

Cross-sectional study: Use of natural products for health-associated conditions in Pakistan.

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ABSTRACT

Natural products have been widely utilized as a therapy regimen to cure and treat a range of diseases and ailments caused by bacteria, fungus, insects or by any other means. The natural products have different phytoconstituents present in their core molecule which produces their particular effects in several diseases. The immune system protects the body from infectious agents such as bacteria, viruses, or fungi. Thus, well-balanced immunity is pivotal for maintaining human health, as an insufficient level of immune defense leads to the development of several infections and health disorders. In contrast, the respiratory diseases caused due to cold weather, climate change might develop hindrance in breathing, bacteria and viruses are the common cause of pulmonary diseases. Respiratory tract infections have a high incidence in the general population and along with conventional medicines, natural products can also be used for their treatment. Bone related disorders are mainly due to the deterioration of bone cells, a decrease in bone density. Downregulation of bone mineral density are common in many bone diseases, therefore, the health of bone, muscle and joint is of primary importance. Diabetes mellitus is a long-term metabolic disease typified by elevated blood glucose levels throughout both fed and fasting states. The use of natural remedies decreases the blood glucose level and phytoconstituents present in them emphasize the treatment. The aim of the present special issue, entitled 'Natural Products and Skin Diseases' is to characterize new approaches in the treatment of skin disorders by collecting together papers that focus on such topics as skin penetration and photoaging, wound healing, oxidative stress, melanogenesis. A "gastrointestinal disease" is any medical condition that affects the gastrointestinal and is impacted by food-related problems. Both functional and structural gastrointestinal (GI) problems have the potential to seriously impact living quality but natural products have the tendency to treat them. The most common ailment that affects people worldwide is pain. Many natural products have long been utilized, and their modes of action are now known. The study comprises numerous questions to evaluate the use of these biological compounds among Pakistani population. Respondents from several age groups are the part of this study. This study gives a thorough understanding of commonly used herbal or organic products. The data of these results provide an initial overview on the use of home remedies from the patient's perspective in a Pakistan context. Bearing in mind the high use of home remedies that was reported by patients in the study, it is highly likely that young population in Pakistani need to advise patients on their use of home remedies during consultations. To this end, given the scarcity of reliable information on home remedies, further research is needed.

Keywords: Herbal products, Immune booster, Antioxidants, Antispasmodic, Insulin resistance

INTRODUCTION

The history of mankind makes it clear that natural products have been utilized as part of therapy regimens to treat a wide range of ailments, including those brought on by bacteria, viruses, fungus, insects, and other medical conditions. The compounds or phytoconstituents found in natural products are what cause them to exhibit the same therapeutic benefits as conventional medications. Today's consumers have very different expectations

when it comes to food intake; they now prioritize health over delight. To maintain sound health, specific protein consumption and meals high in antioxidants are encouraged in addition to frequent exercise. Natural foods such as vegetables and fruits have demonstrated a host of health advantages, including anti-inflammatory, anti-cancer, anti-bacterial, antiviral, immunomodulatory, protectant, laxative, and other medicinal properties.

By blocking several protein signaling pathways, curcumin decreases invasion, metastasis, cell proliferation, and angiogenesis in a range of cancers ⁽¹⁾. Green leafy vegetables and lemons are used to treat iron deficiency anemia because they increase hemoglobin levels. It contributes to an increase in blood iron bioavailability ⁽²⁾. On the other hand, yogurt and bananas are crucial to the mutual benefits of prebiotics and probiotics. According to research⁽³⁾, probiotics introduce beneficial bacteria into the stomach, whereas prebiotics function as a fertilizer for those bacteria.

This population-based survey research on Pakistani population will help the general public to boost and improve their physical well-being by introducing natural products into their everyday diets.

IMMUNE BOOSTING EFFECTS:

Immunity refers to the body's natural ability to defend against a wide range of ailments and diseases. The immune system is incredibly complex and sophisticated in mammals, able to produce an infinite number of cells and chemicals to combat a wide range of pathogens and foreign substances. Substances that may stimulate, enhance, and depress any part or stage of the immune system are referred to as immunomodulators. There are primarily two forms of immunity: acquired or specific immunity and innate or nonspecific immunity.⁽⁴⁾ Innate immunity, which is present from birth and serves as a defense against harmful substances. Dendritic cells, macrophages, neutrophils, basophils, eosinophils, and mast cells are the antibodies that are included in this sort of immunity. As soon as the virus comes into contact with the host, the first line of defense goes into effect (this might take hours or minutes). Dermis, mucosa, and immune system cells (monocytes, dendritic cells, macrophages, and neutrophils) found within the human body are all considered to be components of innate immunity. Majority of them have phagocytic activity. Innate immunity is distinct from acquired immunity, which is gained by interaction with the invader and is specific to that particular invader. It is a more advanced defense mechanism made up of T lymphocytes and B cells (also known as B lymphocytes). Upon detection of the pathogen, the adaptive immune mechanism and cells inside the system become active. Adaptive immunity is antigen specific, meaning that only a specific antigen will be invaded by the body over time due to the slow development of antibodies through vaccination. Immunological memory is a key component of

adaptive immunity, which is important for defense for the same illness recur in the future.

Apart from non-nutrients that work in combination with necessary nutrients to regulate metabolism and other vital processes in our bodies, our food is full of energy-giving nutrients that provide the basis for building blocks. The immunological signaling process is one of these mechanisms, emphasizing how crucial nutrition is in controlling immunity. Building up the immune system can be facilitated by eating a diet rich in foods that have immunomodulatory capabilities⁽⁵⁾. Macrophages, NK cells, and neutrophils—a kind of innate immunity—as well as T and B cells, which are components of our acquired immune system, are constituents of many meals⁽⁶⁾. Insufficient nutrition, on the other hand, might hinder the development of the immune system and result in immunological ineptness, making the body more vulnerable to infections, allergies, and other chronic health conditions. Antioxidants (carotene, vitamin C, vitamin E, folate, selenium, and phytochemicals), vitamin D, zinc, iron, dietary fiber, and omega-3 fatty acids are among the functional components of immunity-boosting foods that are necessary to sustain a strong immune system⁽⁷⁾. When these nutrients are added to the diet from natural sources (fruits and vegetables), the immune system is strengthened against a range of diseases. Carotenoids regulate immune function by apoptosis and gene regulation; they are antioxidants⁽⁸⁾. Other nutrients that are known to strengthen the immune system include protein, vitamin B6, B12, D, copper, zinc, magnesium, iron, omega-3, folate, probiotics, and selenium.

RESPIRATORY TRACT RELATED ISSUES:

Respiratory disorders are common due to its remoteness, cold and harsh climatic conditions as well as limited health care facilities. The people depend on the indigenous plant resources to treat various respiratory disorders. Herbal remedies for the treatment of respiratory disorders are common practice in many parts of the world. The two zones that make up the respiratory tract are the respiratory zone (alveolar duct to alveoli) and the conducting zone (nose to bronchioles), which forms a pathway for the conduction of inhaled gasses. Respiratory infections can be classified as either acute or persistent. Most often, bacteria or viruses cause pulmonary infections. Within a cell, a pathogen replicates in the viral form, resulting in the development of a disease like the flu, cough, sneezing, etc. Viral influenza is the cause of the flu. The majority of cases of the flu are

caused by inhaling small airborne droplets from an infected person's cough or sneeze. Additionally, touching your lips, nose, or eyes after coming into contact with something that has the virus on it can potentially expose you to the flu.

We most commonly use herbs including ginger, turmeric, it has a number of properties that could make it useful in fighting bronchitis. Among these, have antiviral, antibacterial, and anti-inflammatory effects. In addition to this, natural products like cinnamon may help fight viruses, open airways, thin mucus. All these works to provide immunity to fight against infections and make a person healthy.⁽⁹⁾

URINARY TRACT INFECTIONS:

This research highlights some of the medicinal herbs used to prevent or treat acute or chronic urinary tract infections, trials are undertaken to compare the efficacy of botanical products in UTI prevention, and other natural therapeutics reported for UTI. Urinary tract infections, or UTIs, are frequent diseases caused by bacteria that enter the urethra and infect the urinary system. These germs are usually from the skin or pubis. The most prevalent kind of urinary tract infection is cystitis, which can affect many regions of the urinary system. UTIs can also include kidney infections, or pyelonephritis. Urinary tract infections are caused by bacteria that enter the urinary tract. Though fungus can sometimes infect the urinary system, bacteria are the most prevalent cause of UTIs. Most UTIs are caused by the intestinal bacterium *E. coli*. Urinary tract epithelium irritation is brought on by UTIs. The following issues might be brought on by the inflammation: Patients may be experiencing lower back, pelvic, flank, or abdominal pain. pressure in the bottom region of the pelvic, a persistent, intense urge to urinate, a scorching sensation while urinating, frequent urination, passing little volumes of pee, murky urine, blood stains in the urine, and foul smelling urine.

There are several approaches used to treat and prevent persistent and recurring urinary tract infections (UTIs), including employing probiotics, natural foods, using antibiotics, and practicing excellent personal hygiene, however these approaches have not yet been resolved. By eliminating germs from the urinary system and boosting urine output, diuretic botanicals are said to combat urinary tract infections. Since ancient times, Ayurvedic medicines have been utilized to treat UTIs. According to many researches, the plants have demonstrated anti-uropathogenic properties. The natural products work better to defend against infections and prevent

relapse; they are also thought to be safe to use with minimal negative effects. The uro-bactericidal efficacy of root and seed extracts against several uropathogens that were clinically isolated from individuals with urinary tract infections has been observed. The extracts were found to contain a high concentration of natural glycosides in addition to medicinal properties of antioxidants such as tannins, phenolic compounds, steroids, terpenes, coumarins, and flavonoids. These glycosides are thought to function as molecule traps, preventing pathogenic microbes from sticking to host cells and subsequently inhibiting future disease development.⁽¹⁰⁾

BONES AND JOINTS HEALTH:

The equilibrium between the two processes—new bone production by osteoblast cells and bone degradation by osteoclast cells—is what leads to bone turnover and repair. A decrease in bone density and a downregulation of bone mineral density are common in many bone diseases. As a result, several treatment approaches have been used to control the process and stop bone from breaking. It is essential for preserving bone mass and averting any loss of bone density. Natural substances appear to have comparable or even greater therapeutic efficacy than synthetic compounds while mitigating their adverse effects. Natural compounds found in abundance throughout the environment have been utilized to regulate bone metabolism.⁽¹¹⁾

Thymoquinone is a significant active ingredient in most natural products and is responsible for most of their therapeutic effects. It is helpful and contributes to bone mending. The most prevalent kind of degenerative joint disease is arthritis, which is an inflammatory condition characterized by the degeneration of joint cartilage. Natural remedies are becoming more popular due to worries about the expense and safety of traditional arthritis medications.⁽¹¹⁾

SKIN RELATED PROBLEMS:

The biggest organ in the human body is the skin, which covers the body externally. It serves as the initial line of defense as well. Numerous specialist cells and structures are found in skin. The epidermis, dermis, and hypodermis are its three layers. Every layer contributes differently to the skin's general functionality.⁽¹²⁾ The skin is under continual assault from a variety of damaging causes every day. Because of this, there is a growing need for or usage of natural treatments that can alter immune activities in the skin, which has raised the

development of skin, especially in natural derived products. These days, contaminants from the environment harm our skin and have a detrimental effect on our quality of life. External factors are the primary source of skin premalignant and malignant growths as well as premature aging indicators. On the other hand, dryness, pruritus, thinning, atrophy, wrinkles, sagging, poor wound healing, and decreased blood flow are all included in this category.^[36]

Nowadays, people are interested in adopting natural remedies. One of the main determinants of our skin, hair, and nails is our diet. For the best results, we should also take the recommended dosage of these natural therapies. The shape and appearance of hair are influenced by certain physiological elements. We may prevent diseases of the scalp and hair by using natural therapies to keep our scalp healthy.

GASTROINTESTINAL ISSUES:

A "gastrointestinal disease" is any medical condition that affects the gastrointestinal tract. The digestive system, or Gastrointestinal tract, extends from the mouth to the anus and is impacted by food-related problems. Functional and structural are the classification of gastrointestinal related diseases. Both functional and structural gastrointestinal (GI) problems have the potential to seriously impact living quality, mental well-being, and even decrease lifespan. Conditions affecting normal bodily functions, such as the intestines' sensitivity to touch, their ability to move, and the brain's ability to regulate them, are referred to as functional gastrointestinal diseases.⁽¹³⁾ It is a collection of conditions affecting the gut-brain connection that are linked to changes in gut microbiota, altered mucosal and immunological function, motility issues, and visceral hypersensitivity. Frequently occurring instances include functional dyspepsia, IBS, and constipation. When you have a structural gastrointestinal disorder, both the appearance and functionality of your colon are aberrant. Structural GI illnesses include strictures, stenosis, hemorrhoids, diverticular disease, colon polyps, colon cancer, and inflammatory bowel disease. Surgical interventions are typically required for these conditions.

Currently, alternative therapies that are deemed "safe and natural" are being used for functional gastrointestinal disorders (FGIDs). Natural products have been used for their curative properties since ancient times. Historical accounts state that they were used for both sickness prevention and

treatment in Egypt, Mesopotamia, Greece, Rome, and Arabia. In their writings, ancient Indian authors also emphasized the therapeutic properties of cardamom, turmeric, ginger, cinnamon, and pepper⁽¹⁴⁾ Even today, several of these plants are utilized as herbal remedies to treat a range of ailments, including disorders of the gastrointestinal tract. Furthermore, recent studies have looked at how probiotics could lessen the side effects of intestinal mucositis brought on by chemotherapy⁽¹⁵⁾ The role of the gut microbiota in gastrointestinal disorders is becoming more well acknowledged.⁽¹⁶⁾ Additionally, a few natural compounds have demonstrated antioxidant and antibacterial properties that might be advantageous for improving gastrointestinal health.⁽¹⁷⁾ Moreover, toxicological research on anti-cancer herbs has been done.⁽¹⁸⁾ Additionally, evaluations of the antibacterial and antioxidant qualities of saponin extracts obtained from various plant sources have been conducted.⁽¹⁷⁾ These studies have provided insightful information on the potential therapeutic benefits.

DIABETES MELLITUS:

Diabetes mellitus is a long-term metabolic disease typified by elevated blood glucose levels throughout both fed and fasting states.⁽¹⁸⁾ It is brought on by poor insulin production and insulin resistance as a result of the pancreatic beta cells that create insulin being destroyed. Blood glucose must be transported by insulin to organs and cells that rely on it, including the liver, muscles, and adipose tissue. Diabetes comes in several forms, including gestational diabetes mellitus, type I IDDM (insulin dependent diabetes mellitus), and type NIDDM (non-insulin dependent diabetes mellitus). Diabetes cannot cause harm in and of itself, but it can lead to a number of other conditions that negatively impact quality of life, including reduced immunity, retinopathy, nephropathy, and CVS. More than other varieties of diabetes that are manageable is type II diabetes⁽¹⁸⁾

The use of natural items in daily life to reduce blood glucose levels and boost immunity will be the main emphasis of this study. Phytoconstituents included in these natural products work pharmacologically to keep the body's glucose levels stable. These substances function by blocking enzymes, preventing free radical reactions, minimizing oxidative stress in cells, imitating insulin's activity, and repairing beta cell damage.

ANALGESIC EFFECTS:

The most common ailment that affects people worldwide is pain. As the main symptom of the clinical presentation of some illnesses, pain is often connected with problems of the nervous system and musculoskeletal system. Inflammation of the afflicted bodily part is linked to pain.

Many natural products have long been utilized, and their modes of action are now known. Several of them, like ginger, are just as effective as ibuprofen.⁽¹⁹⁾ The effectiveness of these natural plant products is increased when they are used in complementary and alternative medicine (CAM) in addition to allopathic medications. However, because of their

METHODOLOGY

This cross-sectional study is designed to investigate the use of natural products for the mitigation, treatment and cure of minor ailments in order to sustain health among the population of Pakistan. The questionnaire for this survey comprises both the open-ended and closed-ended questions to evaluate the prevalence of these biological compounds among the diverse population which includes ages of all groups with different levels of academic knowledge and awareness. A deep insight of commonly used compounds was gathered to analyze the obtained data qualitatively and quantitatively. Sampling strategy that is chosen for the survey-based research includes online-survey form in which respondent's confidentiality, data security, voluntary participation, informed consent and all the relevant ethical parameters were ensured. Conducted survey aimed to collect data from a sample size of at least 200 individuals during a fielding period of at least one month.

DISCUSSION

IMMUNITY BOOSTING EFFECTS:

This paragraph illustrates the natural products that have already been reported in researches as immunity boosters and are also the part of questionnaire. It includes *Prunus amygdalus* (almond), *Allium sativum* (garlic), *Zingiber officinale* (ginger), *Citrus* species, *Spinacia oleracea* (spinach), *Cucumis melo* (melon seeds), *Citrullus lanatus* (watermelon seeds), *Cucurbita pepo* (pumpkin seeds), *Cucumis sativus* (cucumber seeds), *Curcuma longa* (turmeric), and yogurt. These natural products, by various mechanisms, show immune-modulating effects in minor ailments.

unpredictable dose, natural products could not work well on their own.⁽²⁰⁾ Numerous natural items, including botanical oils (peppermint, lavender, and rosemary), turmeric, ginger, and clove, as well as other goods, include phytochemicals that have medicinal properties that decrease inflammation and alleviate pain.

By boosting immunity and alleviating pain, natural products can improve the standard of life and help cut down on the usage of synthetic medication, which is becoming more and more associated with negative side effects in persistent pain.⁽²¹⁾ Toxic metals are present in herbal medicine together with pharmacologically active substances, which is also unacceptable.

In addition to this, among the diverse population of Pakistan, certain other natural products are being used that have also shown efficacy as immune boosters. The list of biological products comprises the seeds of *Foeniculum vulgare* Mill (fennel seeds), *Solanum melongena* (eggplant), *Phoenix dactylifera* (dates), *Lagenaria siceraria* (bottle gourd), leaves of *Senna alexandrina* Mill. (senna leaves), *Beta vulgaris* (beet roots), honey, *Moringa oleifera* (moringa leaves), *Nigella sativa* (black cumin), seeds of *Nelumbinis semen* (lotus seeds), oil of *Olea europaea* (olive oil), *Carica papaya* (papaya), seeds of *Cuminum cyminum* (cumin seeds), seeds of *Papaver somniferum* (poppy seeds), *Pistacia vera* (pistachio), *Ficus carica* (fig), and *Asphaltum punjabianum* (shilajeet).

A wide variety of phytoconstituents and biological compounds are found in these natural products. Considering these chemical compounds, many of them exhibit immune-related therapeutic effects. These compounds have the ability to exhibit their medicinal effects through several mechanisms. Such therapeutic effects are directly or indirectly related to the immune-stimulating action of the above-mentioned compounds; some of them are discussed below:

ANTI-OXIDANT EFFECT:

A more comprehensive definition of an antioxidant is any material that considerably reduces or stops the oxidation of an oxidizable substrate when present at small concentrations relative to those of the substrate. The phrase "oxidizable substrate or free radical" refers to any kind of chemical that exists inside the biological systems; these free radicals produced in the body harm several different targets, such as DNA, proteins, and other cellular components⁽²²⁾. Free radicals are the unavoidable consequences of the body converting food into energy. In addition, exercise, cigarette

smoking, air pollution, and sunshine may all produce free radicals^{(22); (23)}. There are many layers of organization in cells that defend against the harmful effects of reactive oxidants produced during aerobic metabolism, often known as oxidative stress.⁽²⁴⁾ Three degrees of protection are provided for defense strategies: repair, interception, and prevention.⁽⁶⁾ The location of antioxidant chemicals and enzymes as well as the preservation of sufficient antioxidant levels are aspects of the regulation of antioxidant capacity. Antioxidants can be derived from hundreds, if not thousands, of different chemicals. The most well-known ones include the minerals manganese and selenium as well as the vitamins C, E, beta-carotene, and other similar carotenoids. Glutathione, coenzyme Q10, lipoic acid, flavonoids, phenols, polyphenols, phytoestrogens, and several additional compounds are linked by them.^[37]

Antioxidants mechanism of action includes: As scavengers of radicals, antioxidants work. Flavonoids, phenolic acids, ligands, and phenolic compounds are a few types of antioxidants that scavenge free radicals.^[38]

By forming compounds with transition metals, antioxidants are able to prevent the metals' catalytic impact during the oxidation process^[38]

Selenium contains glutathione peroxidase, an antioxidative enzyme that inactivates free radicals and other oxidants, especially hydrogen peroxide. Selenium breaks down peroxides to generate stable molecules that cannot produce radicals.^[38]

Antioxidants that deactivate oxygen in its singlet state, light may convert regular triplet oxygen into singlet oxygen in the presence of photosensitizers like chlorophyll and pheophytin.^[38]

Antioxidants stop the enzymatic processes necessary for the auto-oxidation process. Examples of substances that inhibit lipoxygenase include gallates, phenolic acids, and flavonoids^[38]

Here is the list of natural product that act as antioxidant:

NATURAL PRODUCTS	ANTIOXIDANT COMPOUNDS
Ginger	Gingerol, paradol, shogaol, zingerone, quercetin
Fennel seeds	Vit C vit A, beta-carotene, manganese, copper.
Garlic	Allicin
Eggplant	Nasunin, chlorogenic acid, quercetin, beta-carotene, naringenin, vitamin C, manganese, Mg
Dates	Phenolic contents (proto catechuic acid, p-coumaric acid and ferulic acid), Vit A, vit C
Bottle gourd	Vit C, Flavonoids (quercetin, kaempferol, myricetin, luteolin, apigenin), carotenoids, Zn
Almond	Vit E, zinc, Flavonoids (quercetin, kaempferol), polyphenols (catechins and epicatechins, Phytosterol (beta-sitosterol, campesterol), Lignans
Orange	Vit C, flavonoids (hesperidin, naringenin), Carotenoids (beta-carotene, lutein, zeaxanthin)
Senna leaves	Flavonoids (quercetin, kaempferol, isorhamnetin)
Beet root	Beta-cyannin, vitamin C, Mg
Honey	Phenolic acids (caffeic acid, chlorogenic acid), Flavonoids (quercetin, kaempferol, apigenin, luteolin, naringenin), vitamin C
Moringa leaves	Flavonoids (quercetin, kaempferol, chlorogenic acid, beta-carotene), vit C, A
Black cumin	Thymoquinone, thymol, Flavonoids (quercetin, kaempferol, rutin), vit C
Lemon	Flavonoids (hesperidin, naringenin), vit C
Lotus seeds	Alkaloids (nelumbine, leinsinine), flavonoids (quercetin, kaempferol), Zn, Mg

Olive oil	Polyphenol (hydroxytyrosol, oleuropein), vit E, Phytosterol (beta-sitosterol, campesterol, stigmasterol)
Papaya	Carotenoids (beta-carotene, lutein, Flavonoids (quercetin, kaempferol), vit C
Cumin seeds	Caffeic acid, quercetin, kaempferol, apigenin, vit C, A
Poppy seeds	Zn, Mg
Pistachio	Lutein, zeaxanthin, gamma-tocopherol, copper, manganese, Phytosterol (beta-sitosterol, campesterol, stigmasterol)
Yogurt	Zn, Mg
Melon seeds	Vit C, vit E, Zn, Cu, Mg
Watermelon seeds	Polyphenol, vit E, Zn, Mg
Pumpkin seeds	Vit E, carotenoids, Phytosterol (beta-sitosterol, campesterol, stigmasterol), Zn
Cucumber seeds	Vit E, Zn, phytosterol, Polyphenols (flavonoids=quercetin, kaempferol, apigenin, luteolin), tannin, lignans, magnesium
Shilajit	Fulvic acid
Fig	Polyphenol, flavonoids, carotenoids

ANTI-MICROBIAL EFFECTS:

Agents that either destroy or inhibit the growth of microorganisms are known as antimicrobials, and they are often categorized based on the type of microbes they target. These consist of agents that are antiviral, antifungal, antibacterial, and anti-parasitic. Microbes like these infiltrate the body, proliferate, and obstruct regular bodily processes to create infections. Infections by bacteria, fungi, viruses, and parasites can occur in our systems when we don't have the proper nutritional balance or when we are exposed to a compromised immune system (due to medicine or sickness).

Antimicrobial foods and supplements function by fortifying the immune system and bolstering the body's defenses against outside invaders. Few of them are listed below:

NATURAL PRODUCTS	ANTIMICROBIAL COMPOUNDS
Ginger	Gingerol, paradol, zerumbone
Garlic	Allicin, ajoene, selenium and germanium
Honey	Hydrogen peroxide
Black cumin	Carvacrol
Cumin seeds	Cuminaldehyde

PROBIOTICS:

According to the present-day approval, probiotics are live bacteria that, when given in sufficient quantities, can improve the host's health and wellbeing⁽²⁶⁾. Therefore, based on related pathways, the advantages of probiotics extend beyond the gut microbiota's mediation. The ability of probiotics to adhere to the intestinal mucosa and epithelial cells of the gastrointestinal tract, a prerequisite for their effectiveness, is crucial for preventing them from being expelled by gut motility. This allows the probiotics to multiply, colonize, and alter the immune system of the entire body by suppressing pathogens through competition. Natural products containing probiotics include:

IMMUNE STIMULATORS:

This effect encompasses all the natural products that, in one way or another, strengthen the activity of the immune system. The details are mentioned below:

NATURAL PRODUCTS	PROBIOTICS
Yogurt⁽²⁵⁾	Lactobacillus, bifidobacterium

NATURAL PRODUCTS	CHEMICAL COMPOUNDS	FUNCTIONS
Fennel seeds, eggplant, date, beet roots, lotus seed, yogurt, melon seeds, watermelon seeds, cucumber seed	Potassium ⁽²⁷⁾	Contributes to critical immunological and antimicrobial processes, such as cytokine production and inflammasome activation.
Dates, bottle gourd, beet roots, moringa leaves, cumin seed, poppy seeds, melon seeds	Iron ⁽²⁸⁾	Immune cell development and proliferation, especially lymphocytes, which are linked to the production of a particular response to infection.
Cucumber seed, melon seed, poppy seeds	Phosphorus ⁽²⁹⁾	Energy metabolism for cellular function, immune support by maintaining a stable microbial environment.
Poppy seeds, yogurt	Calcium ⁽³⁰⁾	Controls the provision of nutrients to immune cells for multiplication to fight against infections.
Pumpkin seeds, melon seeds, yogurt, lotus seeds, moringa leaves	Amino-acids ⁽³¹⁾	The generation of antibodies, cytokines, and other cytotoxic chemicals; the activation of T lymphocytes, B lymphocytes, natural killer cells, and macrophages; and the cellular redox status, gene expression, and lymphocyte proliferation.
Yogurt	Vitamin D	It has effects on monocytes and dendritic cells (dcs), suppresses T cell proliferation ⁽³²⁾ , maturation, and induction of T regulatory cells, and decreases the production of inflammatory cytokines (IL-17, IL-21) with an increase in the production of anti-inflammatory cytokines (IL-10). It also inhibits B cell proliferation, blocks B cell differentiation, and secretes immunoglobulins. It prevents monocytes from producing inflammatory cytokines such as tnfa, IL-1, IL-6, IL-8, and IL-12 ⁽³³⁾
Watermelon seed, yogurt, pistachio, papaya, lotus seed, honey, beet root, eggplant	Vitamin B ^[39]	Vitamin B1 has an anti-inflammatory action on macrophages and inhibits oxidation. Vitamin B2- immune-modulatory function Vitamin B3-energy production and DNA repair Vitamin B5- energy metabolism Vitamin B6- production and function of immune cell, synthesize antibodies Vitamin B9- production and function of immune cell, DNA synthesis and repair Vitamin B12- production and maturation of immune cells.

DIABETES MELLITUS:

According to the responses collected in our research survey, different plants are commonly employed for their potential

antidiabetic properties, ⁽³⁴⁾ with examples such as Aloe barbadensis (aloe vera), Cuminum cyminum (cumin seed), Coriandrum sativum (coriander), Emblica officinalis (Indian gooseberry), java plum (Syzygium cumini), Indian berries (Phyllanthus emblica), garlic (Allium sativum), Ginger (Zingiber officinale), fenugreek seed (Trigonella foenum), bitter melon (Momordica charantia), Indian lilac (Azadirachta indica), Cinnamon (Cinnamomum cassia), and curry leaves (Murraya koenigii) being frequently utilized. These plants contain phytoconstituents such as polyphenols, curcumin, resveratrol, flavones, flavonoids, tannins, polysaccharides, saponins, sesquiterpenes, limonene, and alkaloids, which aid in reducing hyperglycemia in diabetic patients.^{(18), (34), (35) [40]}

The identified phytoconstituents exert their effects through insulin sensitization, mimicking insulin action, inhibiting carbohydrate metabolic enzymes, repairing pancreatic beta cells, and reducing free radical reactions. Insulin resistance, a key factor in diabetes, is often associated with dysfunction in the glucose transporter 4 (GLUT4) movement from the

cytoplasm to the membrane, linked to an aberrant insulin signaling pathway.

Incretin-based therapy and leptin therapy have been introduced for beta cell recovery and glucose homeostasis regulation. Advanced tools like PCR, DNA microarrays, and gene-knockout facilitate gene damage removal. This study consolidates information on natural products, their active components, and their pharmacological effects on diabetes. The combined use of these natural products aims to manage and treat diabetes-related complications, providing essential information for diabetes management ^{(18), (35)}

This study summarizes the natural products' active components and their pharmacological effects on diabetes. These natural products are used in combination to manage and treat diabetes-related complications. The goal of this review article is to provide authentic required information for the management of diabetes. The survey's findings show how respondents felt about specific natural products and their possible advantages ^{(18), (34), (35) [40]} Here is a brief commentary based on the available information:

NATURAL PRODUCTS	ANTI-DIABETIC COMPOUNDS	MECHANISM OF ACTION
Cinnamomum cassia/Cylon cinnamomum ^[41]	Proanthocyanidins, cinnamaldehyde, cinnamic acid.	Reduce insulin resistance.
Murraya koenigii ^[42]	Alkaloids, carbazol.	Improve glucose metabolism in adipose via Akt signaling pathway. Inhibit carbohydrate metabolism.
Trigonella foenum ^[43]	Diosgenin, galactomannan, trigonoeoside, 4-hydroxyisoleucine.	Inhibit ROS reaction
Momordica charantia ^[44]	Charantin	Reduce oxidation of beta cells, regulate sugar metabolism.
Azadirachta indica ^[44]	Nimbin, Nimbidol, nimbidin	Improve insulin sensitivity, inhibiting enzymes for carbohydrate metabolism.
Allium sativum ^[45]	Diallyl trisulfide, Allin, s. allyl cysteine sulfoxide	Insulin sensitization, regulation of glucose metabolism
Phyllanthus emblica ^[46]	Quercetin, gallic acid, kaempferol	Antioxidant, insulin secretion, beta cell protection.
Coriandrum sativum ^[47]	Linalool	Antioxidant, reduce insulin resistance, anti-inflammatory.
Emblica officinale ^[48]	Ellagic acid	Antioxidant, GLUT-4 translocation, AMPK and PKC in insulin signaling
Syzygium cumini ^[49]	Mycaminose compounds	Sensitization insulin
Aleo barbadensis ^[50]	Polysaccharides	Antioxidant activity

Zingiber officinale ^[51]	Gingerol,shogaols,zingiberon,paraol.	ICMA-1 expression is reduced, ROS improves, inhibit MCP-1 and ICMA -1 expression
Malus domestica	Quercetin	Antioxidant
Curcuma longa ^[52]	Curcumin, phenolic compounds	ICMA-1 expression is reduced, ROS improves, inhibit MCP-1 and ICMA -1 expression
Nigella sativa ^[53]	Thymoquinone, nigellone	Insulin secretion, glucose absorption, gluconeogenesis, antioxidant
Salvia hispanica	Linolenic acid, tocopherol	Reduce insulin resistance.
Chenopodium quinoa	Phenolic compounds,minerals	Antioxidant, lower insulin resistance.
Olea europaea ^[54]	Hydroxytyrosol, oleuropein	Insulin sensitivity and lipid metabolism

SKIN RELATED ISSUES:

Our survey revealed that a significant portion of the younger population grapples with at least one skin problem. In response, our surveyed population has turned to natural products to enhance their quality of life. These natural products encompass a range of items such as Curcuma longa (turmeric), Oryza sativa (rice flour), honey, Aloe barbadensis miller (aloe vera), Cocos nucifera (coconut), Solanum lycopersicum (tomato), Cicer arietinum L. (gramflour), Linum usitatissimum (flax seed), Elettaria cardamomum, Syzygium aromaticum (clove), Citrus limon, Azadirachta indica (neem), curd, and Cucumis sativus (cucumber), along with other products like mustard oil, multani mitti, and Beta vulgaris L. (beetroot).

These natural products contain various phytoconstituents, including lycopenes, curcuminoids, antioxidants, trisaccharides, minerals, vitamins, phenylpropanoids, caryophyllene, linolenic acid, linoleic acid, quercetin, lecithin, and fatty acids.

ANTIOXIDANTS:

These are the substances that inhibit damaging oxidizing agents in living organisms, and Oryza sativa, Solanum lycopersicum, Elettaria cardamomum, Citrus limon, Cucumis sativus, and potato peel are identified as natural products with antioxidant properties. These natural products have different phytoconstituents which are ferulic acid, crude fibers, ash proteins quercetin, vitamins C and E and anethole which exhibit antioxidant activity.^[55]

NATURAL PRODUCTS	ANTIOXIDANT COMPOUNDS
Oryza sativa	Flavonoids, tocopherol, phytic acid and phenolic acid
Solanum lycopersicum	Carotenoid, lycopenes, ascorbic acid, and vitamin E
Elettaria cardamomum	Phenolic and Flavonoids
Citrus lemon	Vitamin C and E
Cucumis sativus	Ferulic acid, alpha tocopherol
Potato peel	Polyphenol, ascorbic acid, Carotenoid and protein

ANTI-AGING EFFECTS:

It refers to the delay in aging process of the skin.

Honey, Aloe barbadensis Miller, Cucumis sativus, Oryza sativa, Solanum lycopersicum, and Syzygium aromaticum are among the natural items that have anti-aging properties.^[55]

These natural products contain a variety of phytoconstituents, including fructose, sucrose, trisaccharides, and soluble vitamins such as ferulic acid, which have anti-aging properties and help prevent wrinkles on the skin.

NATURAL PRODUCTS	ANTI-AGING CHEMICAL COMPOUNDS
Honey	Collagen, alpha lipoic acid
Aloe barbadensis miller	Mucopolysachharides, collagen and elastin fibers
Oryza sativa	Vitamin, rice protein hydrolase
Cucumis sativus	Folic acid and Vitamin C

DETOXIFICATION EFFECTS:

It is the process of clearing the skin of toxic chemicals, which opens the pores.

Cicer arietinum L., Cucumis sativus, Oryza sativa, and Curcuma longa are the natural items that have detoxifying properties.

Curcuminoids, monoterpenes, ferulic acid, ascorbic acid, caffeic acid, lycopenes, fiber acid, vitamin B6, and folate are some of the phytoconstituents found in these natural products. [55]

NATURAL PRODUCTS	DETOXIFYING COMPOUNDS
Cucumis sativus	Ash, fiber acid and folate
Curcuma longa	Turmerone, monoterpenes and curcuminoids

ELIMINATION OF DEAD SKIN CELLS THROUGH EXFOLIATION:

Sesame oil, Cicer arietinum L., and curd milk with lemon are examples of natural items that have exfoliating properties.

These natural products contain the phytoconstituents lactic acid, AHA, lecithin, vitamin A, D, E, vitamin B6, and folate. [55]

NATURAL PRODUCTS	CHEMICAL COMPOUNDS
Curd	Glycolic acid, lactic acid and AHA
Sesame oil	Sesaminol and linolenic acid
Cicer arietinum	Maleate, vitamin B6

ANTI-PIGMENTATION EFFECT:

Reduce the visibility of pigmentation for example dark spots.

The natural products which have these properties are Curcuma longa, Azadirachta indica, Linum usitatissimum.

The phytoconstituents which are present in these natural products are curcumin, curcuminoids, monoterpenes, lecithin and ascorbic acid which exhibit the anti-pigmented property. [56]

NATURAL PRODUCTS	ANTI PIGMENTED COMPOUNDS
Curcuma longa	Curcumin, demthoxycurcumin
Azadiracta indica	Quercetin
Linum usitatissimum	Beta carotene and alpha linolenic acid

ANTI-INFLAMMATORY EFFECTS:

The natural products which have anti-inflammatory properties are Aloe barbadensis miller, coconut oil, Murraya koenigii and Linum usitatissimum. [69]

The phytoconstituents which are present in these natural products are lycopenes, lauric acid, caproic acid, limonene, caryophyllene, linoleic acid, omega 3 fatty acids and ceramides have anti-inflammatory properties.

NATURAL PRODUCTS	ANTI INFLAMMATORY CHEMICAL COMPOUNDS
Aloe barbadensis miller	Anthraquinones, C glycosyl chromone
Coconut oil	Lauric acid
Murraya koenigii	Carbazole alkaloids
Linum usitatissimum	Carrageenan

PAIN RELIEF EFFECTS:

Different plants are commonly employed for their potential pain relieving and anti-inflammatory activity such as turmeric (Curcuma longa), clove (Eugenia caryophyllata), ginger (zingiber officinale), rosemary oil, peppermint oil (Mentha piperita), lavender oil (Rosmarinus officinale), eucalyptus oil (Tasmanian blue gum). These plants contain phytoconstituents such as phenolic and polyphenols, flavonoids, terpenes, essential oils, tannins, quinones, alkaloids. [57]

Traditional pain relief often involves powerful drugs, which work on different pain receptor of our body. However, they do have some serious consequences instead of being widely

used. Natural remedies, like plant-based products, are considered safer because they have fewer side effects compared to other pain-killers. [61] Other pain medications, such as NSAIDs, can cause issues like stomach bleeding and liver damage when used for a long time.

According to this survey, natural remedies can help to reduce inflammation and block pain signals, which in turn helps people feel better. Both chamomile and lavender encourage relaxation, which may lessen pain perception. Natural products encourage holistic health and frequently have fewer adverse effects.

NATURAL PRODUCTS	SCIENTIFIC NAME	ACTIVE CONSTITUENTS	MECHANISM OF ACTION
Clove [58]	Eugenia caryophyllata	Eugenols, beta pinene, limonene, farseol	Neurotransmitters involved in pain perception.
Turmeric [59]	Curcuma longa	Curcuminoids (curcumin,b-methoxycurcumin	Anti-inflammatory and antioxidant effects, modulating multiple signaling pathways
Ginger[60] [61]	Zingiber officinale	Phenolic compounds (gingerol, shaogol ,and paradols), terpene, oleosin	Anti-inflammatory effect, antioxidant activity.
Rosemary oil[62]	Rosmarinous officinale	Alpha-pinene, camphor	Exhibits analgesic and anti-inflammatory effect,muscle relaxation,
Lavender oil[63]	Lavandula angustifolia	Essential oil, phenolic compounds.	Modulating neurotransmitter activity.antioxidant.
Peppermint oil [64]	Mentha piperita	Carvacrol, menthe, limonene	Reduce pain spasm, natural analgesic.
Eucalyptus [65]	Tasmanian blue gum	Essential oil, phenolic compounds	Cooling effect, muscle relaxation
Honey [66]		Phenols, vitamins, zinc, carbohydrates.	Anti-inflammatory effect, antioxidant activity.
Garlic [46]	Allium sativum	Allicin, allin, diallyl disulphide	Antioxidant, anti-inflammatory.
Black pepper [67]	Piper nigrum	Alkaloids, piperine	Anti-inflammatory, an analgesic.
Capsicum [68]	Capsicum annum	Capsaicinoids (capsaicin), tocopherol.	Binds to pain receptor (trpv1) and reduce pain signals.
Willow bark [69]	Salix spp	Salicin	Inhibiting the enzyme involved in inflammatory processes, antipyretic, analgesic.

Phytoconstituents and Their Roles in GI Health:

GASTROINTESTINAL ISSUES:

A variety of natural ingredients have been reported for their potential effectiveness in addressing gastrointestinal (GI) issues. [70] These include basil seeds (Ocimum basilicum), cumin seeds (Cuminum cyminum), ispaghol (Plantago ovata), peppermint (Mentha piperita), ginger (Zingiber officinale), garlic (Allium sativum), fennel seed (Foeniculum vulgare), honey, lemon juice (Citrus limon), melon (Cucumis melo), cardamom (Elettaria cardamomum), spearmint water (Mentha spicata), chamomile (Matricaria chamomila), clove (Syzygium aromaticum), bishop’s weed (Trachyspermum ammi), green tea (Camellia sinensis), black cumin (Nigella sativa), papaya (Carica papaya), and banana (Musa acuminata).

ANTIOXIDANTS:

Antioxidants are chemical compounds that safeguard cells from free radical damage, thereby protecting the gut lining and promoting the growth of beneficial bacteria. [37] Flavonoids, such as isoflavones found in black cumin (Nigella sativa), exhibit antioxidant properties.

NATURAL PRODUCT	ANTIOXIDANT PROPERTIES
Basil seeds	Orentin , vicenin

Ginger ^[7] .	Gingerol
Honey ^[37]	Flavonoids, phenolic acid , catalase and peroxidase
Lemon ^[37]	Vitamin c
Melon ^[37]	Vitamin C, beta carotene and lycopene
Cardamom ^[37]	Flavonoids and phenolic compounds
Cinnamon ^[37]	Cinnamaldehyde
Clove ^[37]	Eugenol

ANTI-INFLAMMATORY AGENTS:

Compounds with anti-inflammatory properties, such as those found in ginger, chamomile, and lemon juice, help alleviate pain and reduce inflammation in the GI tract by inhibiting enzymes involved in the production of inflammatory mediators^[71]

NATURAL PRODUCT	ANTI INFLAMMATORY PROPERTIES
Garlic ^[71]	Allicin
Chamomile ^[71]	Flavonoids and terpenoids

ANTISPASMODICS:

Antispasmodic agents, like peppermint and fennel seed, relieve cramps and spasms in the stomach, intestines, and bladder by inhibiting smooth muscle contractions in the GI tract. They are used in the treatment of various GI conditions, including peptic ulcers, nausea, vomiting, and motion sickness.

NATURAL PRODUCT	ANTISPASMODIC
Mint ^[72]	Menthol
Fennel seeds ^[73]	Anethole
Bishop's weed ^[74]	Thymol

These natural ingredients and their phytoconstituents offer promising avenues for managing GI issues effectively. Their diverse mechanisms of action contribute to their potential therapeutic benefits in promoting gastrointestinal health.

BONES, JOINTS AND MUSCLES HEALTH:

Variety of responses for natural substances are obtained from this domain, and includes natural products like citrus fruits, eggs, fish, milk, nuts, lady finger (*Abelmoschus esculentus*), bishop's weed (*Aegopodium podagraria*), olive (*Olea europaea*), mustard oil (*Brassica nigra*), cucumber (*Cucumis sativus*), water chestnuts (*Eleocharis dulcis*), leafy vegetables, edible gum, reddish (*Raphanus sativus*), garlic (*Allium sativum*), clove (*Syzygium aromaticum*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), flax seeds (*Linum usitatissimum*), lotus seed (*Nelumbo nucifera*), sesame seed (*Sesamum indicum*), shilajit (*Asphaltum punjabianum*), mint (*Mentha piperita* L), almond (*Prunus amygdalus*), aloe vera (*Aloe barbadensis miller*), dates (*Phoenix dactylifera*), beans (*Phaseolus vulgaris*).

Many of them are effective in maintaining health of bones, joints and muscles but improving the diseases associated with them, their actions are further discussed below:

NATURAL PRODUCTS	CONSTITUENTS	THERAPEUTIC ACTION
Citrus fruits ^[75]	Vit C, calcium, potassium, magnesium	Collagen synthesis, regulate muscle contraction and overall muscle function
Egg ^[76]	Proteins (albumin, vitellins), vit D Ca, P, vit K, omega-3-fatty acids, choline	Muscle maintenance, Ca absorption, bone formation, bone metabolism
Fish ^[77]	Omega-3-fatty acids, vit D, Ca, P, collagen, proteins	Maintain joint health and reduce muscle stiffness
Milk ^[78]	Ca, vit D, P, vit K, Mg, proteins (whey and casein)	Muscle function, growth, repair
Nut ^[79]	Ca, Mg, P, vit E, omega-3-fatty acids	Bone formation, regulation of calcium, anti-oxidant, anti-inflammatory
Lady finger ^[80]	Vitamin K	Bone building

Olive oil ^[81]	Oleic acid	Bone and mineral density
Mustard oil ^[82]	Allyl isothiocyanate	Anti-inflammatory
Waterchest nuts ^[83]	Potassium, magnesium	Maintain bone density
Cabbage leaves ^[84]	Boron	Maintain bone health, prevent the loss of estrogen, which is essential for calcium absorption and maintaining bone density.
Edible gum ^[85]	Calcium, magnesium, collagen, vit C	Anti-inflammatory, support bone and muscle health
Garlic ^[86]	Allicin, sulphur compounds, vitamin C, vitamin B6	Anti-oxidants
Clove oil ^[87]	Eugenol, calcium, magnesium	Anti-inflammatory
Turmeric ^[88]	Curcumin, antioxidants, cuminoids	Bone density, muscle recovery
Ginger ^[89]	Gingerol, shagoal	Antioxidants

RESPIRATORY TRACT INFECTIONS:

There are about 54 species on which studies have been conducted and published about their usage in respiratory problems including: Adhatoda and Achyranthes aspera (prickly chaff flower), Adhatoda Vasica (Malabar nut), Onosma bracteatum (saqil-ul-hammam), Viola odorata (sweet violet), Glycyrrhiza glabra (liquorice), Pindrow Abies (pindrow fir), Precatorius Abrus (rosary pea), Artemisia vulgaris (common mugwort), Officinalis Emblica (Indian gooseberry), Cauliflower (Cannabis sativa), Capsicum annum (chilli), Sativa Nigella (black cumin) and, Zingiber officinalis (ginger). ⁽⁹⁾

However, Pakistani population have several other opinion on natural products for treating these infections which includes:

NATURAL PRODUCT	PHYTOCONSTITUENT	THERAPEUTIC ACTION
Ginger ^[90]	Shogaol, gingerol, glucopyranoside	Anti-inflammatory Bronchodilator
Cinnamon ^[91]	Cinnamaldehyde, Cinnamate, cinnamic acid	Anti-inflammatory Anti-microbial Anti-oxidant
Jaggery ^[92]	Flavonoid, alkaloids	Detoxifying agent Anti-inflammatory Bronchodilator Antioxidant Lung cleaner

Ginger (Zingiber officinale), Turmeric (Curcuma longa), mustard oil (Brassica nigra), cinnamon (Cinnamomum verum), liquorice (Glycyrrhiza glabra), olive oil (Olea europaea, Clove (Syzygium aromaticum), mint (Mentha piperita), black pepper (Piper nigrum), Nutmeg (Myristica fragrans), star anise (Illicium verum), drum stick (Moringa oleifera), fennel seed (Foeniculum vulgare mill), thyme (Thymus vulgaris), cardamom (Elettaria cardamomum), Carom leaves (Trachyspermum ammi).

Many of the abovementioned products shows therapeutic efficacy by acting through various mechanisms inside the body. The details are further described as:

Honey ^[93]	Flavanoids, Phenolic compounds	Anti-microbial Anti-fungal Anti-viral Anti-inflammatory Anti-oxidant
Liquorice ^[94]	Glycyrrhizin, β-glycyrrhetic acid, glabrin, isoflavones	Anti-viral Anti-inflammatory Expectorant activity
Clove ^[95]	Flavanoids (eugenol), Alkaloids	Anti-microbial Anti-inflammatory Immune-stimulant Expectorant
Turmeric ^[96]	Curcuma longa, Flavanoids, Curcuminoids	Anti-bacterial Expectorant

Blackpepper ^[97]	Piperine	Anti-oxidant Anti-inflammatory Anti-congestive property
Mint ^[98]	Flavanoids, Glycosides, Alkaloids, Steroids, Tannins	Decongestant Expectorant Anti-oxidant Anti-inflammatory
Drumsticks ^[99]	Vitamin A, vitamin C alkaloids, flavonoids, tannin, steroids, glycosides, fixed oil and fats	Anti-oxidant Anti-bacterial Anti-inflammatory
Nutmeg ^[100]	Alkaloids, Phytates, Tannins, Oxalates, Flavanoids, Terpenoids	Anti-fungal Anti-viral Anti-bacterial Anti-thrombotic
Star anise ^[101]	Trans anethole, Alkaloids, Flavanoids	Anti-oxidant Anti-bacterial Anti-inflammatory Insecticidal Anti-viral

Raisin ^[102]	Triterpinoids, Minerals	Anti-oxidant
Dates ^[103]	Flavanoid, saponin glycosides, dietary fiber polysaccharides	Anti-oxidants Reduce risk of chronic infection
Black cumin ^[104]	Sterols, phenolic compounds, alkaloids, saponins, lipid components, fatty acids	Bronchodilator Use in pulmonary diseases
Thyme ^[105]	Phenol, Glycosides, Tannins, Flavanoids	Anti-microbial Spasmolytic activity
Garlic ^[106]	Flavanoids, Steroid, saponins, organoselenium compounds, allicin	Anti-microbial activity Anti-biotic activity Anti-oxidant
Fennel ^[107]	Alkaloids, Saponins, Tannins, Flavanoids, Steroids	Anti-bacterial Anti-oxidant Anti-inflammatory Anti-microbial
Cardamom ^[108]	Phenol, Flavonoid	Bronchodilator Expectorant Anti-oxidant

URINARY TRACT INFECTION:

In patients with urinary diseases, diuretics such as chemical compounds found in *Solidago* spp. (goldenrod) plant, *Levisticum officinale* (lovage) root, *Petroselinum crispum* (parsley) fruit, and *Urtica dioica* (stinging nettle) increase urine volume, which aids in the removal of microorganisms. Individuals who eat antiseptic and anti-adhesive herbs, such as *Vaccinium macrocarpon* (cranberry), *Arctostaphylos uva-ursi* (uva ursi), and *Juniperus* spp. (Juniper) leaf, excrete antimicrobial compounds that may either kill microbes directly or prevent them from adhering to epithelial cells, protecting against both acute and chronic UTIs. Berberine is abundant in the roots of *Hydrastis canadensis* L. (Goldenseal) and, *Mahonia aquifolium* (Pursh) Nutt. (Oregon grape). Because it stops bacteria (including *E. Coli* and *Proteus* species) from attaching to the host cell, berberine is a valuable medication for treating infections caused by a variety of bacteria. This implies that

berberine may be used to treat urinary tract infections. Additionally, the epicarp of *Cucumis melo* L., the seeds of *Cucumis sativus* L., *Argemone mexicana* L., *Clausena excavata* Burm. f, *Adiantum lunulatum* Burm. f, and *Mimosa pudica* L. are used by the tribes of Odisha state, India, to treat urinary tract infections. ⁽¹⁰⁾ Numerous studies have extensively documented the anti-uropathogenic properties of these plants.

Natural compounds that we got from our research (survey forms) are: cranberry (*Vaccinium macrocarpon*), raspberry (*Rubus idaeus*), blueberry (*Vaccinium Cyanococcus*), parsley (*Petroselinum crispum*), basil leaves (*Ocimum basilicum*), cumin seeds (*Cuminum cyminum*), garlic (*Allium sativum*), sesame seeds (*Sesamum indicum*), carrot (*Daucus carota*), jaggery (*Saccharum officinarum*), cucumber (*Cucumis sativus*), watermelon (*Citrullus lanatus*), melon (*Cucumis melo*), lemon (*Citrus limon*), milk, curd, mint leaves (*Mentha piperita*), green tea (*Camellia sinensis*) and, dates (*Phoenix dactylifera*).

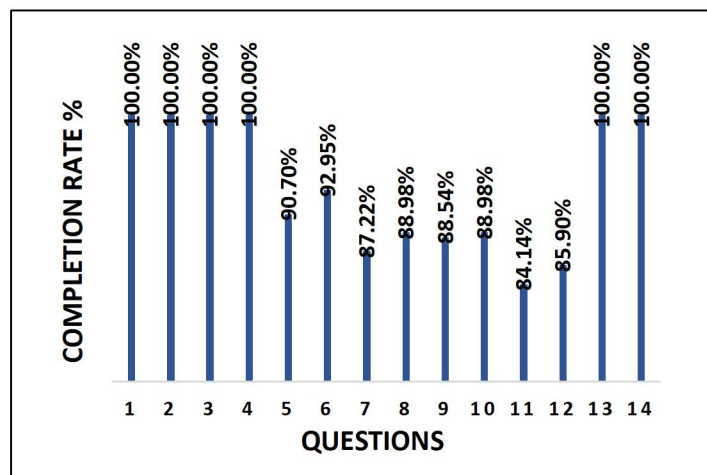
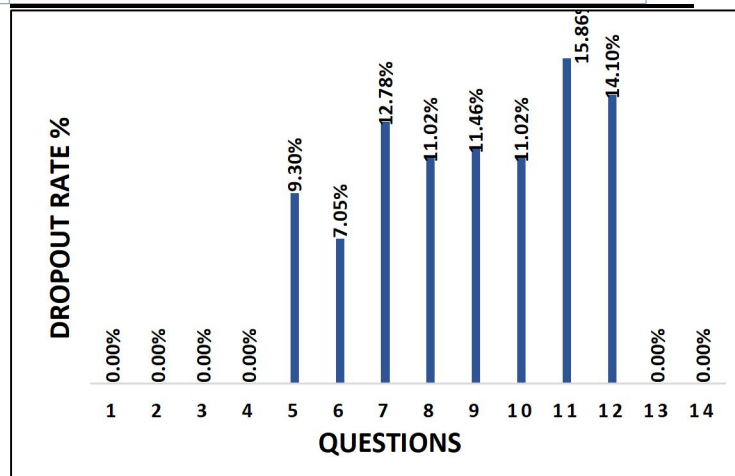
NATURAL PRODUCTS	PHYTOCONTITUENT	MECHANISM OF ACTION
Craneberry, Raspberry, Blueberry ^[109]	Flavanoids, vitamin C, E	Antiinflammatory Antimicrobial Antioxidant
Curd ^[110]	Ca, P, Mg, K Vit B, A, Lactic acid, Panthothenic acid	Prevents the growth of unwanted bacteria. Ca help to remove bacteria from call of bladder Phosphorus make urine acidic and help in bladder contraction Mg & K help to improve urine output
Basil seeds ^[111]	Flavonoids, Minerals, Fibers	Antioxidant, antimicrobial effects, Anti-inflammatory
Citrus species ^[112]	Ascorbic acid	Vitamin C may prevent infections caused by bacteria, viruses, and protozoa. Give anti biofilm effect
Dates ^[113]	Anti-oxidants Vitamin A, C, B Protein	Anti-fungal Anti-bacterial Anti-viral characteristics, prevent chronic inflammation and other disorders
Cumin seed ^[114]	Steroid, Saponin, Tannin, Alkaloid, Flavonoid.	Anti-microbial activity
Parsley leaves ^[115]	Furanocoumarins, Monoterpene, hydrocarbons	Diuretic Anti-inflammatory
Milk ^[116]	Vitamin A, B, Minerals	Boost your immune system and prevent from infections Minerals help in buffering of urine
Sesame ^[117]	Lignans, Flavonoid, Protein, vitamin B1, dietary fiber, minerals P, Fe, Mg, Ca, Mn, Cu, Zn	Anti-inflammatory Anti-microbial Minerals nourishes kidney help in urine formation Relief in pain
Jaggery ^[118]	Flavanoids, Fibers, Zn	Increase immunity Anti-inflammatory Anti-oxidant Diuretic
Cucumber ^[119]	Vitamin C, Fiber, Flavonoids, Minerals	Diuretic Antioxidant Antibacterial
Watermelon ^[120]	Vitamin C, Flavonoids, Minerals	Diuretic Antioxidant Antiinflammatory

Garlic ^[121]	Organosulfur compounds, Vitamin K, B, Minerals P, K, Mg, Zn	Antimicrobial Minerals help in urine formation act as diuretics.
Carrot ^[122]	Flavonoids, Vitamin C, Terpene, Minerals	Antioxidant Antiinflammatory
Green tea ^[123]	Flavonoids, Minerals	Antimicrobial
Mint ^[124]	Flavonoids	Antimicrobial

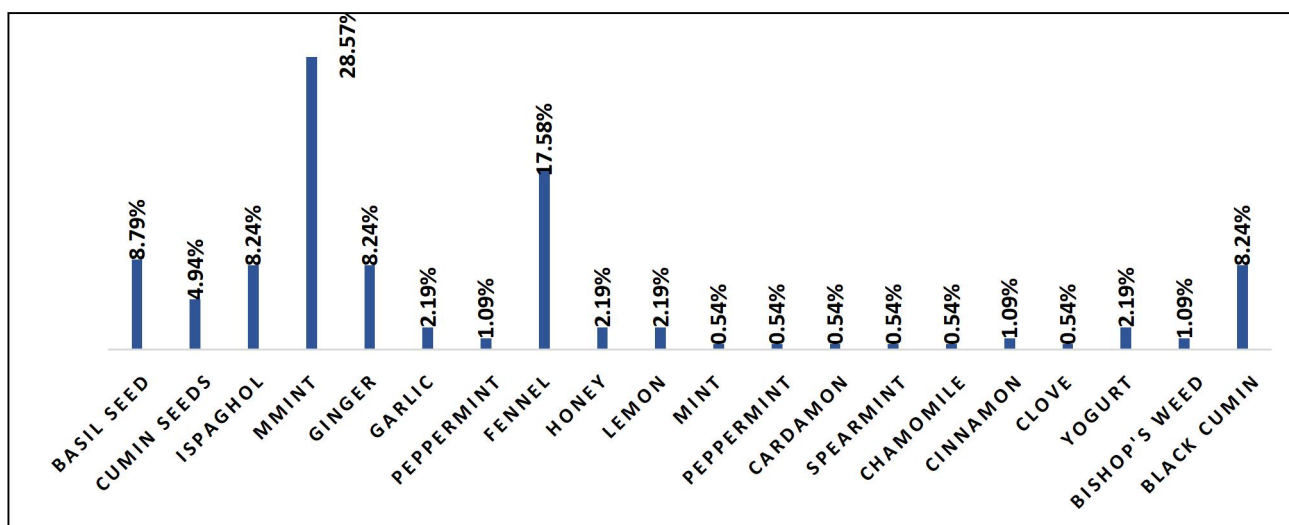
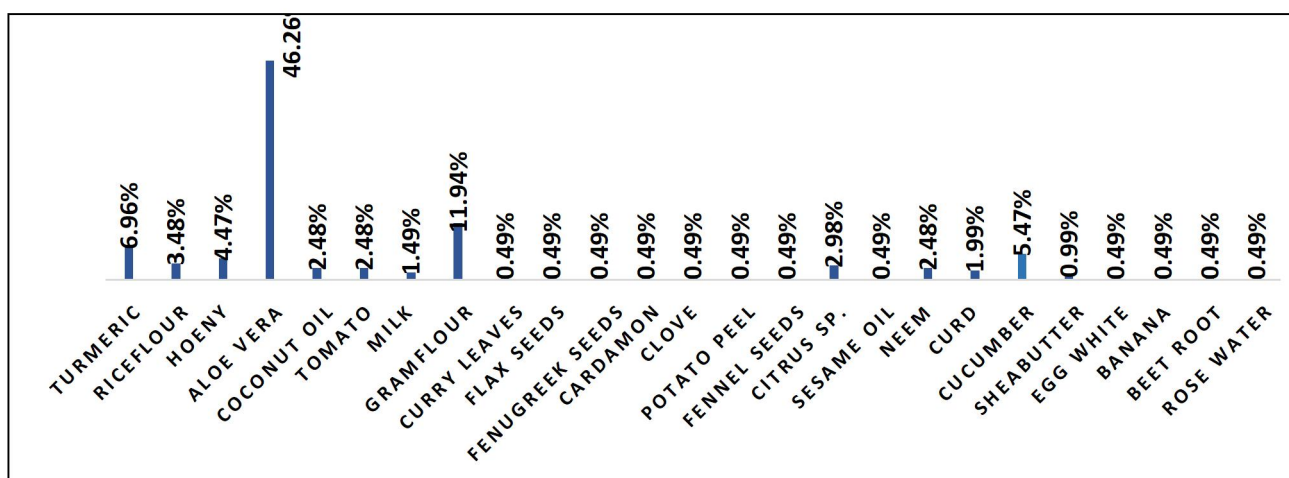
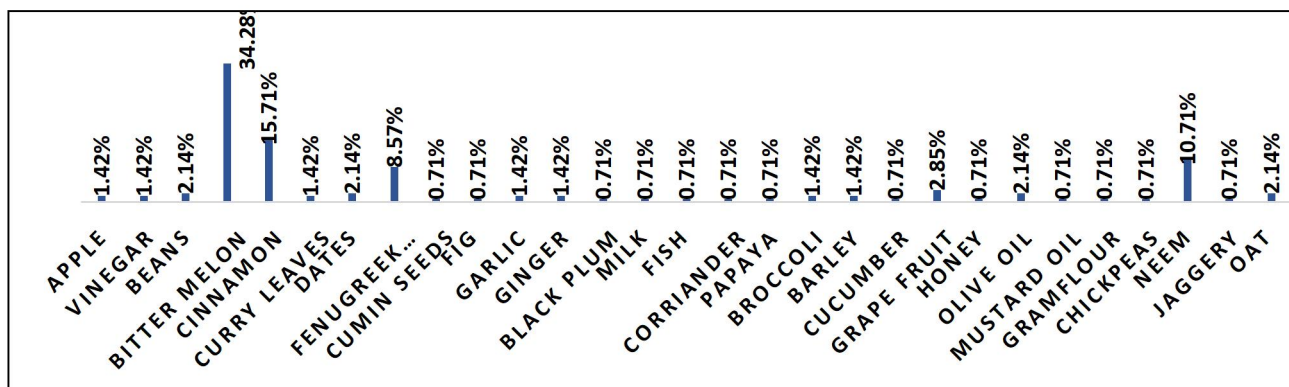
RESULT

As per the statistical analysis of the conducted survey, 68.7% of the respondents were females while 31.71% were the male population of Pakistan. Highest proportion of the respondents that is; 73.12% belong to an age group of 20-30, only about 14.53% respondents were under 20 and 12.77% were 30+ population. The survey has been circulated among the individuals with different academic backgrounds and the responses comprise 73.12% undergraduate, 18.94% graduate and only 8.37% post graduate individuals. Among them, a large group of respondents that is; 76.12% have used natural products in their lifetime while the remaining 24.22% had never been a consumer of any natural product for any disease.

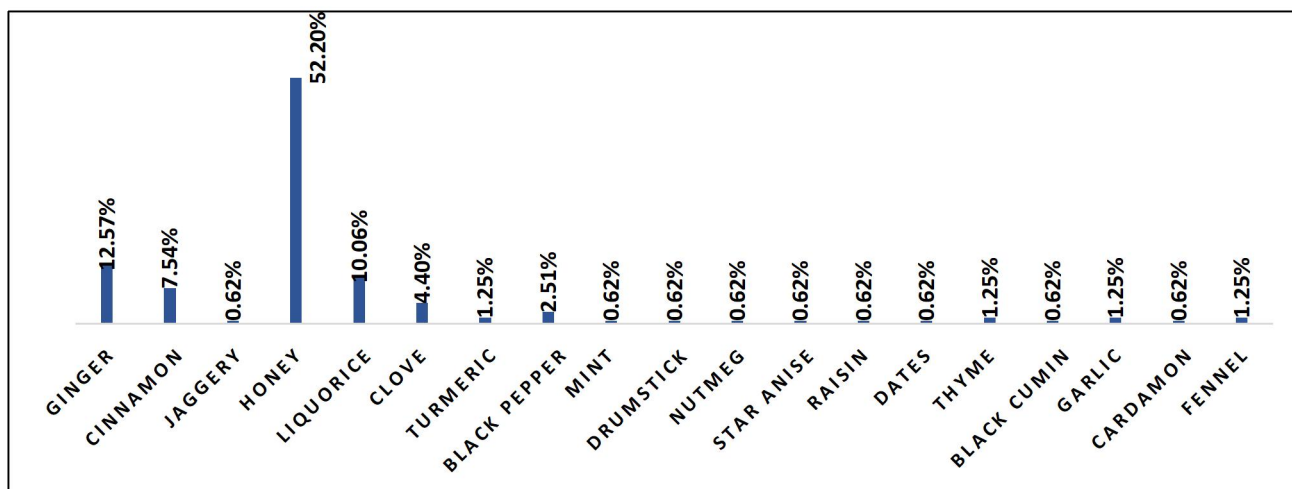
The questionnaire comprises various sections, each of them focuses on the treatment of different health related problems based on the public's opinion of natural products. This survey achieved an overall response rate of 113.5% with about 93.39% overall completion rate and 6.167% overall dropout rate. The data for the completion and dropout rate of individual questions are given below:



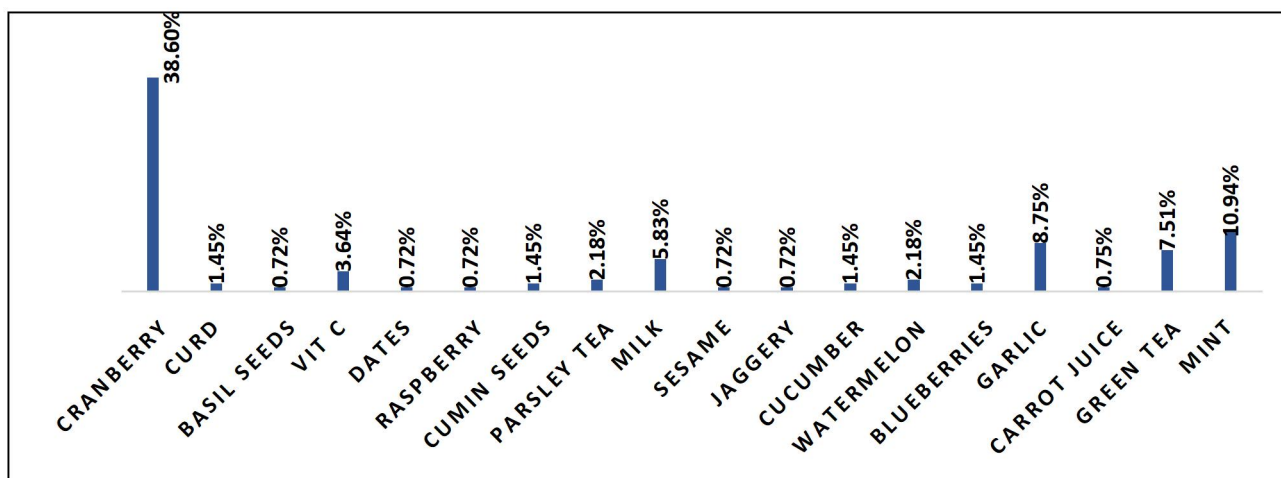
The responses achieved from different sections, particularly sections, that highlighted the use of natural products for various conditions, reflects the most frequently used herbal/biological product by the peoples of Pakistan. The sample data is summarized in tabular form as:

GASTROINTESTINAL ISSUES:**SKIN RELATED PROBLEMS:****DIABETES MELLITUS:**

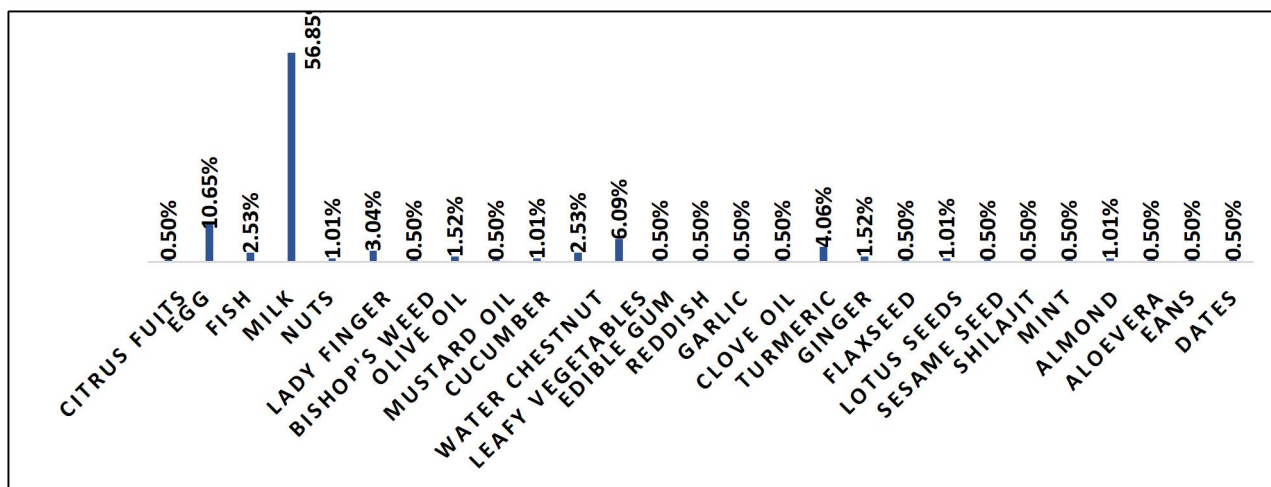
RESPIRATORY TRACT ISSUES:



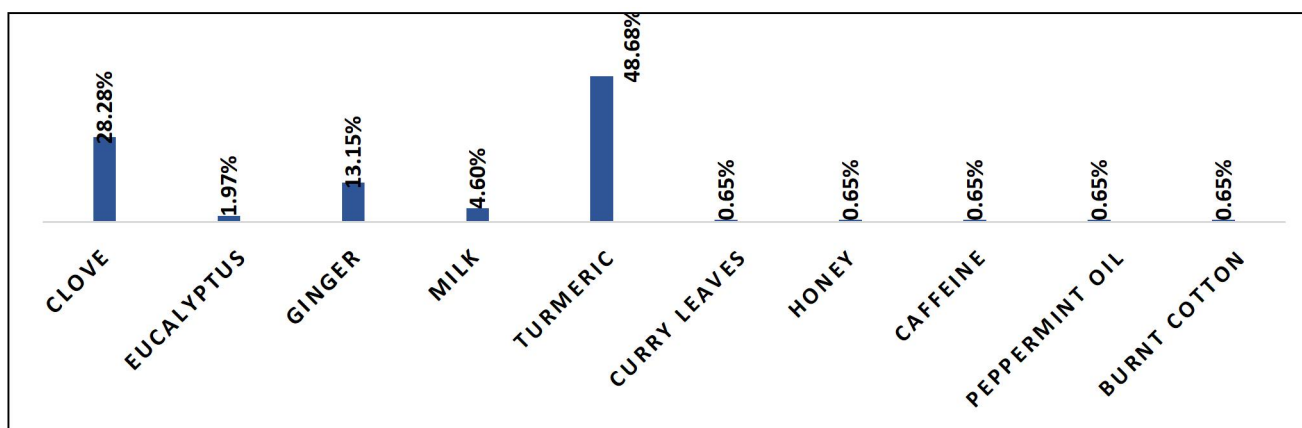
URINARY TRACT INFECTS (UTIs):



BONES, JOINTS AND MUSCLES HEALTH:



ANALGESIC EFFECTS:



In addition to all this data, respondents have mixed views on the efficacy and preference of these organic products when compared with the conventionally prescribed medicinal substances. However, about 54.6% individuals moderately prefer their use while 37% have strong preference and very few that is; only 8.4% weakly prefer them over conventional medicines. The reason could be because of their delayed onset as respondents experienced their efficacy instantly (11.9%), within a day (44.5%), within weeks (33.9%), and, within months (9.7%) of using them.

Moreover, it has also been found through this study that not all the natural products obtained from this survey for a particular disease or health condition exhibit therapeutic response to those conditions, survey literature also did not find any relation of such natural substances with a particular health disease.

CONCLUSION

In the light of these results, the survey based study demonstrates that the acceptance of natural products is not only common in elderly respondents but the young population of Pakistan also have an exceptional recognition of various herbal products. Moreover, the data also indicates the most chosen biological products for gastrointestinal issues, skin-related problems, urinary tract infections, immune boosting, respiratory tract related diseases, maintenance of bones, joint and muscle, diabetes related management, and, for pain relief. It has been found that Mint for GI issues, Aloe vera for skin related problems, Cranberry for UTIs, Vit C related natural

products as immunity boosters, Honey for respiratory tract related diseases, Milk for the health of bones, joint, muscles, Bitter melon for diabetes and, turmeric for analgesic effect have gained great inclination among Pakistani population. The findings from this study also reveals that population of Pakistan were also using a number of natural products as folk's remedy or it might have certain relation with any health condition that has not been discovered yet.

In future, the phytoconstituents present in these natural compounds can bring great revolution in the field of medicines by treating diseases without causing significant adverse effects. Researches are being conducted on these phytoconstituents, their extraction, isolation and conversion of them into useful medicament.

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