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Review

Dietary intake of cluster bean decrease the complication associated with covid 19 infected patients

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Abstract

COVID-19 infection increase the morbidity and mortality rate. The infection affect the entire world. It is a respiratory syndrome, viral replication is responsible for the infection. Corona infection adversly affect the cancer patients due to their immuno compromised and also infection of COVID-19 can cause both lung and kidney damage. It mainly worse the health conditions of cardiovascular patients and diabetic patients. The results of quantitative analysis report of cluster beans have a active phytochemicals such as HB acid, gallic acid, Vanillic acid, sinapic acid, kaempferol, ferulic acid, coumarins, quercetin, catechin and also it contains fibres. Due to the current review aims to explore the various active metabolites present in the cluster beans minimize the complications related to COVID-19 patients. It has wide potential action in anti oxidant, antidiabetic, anti microbial, cardioprotective and cytotoxic potential. It available in cheap. It is obtained from safe source of plants and has minimum side effects. In this review we tried to explain regular intake of cluster beans in their diet plays major role in reduce the post complications related to COVID-19 affected patients.

Keywords: COVID-19, Cardiovascular disease, Diabetes, Inflammation, Cluster beans.

INTRODUCTION

On 30 January 2020, the world health organization declared the COVID-19 virus is an epidemic or pandemic. The COVID-19 virus orginated from Wuhan, Hubei in China and initially it spreads more than 20 countries in the world. In 31 december 2019, survey report the viruses positive single standard RNA viruses . They are classified as four genera, they are alpha, beta, gamma, delta. From the classification COVID-19 virus belongs to beta corona virus genera. The beta corona virus in family of coronaviridae. The viruses are mostly caused by zoonotic.[1] The virus inflected hosts observed with asymptomatic symptoms to severe symptoms in their body systems. Such as respiratory system, digestive system, genital organs.[2] Basically corona virus are large family, it contains more varieties of viruses. It causes moderate illness to serious illness. They are,

1. Middle east respiratory syndrome (MERS)
2. Severe acute respiratory syndrome (SARS).[3]

In 2011-2012 the Saudi Arabia reported their first case in middle east respiratory syndrome. In this case 858 cases were death. Since no MERS-Cov-2 cases were reported before the COVID-19. It is seventh member of corona virus.[1] In compare with other viruses SARS and MERS have higher ability to spread and cause infection and have lower mortality rate. The survey reports indicates the virus might be caused or spread from bat.[2] Before the outbreak of COVID-19 virus, there were no knowledge about the disease. In India the first case of COVID-19 infection reported in Kerala in 30 January 2020, a student arrived from Wuhan city. The first death of person in India by COVID-19 infection in 12 march 2020 in Karnataka. Gradually the COVID-19 infection spreaded many cities such as Mumbai, Kolkata, Tamilnadu by air travellers.[2]

Corona Virus

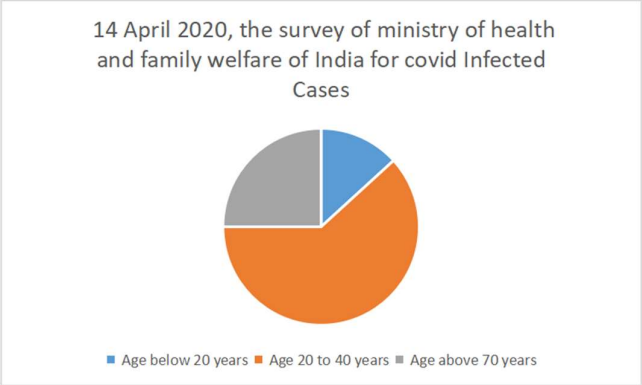
Corona viruses are single stranded enveloped RNA viruses. The diameter ranging from 80nm-120nm. The corona virus of SARS-CoV-2 and MERS-CoV and COVID-19 have better adaptation in human. They are able to withstand the human body temperature, hence the virus are more resistance for temperature. The main protein components of corona virus structure are S(spile), E(envelope), N(nucleocapsid), M(membrane).[1]

Symptoms



COVID-19 infected people shows symptoms between 2 to 14 days. World health organization reports the most common symptoms of this condition are cough, fever, shortness of breath and also difficulties in breathing.Loss of smell and loss of taste and respiratory problems are reported in COVID-19 infected patients.

In India 14 April 2020, the survey of ministry of health and family welfare of India reports the infected cases in percentage by age wise. Majorly 42% of infected people are have age between 20-40 years. 17% of patients infected between age above 70 years. Below 20 years, 9% of population infected by COVID-19.



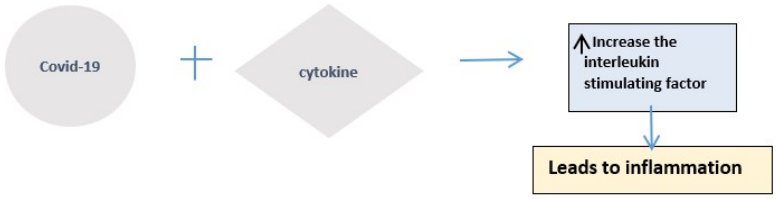
From the above report, youngsters are mostly affected in India while compare with other countries.[2] Mostly it easily affect older people and immune compromised patients, they were suffered with fatigue, reduced alertness, reduced mobility, diarrhoea and loss of appetite.[4]

Pathophysiology

The corona virus disease 2019 (COVID -19) caused due to severe acute respiratory syndrome, corona virus to (COVID-19), that is one of the infecting agent, it has spread from its epicenter in Wuhan china to all parts of the globe. New infections across the world has revealed that pathogenicity are associated with differences in COVID-19 lineages, clades and strains. These infectious agents affect the viral replication, immune evasion and transmission within different human populations. Immune dominant regions of COVID-19 and other corona viruses are recognized by major histocompatability complex (MHC)/Human leukocyte antigens (HLA) genes. Many mechanisms such as viral entry through angiotensin receptor (ACE) affecting multiple organs and thus

releasing pro - inflammatory markers have been spreaded. Angiotensin- converting enzyme -2(ACE-2) it is a important innate immune response to COVID-19 infection, including inflammatory cytokines, chemo kines and acute phase proteins. It helps for the understanding of COVID-19 pathophysiology.[25]

COVID-19 is developed or spreaded by direct contact with infected persons and having close contact through respiratory droplets. The cytokines profile resembling secondary haemophagocytic lymphohistiocytosis (SHLH) is associated with COVID-19 that increases the interleukin stimulating factor in the body.[26]



The COVID-19 is involving the conducting airways and upper respiratory tracts. And cause invasion and infection of the type-2 pulmonary alveolar epithelial cells via ACE-2, inflammatory cells in the lungs tissues, with CD8 mediated cytotoxicity and lung injury. Finally diffuse the alveolar damage with resulting acute respiratory distress syndrome(ARDS). [27]

Complications and risk factors related to covid-19 infection

Cardiovascular complications

The long term consequence of infection with COVID-19, causes the heart problems. There have been several different proposed mechanisms for the pathogenesis of cardiac injury from COVID-19 early descriptive autopsy studies have observed various findings on histological analysis of the heart, including interstitial inflammatory infiltration, myocardial hypertrophy and necrosis. In a study cell RNA sequencing, ACE2 expression has been shown to be present in 7.5% of myocytes, making it an organ at increased risk of direct viral injury. The cause of myocarditis after the virus gains entry into the cell, viral antigen presented results in cell mediated toxicity. Thrombosis is also caused with COVID-19 , which associated with high morbidity and mortality. The pathogenesis of thrombosis is interplay between excessive inflammation platelet activation and endothelial dysfunction.[29]

Diabetes mellitus

Diabetes mellitus has been associated with COVID-19, that causes the new onset hyperglycemia and acute decompensation of diabetes, including diabetic ketoacidosis. Iatrogenic hyperglycemia from steroidal use, proposed mechanisms for hyperglycemia including insulin resistance as a result of the inflammatory state and insulin secretory defects from impaired beta cells. Newly diagnosed with diabetes after COVID-19 already had unrecognized diabetes before infection.

Cancer

Cancer is the most common life-threatening disease in globe. It forms the various genetic modification that affect the regulatory and functionality of genes. In cancer patients are easily affecting the COVID-19 because immunosuppressive state patients infected with the COVID-19 virus have elevated cytokines, some of which may contribute to the growth of cancer. The major challenge in managing cancer patients was the unavailability of hospital beds due the changes in resource allocation and lack of cancer care support.[14]

Central nerveous system

Initial neurological symptom is described as a olfactory and taste disorders. These patients are depend as asymptomatic or pauci-symptomatic compared to patients and also cause the respiratory symptoms. The pathogenetic mechanism that could explain the taste and olfactory disorder in COVID-19 infection. And also the severe COVID-19 symptoms of neurological symptoms such as acute cerebrovascular disease, skeletal muscle injury and impaired consciousness. The pathogenesis of the COVID-19 to ACE2-R in endothelial cells is increasing blood pressure, and also create thrombocytopenis and coagulation disorders.

Epilepsy is the main neurological symptoms of the COVID-19. That causes the developing multiple episodes of seizures after infection with COVID-19.

Kidney damage

The severe cases of COVID-19 patients was affecting the kidney damage . The major problem including high levels of protein or blood in the urine is excreted. The virus itself infects the cells of kidney. Kidney cells have receptors that enable to attach the new corona virus to another cell and make copies of itself potentially damaging those tissues. Kidneys are works like a filters, that excrete out the toxins, extra water and waste products

from the body. COVID-19 cause tiny clots to form in the blood stream, that clots is disturbing the normal kidney function. [30]

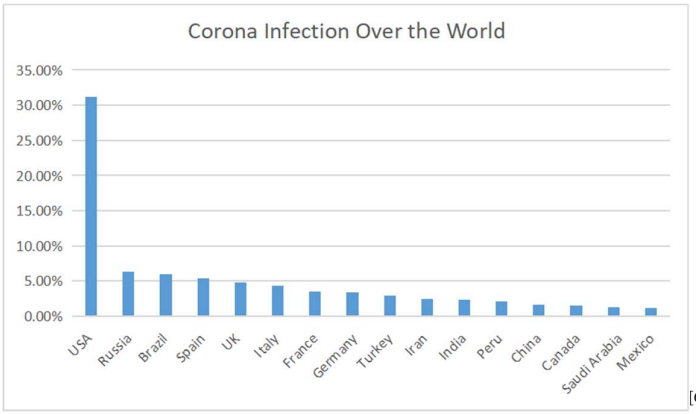
Respiratory complication

COVID-19 can have wide ranging impacts or problems throughout the body, COVID-19 mainly causes the respiratory illness. The common respiratory symptom is reported in COVID-19 that is dyspnea, which can persist in 22.9 % - 53% of patients. Abnormalities in lung function as assessed by pulmonary function testing(PFT).[28] Impaired respiratory function is one of the sequelae of COVID-19. Forced vital capacity (FVC) and forced expiratory volume (FEV) were lower than after COVID-19. It's results in increasing the disease severity. Viral pneumonia is cause of pulmonary fibrosis. The patients who had viral pneumonia that lead to pulmonary fibrosis. That is results from abnormal repair of lung injury caused by various mechanisms including viral infections and inflammation. The fibrotic phase is one of the pathological features of acute respiratory distress syndrome (ARDS).[29]

Diagnosis

In 17 march 2020 ministry of health permit the private laboratories to testing the COVID-19. Before this government laboratories only able to testing. ICMR declare the private laboratories to testing the COVID-19 sample in free cost. In 5 April 2020 ICMR testing the sample and report 3554 peoples have positive sign of corona.[2]

Viral gene detection, human antibody detection and viral antigen detection are the technique to diagnosis the virus. The methods are related to the RT-PCR methods.[5]



[6]

Cluster beans in complications of covid-19

Cluster Beans



Synonym: Guar, Cyamopsis psoralioides DC.
Biological source: It is derived from seed part of cyamopsis tetragonoloba.
Geographical source: Africa.
Family: Fabaceae.
Sub family: Faboideae.[7]

Morphological character of cluster beans

Stem: Angled
Leaves: Trifoliate
Androecium: Mondelphus 10 stamens
Flowers: White small flowers or purple colour flower
Root type: Deep root.[31]

Cultivation

Cluster beans is a tropical crop it not grown in shade. It can grown at drought and alkaline soil conditions. Hence it is drought resistance crop. It rooted shallow at the surface. It needs ph between 7.5 to 8.5.

Seed Preparation

Seed should be same size and colour. The seed should be separated from other crop seeds and weed seeds and also free from diseases. Firstly, inoculate it in a special guar inoculant. After inoculation it should be planted in moist soil for 2 hours.

Growing Conditions

Soil temperature for cluster bean cultivation around 21 degree Celsius. For germination it requires 30 degree Celsius for optimum growth. Irrigation increase the production of yield and for better yield irriagate done at 5 days interval.

Usually cluster bean are slow growing plant, so the weed should be removed at proper time to, maintain the optimum growth. After 120 days it should be harvested.[31]

Chemical Constituents

The guar (cyamopsis tetragonoloba) is a legume and rich source of guar gum. It contains majorly polyphenols composition which are gallotannis, gallic acid, gallic acid derivatives, Myricetin-7-glucoside, 3-glycoside, chlorogenic acid, ellegic acid, 2,3,4-trihydroxy benzoic acid, texasin-7-o-glucoside and p-coumaryl quinic acid.[8]

Seed powder of cluster beans contains ash, fat, fibers, protein and moisture are detected. Also it contains Calcium, Iron, Phosphorous, sodium, potassium, zinc and copper.[8]

Nutritional Information (per 100g)

Nutritients	Nutrition value
Energy	40.0 kcals
Carbohydrates	4.91 g
Protein	3.55 g
Fats	0.37 g
Fiber	4.83 g
Sodium	4.05 mg
Potassium	301 mg
Iron	3.9 mg
Calcium	121.0 mg
Beta Carotene	241.0 mcg
Magnesium	81.74 mcg

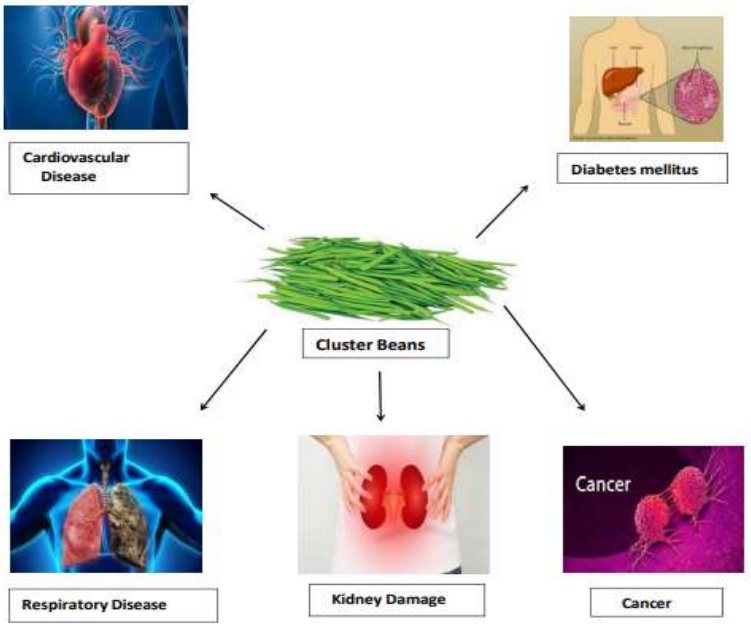
Uses

It used in various diseases such as dyspepsia, anti secretory, hypolipidemic, anti hyperglycemic effect. It also used in,

1. Anti-diabetic
2. Cytoprotective
3. Anti-coagulant
4. Anti-microbial
5. Anti-inflammatory
6. Anthelmintic activity
7. Anti-oxidant
8. Anti-ulcer
9. Anti-cholinergic
10. Hemolytic
11. Anti-asthmatic
12. Reversible anti fertility effect
13. Wound healing activity
14. Anti-cataract activities.[12]

Especially seeds are rich in gallic acid, proteins, carbohydrates, methionine, alpha-D-galactoside, calcium and polyphenols.[12]

Cluster Beans reduce Covid-19 complications



Cardio-protective agent

- Cardiovascular disease is a one of the main cause of death in united states and also canada. Cardiovascular disease mainly caused by hyperchlolesterolemia. Therefore, beans have high nutrition with dietary fibers, protein and micro nutrients. The consumption of nutrient dense of fiber reduce the risk of cardiovascular disease.[9]
- Infection with COVID-19 leads to dysregulation of host metabolic pathways of amino acids, glucose and lipids.[13]
- Activation of SREBP (Sterol regulatory element binding protein 2) is a controller of fatty acid and sterol synthesis this leads to stimulate the pro inflammatory cellular mechanism which enhances the COVID-19 severity.
- COVID-19 infection trigger the SREBP-2 and leads long-term cardiovascular complications. In familial hypercholesterolemia patients increased level of LP(a) - [lipoprotein a] compare with healthy person. It leads to endothelial dysfunction it activate the pro inflammatory and pro thrombotic effect with COVID-19.[13]
- In here, COVID-19 infection increases the LP(a) level in excess amount. The high level of IL-6 promote the cytokine storm, which leads to endothelial dysfunction and also risk in formation of thrombus. The patients after discharge observed with increased LP(a) level after the viral infection which destabilize pre-existing atherosclerotic plaque.[13]
- The intake of guar gum decreases the cholesterol level by various mechanism such as interruption of enterohepatic circulation of bile acids with enhanced bile acid secretion and prevent the absorption of cholesterol which leads to increase the excretion of sterols and also it entrap the fat in micelles, therefore interrup the fat absorption .[17]
- Soluble dietary fiber of guar gum reduce the plasma cholesterol. It lowering the serum total cholesterol levels in patients with hypercholesterolemia. Its mechanism of action similar to bile sequestering resin.[17]

Clinical Trails Hypercholesterolemia

S.No	Researchers	Year of studies	Materials	Mechanism of action
1.	Fernandez et al	1995	Cluster beans seeds	The hypocholesterolemia effect of guar gum in small intestine.[15]
2.	Favier et al	1997	Cluster beans seeds	The guar gum reduces the plasma cholesterol level in rats. The guar gum provide action by entrap the bile acids in small intestine and promotes the faecal excretion.[16]

Overall cluster beans promote changes in blood phospholipids, triglycerides and also hepatic lipid profile.[17]

Diabetes Mellitus

Diabetes mellitus result from hyperglycemic condition of blood glucose level. Various egyptians and indians recognize the diabetes mellitus before 3000 years ago. In greek work Diabetes means siphon(to pass through) and Mellitus is a latin word means honeyed or sweet. In this condition blood and urine have high concentration of sugar was reported by great britain. It is metabolic disorder resulted from decrease in insulin secretion or interrupt in action of insulin.[10]

Infection with COVID-19 increase the mortality rate, because of people who have hyperglycemic levels leads to hyperglycosylation of ACE2 and increased viral prolifertion. It leads to initiate inflammation, endothelial dysfunction and thrombosis also oxidative stress. Therefore, it increase the mortality rate.[11]

Infection with COVID-19 of diabetes patients

↓

Worsening hyperglycemia

↓

Increase immune stimulation

↓

It leads to organ damage

↓

Increase in mortality rate.[17]

Endothelial dysfunction observed in the COVID-19 patients with diabetes mellitus. COVID-19 trigger the glucose dependent endothelial dysfunction.[13]

Clinical trials

A metabolic disorder of diabetes mellitus still uncurable. The prolong condition of diabetes mellitus leads to severe organ damage in the body and cause life threatning issues. Synthetic drugs produce therapeutic action combined with adverse effect but traditional medicinal plants play vital role in source anti-diabetic drug with no adverse effect.[14]

Clinical trials of cluster beans for anti-diabetic activity

S.No	Researchers	Year of study	Materials	Mechanism of action
1.	Mukthar et al	2004	Aqueous and methanolic extract of cluster bean seed	Promote the reversing the beta cell damage in the pancreas.[20]
2.	Krentz et al	2005	Cluster beans	The anti-diabetic potential by measuring the alpha amylase enzyme inhibition activity. Because, the alpha amylase increase level of glucose in blood.[18]
3.	Tundis et al	2016	Butanol fraction of cluster beans	Inhibit the alpha alpha glucosidase enzyme.[21]
4.	saeed et al	2021	Aqueous extract and ethanolic extrat of cluster bean	Anti diabetic activity[19]

Cancer

Cancer patient easily affected with the COVID 19 who had a higher risk of infection due to low immunity. Those patient not only dead with disease and the risk of COVID 19 they also have increased anxiety and physiological outcomes. They tend to have hematological abnormalities such as anemia, neutropia, leukaemia. The clinical trails concluded that patient with cancer had high mortality rates patient infected with the SARS-COV-2 causes the COVD-19 disease. Male patient age 72 years old who died from complication of COVD-19, a postmortem biopsy showed diffuse alveolar damage with loose fibrous tissue. Excessive inflammation from viral infection and increase in risk of d tumor development. Hypertension was the most common mortality followed by

diabetic and chronic obstructive pulmonary disease. These observation helps for monitoring, diagnosis and treatment of disease during COVID-19.[22]

Clinical trails of cluster beans for anti-cancer activity

S.No	Researchers	Year of studies	Materials	Mechanism of action
1.	Shyale et al	2006	Methanolic extract of cluster beans	Anti cancer action against human breast adenocarcinoma, intestine carcinoma cell, colon carcinoma cell, human prostate carcinoma cell line.[14]
2.	Soehhnlen et al	2011	Cluster bean seeds extract	Cytotoxic potential due to presence of various flavanoids was reported.[14]
3.	Soni et al	2017	Aqueous extract of cluster bean	Anti cancer activity against oral cancer lines by specific test.[14]
4.	Kumareswari and Rani	2020	Cluster beans extract	Activity of cluster bean against human A549 lung cancer cells

Anti-inflammatory action of cluster beans

Kidney

Acute kidney injury, requires renal replacement therapy after discharge according to secondary meta-analysis and nationwide analysis, hospitalized COVID-19 patients. An increased mortality rate of over 25-30% has been reported in hemodialyzed patients. COVID-19 associated acute kidney injury usually presents with proteinuria. Severity of proteinuria correlates with tubular damage increased risk factor for renal function. It could be used for marker for acute kidney damage. Functional biomarkers such as cystatinc, stress biomarkers could be different for easy detection of COVID-19. Data from autopsy studies have acute tubular injury is the most common finding in COVID-19 patients with kidney disease. Viral RNA was detected in the renal tissue of 23 patients with kidney disease compared with 3 to 7 patients with acute kidney injury.[23]

Respiratory complication

Respiratory complications associated with the COVID-19 phase are mainly secondary infections. Lung function impairment and pulmonary thromboembolic disease. The pathophysiology of respiratory problem with COVID-19 is main role plays in COVID-19 in the body.[24]

Clinical trails for anti inflammation

The anti inflammation activity of cyamopsis tetragonloba was identified by various scientific methods. The cyamopsis tetragonloba has potency activity against neurogenic inflammation (Xylene induced ear swelling), acute (Carageenan induced paw edema) and subacute(Formaldehyde induced paw edema) and were reported by conducting experiments in rodents. Due to the presence of the flavonoid and saponin.[32]

CONCLUSION

COVID-19 is mostly susceptible to older people and complicated with cardio vascular system, cancer, diabetes, lung, and kidney disease patients. These complications are forms the COVID-19 infected patients. Their immune system gears up in older people and overreacts to produce too many of the chemicals to fight an infection. The cluster beans is having the rich source of guar gum and also contains the gallotannins, gallic acid, 3-glucoside, chlorogenic acid, ellegic acid, fats, fibers and protein contents. The cluster beans play major role in anti-inflammatory action to reduce the mortality rate in COVID-19 infection. And also calcium, iron, phosphorus, sodium, potassium, zinc and copper components present in the cluster beans may reduces the COVID-19 risk factors. The iron, zinc and copper may increases the immunity power. Calcium and phosphorus is increases the energy. So in this review study cluster bean is reduced the COVID-19 complications. Regular intake of cluster bean may reduced the complication. Various secondary metabolites, fibers and proteins present in the cluster bean may decrease the risk factor for covid 19. Further studies are needed to the relationship between the cluster bean and covid 19 associated complication.

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