global
[20]	Mixed herbal formula	<i>Gymnema sylvestre</i> R.Br. ex Schult., Apocynaceae	Type 2 diabetes, prediabetes	Insulin sensitization, anti-inflammatory, and glucose regulation	India, Southeast Asia
[15]	Various polyphenols	<i>Curcuma longa</i> L., Zingiberaceae	Cancer, diabetes, and cardiovascular diseases	NF-κB inhibition, antioxidant, anti-inflammatory	India, Middle East
[13]	Resveratrol	<i>Vitis vinifera</i> L., Vitaceae	Neurodegenerative diseases, diabetes	SIRT1 activation, anti-inflammatory, neuroprotective	Europe, USA
[19]	Bitter Melon, Meyer, Allium, Asphodelaceae, Fabaceae, Menispermaceae, Apocynaceae, Fabaceae, Lamiaceae, Zingiberaceae, Leguminosae,	<i>Momordica charantia</i> , <i>Panax ginseng</i> , <i>Allium cepa</i> , <i>Allium sativum</i> , <i>Aloe vera</i> , <i>Pterocarpus marsupium</i> , <i>Tinospora cordifolia</i> , <i>Tinospora crispa</i> , <i>Gymnema sylvestre</i> , <i>Cyamopsis</i>	Diabetes	Antidiabetic Activity (lowering blood glucose levels)	Global

	Euphorbiaceae, Ginger	<i>tertragonoloba</i> , <i>Ocimum sanctum</i> L., <i>Costus pictus</i> , <i>Phaseolus vulgaris</i> , <i>Euphorbia hirta</i> Linn., <i>Zingiber officinale</i> Rosc			
[21]	Apocynaceae, Theaceae, Araliaceae, Asteraceae, and Plantaginaceae	<i>Rauvolfia serpentina</i> , <i>Camellia sinensis</i> , <i>Panax ginseng</i> , <i>Artemisia annua</i> , and <i>Digitalis purpurea</i>	diabetes, hypertension, cancer, cardiovascular disorders and	antioxidant activity, immune stimulation, apoptosis induction, and modulation of metabolic pathways	Asia, Europe, and coastal regions
[25]	Asteraceae, Papaveraceae, Apiaceae, Paeoniaceae, Berberidaceae, Lamiaceae, Fabaceae, Schisandraceae, paclitaxel, Taxaceae, Zingiberaceae	<i>Artemisia annua</i> , <i>Corydalis yanhusuo</i> , <i>Ligusticum chuanxiong</i> , <i>Paeonia lactiflora</i> , <i>Epimedium brevicornum</i> , <i>Salvia miltiorrhiza</i> , <i>Pueraria lobata</i> , <i>Schisandra chinensis</i> , <i>Taxus brevifolia</i> , <i>Curcuma longa</i>	Cancer, cardiovascular diseases	ROS gen, DA mod, vaso, AOX, AI, ERK inh, OB stim, BR inh, PLT inh, MMP-9 ↓, antiviral, hepato-prot, MT stab, NF-κB inh, anti-prolif.	Global

[18]	Curcumin, Berberine, Resveratrol, Ginsenoside s, Quercetin, Allicin, Epigallocate chin gallate (EGCG)	<i>Curcuma longa</i> L. (<i>Zingiberace ae</i>) <i>Berberis vulgaris</i> L. (<i>Berberidace ae</i>) <i>Vitis vinifera</i> L. (<i>Vitaceae</i>) <i>Panax ginseng</i> C.A.Mey. (<i>Araliaceae</i>) <i>Allium sativum</i> L. (<i>Amaryllidac eae</i>) <i>Camellia sinensis</i> (L.) Kuntze (<i>Theaceae</i>)	Cancer, Diabetes, Cardiovascular diseases, Infectious diseases, Neurodegenerative disorders	Antioxidant activity, Anti- inflammator y effects, Immunomod ulation, Antimicrobi al action, Apoptosis induction, Enzyme inhibition	Africa, South Asia, East Asia, Latin America, Europe, North America
[22]	Curcumin, Berberine, Resveratrol, Ginsenoside s, Quercetin, Allicin, Epigallocate chin gallate (EGCG)	<i>Curcuma longa</i> L. (<i>Zingiberace ae</i>), <i>Berberis vulgaris</i> L. (<i>Berberidace ae</i>), <i>Vitis vinifera</i> L. (<i>Vitaceae</i>), <i>Panax ginseng</i> C.A.Mey. (<i>Araliaceae</i>), <i>Allium sativum</i> L. (<i>Amaryllidac eae</i>), <i>Camellia sinensis</i> (L.)	Cancer, Diabetes, Cardiovascular diseases, Infectious diseases, Neurodegenerative disorders	Antioxidant activity, Anti- inflammator y effects, Immunomod ulation, Antimicrobi al action, Apoptosis induction, Enzyme inhibition	Africa, South Asia, East Asia, Latin America, Europe, North America

		<i>Kuntze</i> (<i>Theaceae</i>)			
[17]	Curcumin, Berberine, Resveratrol, Ginsenosides, Quercetin, Allicin, EGCG	<i>Curcuma longa</i> (<i>Zingiberaceae</i>), <i>Berberis vulgaris</i> (<i>Berberidaceae</i>), <i>Vitis vinifera</i> (<i>Vitaceae</i>), <i>Panax ginseng</i> (<i>Araliaceae</i>), <i>Allium sativum</i> (<i>Amaryllidaceae</i>), <i>Camellia sinensis</i> (<i>Theaceae</i>)	Cancer, Diabetes, Cardiovascular diseases, Infectious diseases, Neurodegenerative disorders	Antioxidant activity, Anti-inflammatory effects, Immunomodulation, Antimicrobial action, Apoptosis induction, Enzyme inhibition	Africa, South Asia, East Asia, Latin America, Europe, North America
[16]	Terminalia arjuna (Bark Powder)	<i>Terminalia arjuna</i> (Roxb. ex-DC.) Wight & Arn., Family: <i>Combretaceae</i>	- <i>Cardiac hypertrophy</i> - <i>Myocardial infarction (MI)</i> - <i>Oxidative stress-induced cardiac dysfunction</i> - <i>Inflammation-related heart damage</i>	- ↓ Oxidative stress markers: MDA, NO, AOPP, MPO - ↑ Antioxidant enzymes: SOD, Catalase, GPx - ↑ Gene expression: Nrf2, HO-1, HO-2 - ↓ Inflammatory markers: IL-1, IL-6, TNF-α, TGF-β,	Bangladesh, India, Sri Lanka, Nepal, Mauritius

				iNOS, NF-κB - ↓ CK-MB levels (cardiac injury marker) - ↓ Collagen deposition and fibrosis (histopathology)	
[6]	Omega-3 Fatty Acids	<i>Marine oils (e.g., fish oil from sardines, anchovies, mackerel); rich in EPA and DHA</i>	<i>Parkinson's Disease (PD), neurodegeneration</i>	- ↓ Oxidative stress markers: TBARS - ↑ Antioxidant enzymes: GSH, Catalase, SOD, GPx - Behavioral modulation: ↓ catalepsy, improved open field activity - Neuroprotection against MPP⁺-induced damage	Global (widely used in North America, Europe, South Asia, East Asia)
[9]	Cinnamon	<i>Cinnamomum verum J. Presl or Cinnamomum cassia (L.) J. Presl, Family: Lauraceae</i>	Type 2 Diabetes Mellitus (T2DM), Hypertension	- ↓ HbA1c (8.22% → 7.86%) - ↓ Systolic & Diastolic BP (SBP: 132.6 → 129.2)	South Asia (India, Pakistan), Middle East, Southeast Asia, Global (as

				mmHg; DBP: 85.2 → 80.2 mmHg) - ↓ Fasting Plasma Glucose (FPG), BMI, waist circumferenc e - No significant effect on lipid profile (TC, TG, HDL, LDL)	dietary supplement)
[26]	Ethanollic extract of Calotropis gigantea flowers (EECGF)	<i>Calotropis gigantea Linn (Family: Asclepiadace ae)</i>	Asthma, Allergic inflammation, Acute inflammation	- ↓ Leukocytosi s and eosinophilia (milk- induced model) - ↓ Mast cell degranulatio n (egg albumin- induced model) - ↓ Paw edema (carrageenan -induced model) - Bioactive constituents: steroids, saponins, flavonoids	South Asia (India), traditional systems like Ayurveda, Siddha, Unani