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A comparison between the hypolipidemic effects of *Withania somnifera* (Ashwagandha) root powder and *Momordica charantia* (Karela) fruit powder an in-vitro study

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ABSTRACT

One of the most prevalent risk factors for atherosclerotic & cardiovascular disease is hypercholesterolemia, which ranks as the sixth-highest risk factor for death globally. One-third of ischemic heart disease is caused by high cholesterol levels, which are common in both industrialised and developing countries. Although hypercholesterolemia can be controlled with modern treatment, there are long-term negative side effects. For centuries, the Indian subcontinent has relied heavily on the Ayurvedic medical system to heal ailments which are safer alternatives to treat various types of diseases. Herbal therapies frequently help established medical practises, especially when it comes to offering a safer alternative and well-tolerated treatments for chronic diseases like hypercholesterolemia. The study's findings on Ashwagandha & Karela's ability to lower cholesterol were similarly favourable & showed encouraging results.

Keywords: Ashwagandha, Karela, Hypercholesterolemia, safer alternatives.

INTRODUCTION

High cholesterol ranks as the sixth-highest risk factor for death worldwide. [1] Globally and in India, there are more and more people falling under the category of having high cholesterol levels. [2] Cholesterol levels can be increased by sedentary lifestyles, high-saturated-fat diets, and genetics etc. High cholesterol increases the risk of vascular diseases like heart disease, stroke, and other vascular ailments. Elevated blood cholesterol is the cause of one-third of cases of ischemic heart disease worldwide. Hypercholesterolemia is the main contributor to atherosclerosis and the associated heart issues. At various phases of the illness, people with high cholesterol are more likely to develop coronary heart disease. Lowering blood cholesterol is the major objective of treatment to control these ailments.[2]

As a result of the rise in the number of hypercholesterolemic patients worldwide, numerous national and international pharmaceutical companies are creating and actively selling a variety of cutting-edge synthetic drugs. The negative impacts of synthetic drug abuse, however, have been amplified, and people are now more aware of them. Many people have been encouraged by this to return to using herbal remedies, which are natural and much safer as compared to synthetics. [3]

Because they are safe and well-tolerated, herbal medicines usually complement contemporary medical practises, especially when it comes to treating chronic illnesses. Because many chronic illnesses no longer have effective conventional treatments, traditional medicine is witnessing a big return in Western countries, especially Canada, the USA, and Britain etc. [4]

Nutraceuticals, which are products that sit between foods and medications, allow for the inclusion of specific nutrients with favourable health effects. The plasma lipid profile may be improved by plant-based nutraceuticals. [5]Anogeissus latifolia gum ghatti, Sidarhomboidea, soy protein, grape seeds, garlic, ginger, and citrus peel extracts have all been studied for their potential to decrease cholesterol. [6]

To explore if they can lower cholesterol levels, for instance, several herbal extracts are being researched. A substantial body of research supports the predictive and causative characteristics of dyslipidaemia and oxidative stress, as well as the effectiveness of antioxidant treatment to treat aberrant lipid parameters [7].

A fruit used in Ayurveda, karela is also known as *Momordica charantia L.* , a member of the Cucurbitaceae family. It is also referred to as balsam pear, bitter gourd, bitter melon, karela, or kugua. For thousands of years, its fruit has been utilised as a vegetable. In tropical and subtropical climates of the world, it is extensively distributed. As the entire plant, including the fruit, tastes extremely bitter, it is known as "bitter melon" or "bitter gourd." India, China, Japan, Malaya, Thailand, Vietnam, Singapore, Colombia, Brazil, the Amazon, Cuba, East Africa, Haiti, Ghana, Mexico, Nicaragua, New Zealand, Panama, the Middle East, Central America, and South America are just a few of the nations where karela is commonly grown. [8]

Several compounds, including glycoside, charantin, vicine, karavilosides, and polypeptide-p, are present in karela (plant insulin) ,which increases glucose absorption and may lower blood sugar levels.[9,10]

Also, Ashwagandha or *Withania somnifera* is a member of the Solanaceae family. It is an evergreen plant also known as winter cherry and ashwagandha that has significant therapeutic properties.

The words "Ashwa&gandha" in Sanskrit translate to "smell" and "horse." Its root has received its moniker not only for the pungent smell it gives off, but also because it is believed to provide animals strength and vitality.[11]

W. somnifera is utilised in medicine for its antibacterial, antifungal, antioxidant, anti-inflammatory, anticancer, and other disease-fighting properties . Numerous types of alkaloids, flavonoids, anolides, reducing sugars, amino acids, steroids, volatile oil, starch, glycosides, hentriacontane, dulcitol, and withaniol are found in the roots of W. somnifera [12].

The biggest advantage of ashwagandha is its capacity to reduce stress. It appears to block many stress pathways and control brain chemicals in addition to controlling cortisol. Ashwagandha can lessen the signs of stress and anxiety, according to several researches.

In a 60-day placebo-controlled trial, 64 chronically stressed individuals were divided into two groups. One group received supplements containing ashwagandha, while the other received a placebo. Following the trial's conclusion, the Ashwagandha group reported an average 69% decrease in anxiety and sleep issues compared to the control group's 11%. [11]

Similar results were found in another 6-week trial, when 88% of people who took Ashwagandha felt less anxiety than 50% of those in the placebo group. [12-15]

Despite these positive outcomes, there is very little evidence to support the hypolipidemic benefits of the herbal remedies mentioned above.

The current investigation was conducted on pooled discarded & healthy serum samples in order to evaluate and assess the total cholesterol-lowering effects of the filtrate of *Momordica charantia* fruit powder (Karela) and *Withania somnifera* root powder (Ashwagandha) .

MATERIALS AND METHODS

Standard preparation:
Cholesterol standard was obtained from Erba chem Transasia kit (Trinder's method, endpoint) with standard cut off value 200 mg/dL.

Sample preparation:
Herbal filtrate of Ashwagandha *(Withania somnifera)* branded root powder in distilled water (d/w) & cow's urine (c/u) (branded ,distilled & purified)was taken and added to the discarded healthy pooled serum samples collected aseptically and a kinetic study was performed with it.

Herbal filtrate of karela *(Momordica charantia)* branded fruit powder in distilled water (d/w) & cow's urine (c/u) (branded ,distilled & purified) was taken and added to the discarded healthy pooled serum samples collected aseptically and a kinetic study was performed with it.

Following samples were obtained:
CHOL PS: Pooled sample

C1:- Karela soaked sample (300 mg powder in d/w for 12 hrs)
C2:- Karela soaked sample (300 mg powder in c/u for 12 hrs)
D1: Ashwagandha soaked sample (300 mg powder in d/w for 12 hrs)
D2:- Ashwagandha soaked sample (300 powder mg in c/u for 12 hrs)

Method:
CHOD -PAP: Enzymatic Colorimetric Determination of Serum Cholesterol,is intended for the in- vitro quantitative determination of total cholesterol in serum samples at 505 nm on the fully automatic EM 200 Autoanalyzer .
Aliquots were drawn at an interval of 0, 2 ,4 ,6 hours from each tube maintained in hot water bath at 37 ^{0} C.
System used: Erba Chem EM - 200 AUTOANALYSER

- Automation: Fully Automatic
- Model: EM200
- Usage/Application: Clinical

Erba EM200 Fully Automated Biochemistry Analyzer, random access and discrete clinical chemistry analyser that enhances productivity and turnaround time. It has a throughput of 200 spectrophotometric tests per hour.

RESULTS

Baseline (0 hrs.) reading in all the samples was 189 mg/dL (table 1).

Table 1: Changes in total cholesterol levels in pooled sample (PS), Momordica charantia -soaked sample (300 mg in distilled water for 12 hours)-C1, Momordica charantia -soaked sample (300 mg in distilled cow urine for 12 hours)-C2. Ashwagandha-soaked sample (300 mg in distilled water for 12 hours)-D1, Ashwagandha -soaked sample (300 mg in distilled cow urine for 12 hours)-D2.

Table 1:

Sample	Baseline	2 hrs	4 hrs	6 hrs
CHOL PS	189 mg/dl	187 mg/dl	186 mg/dl	183 mg/dl
C1	189 mg/dL	172 mg/dL	150 mg/dL	113 mg/dL
C2	189 mg/dL	169 mg/dL	148 mg/dL	111 mg/dL
D1	189 mg/dL	162 mg/dL	151 mg/dL	112 mg/dL
D2	189 mg/dL	160 mg/dL	149 mg/dL	110 mg/dL

Graphs given below show the decrease in the total cholesterol levels after 2hrs., 4 hrs. and 6 hrs. respectively for samples CHOL PS, C1,C2,D1 & D2.

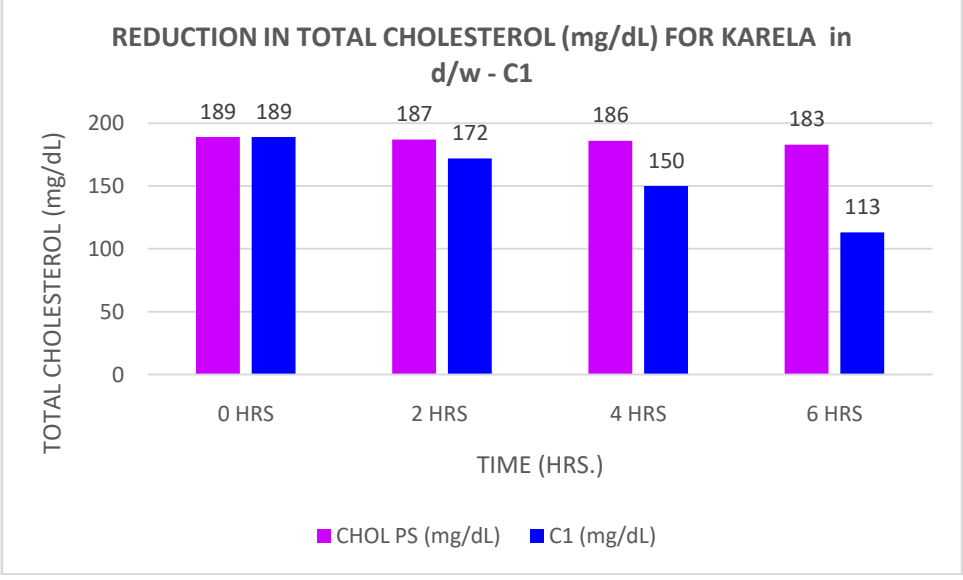

Figure 1.

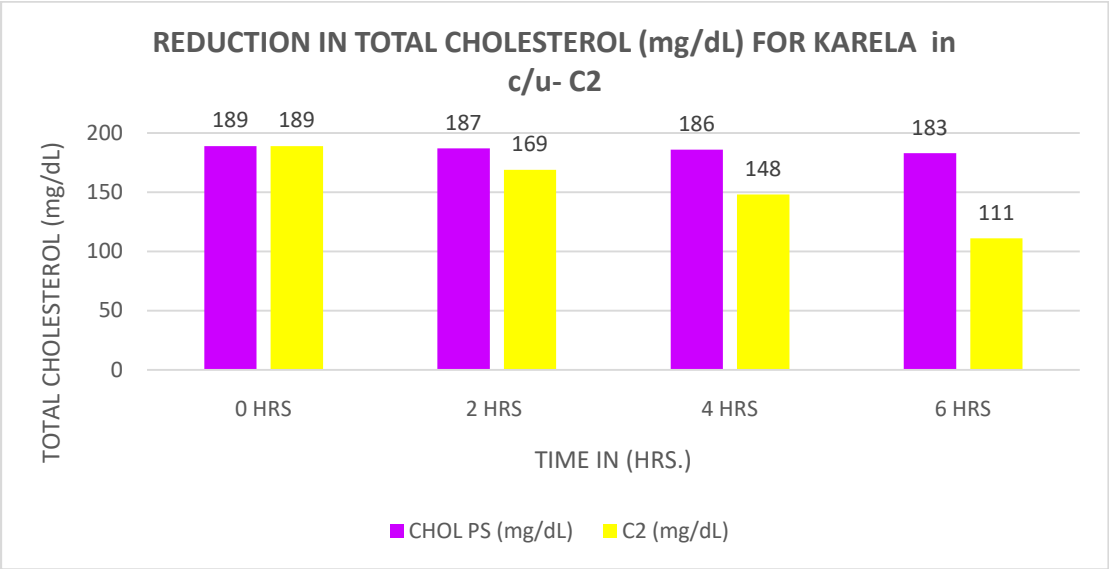

Figure 2.

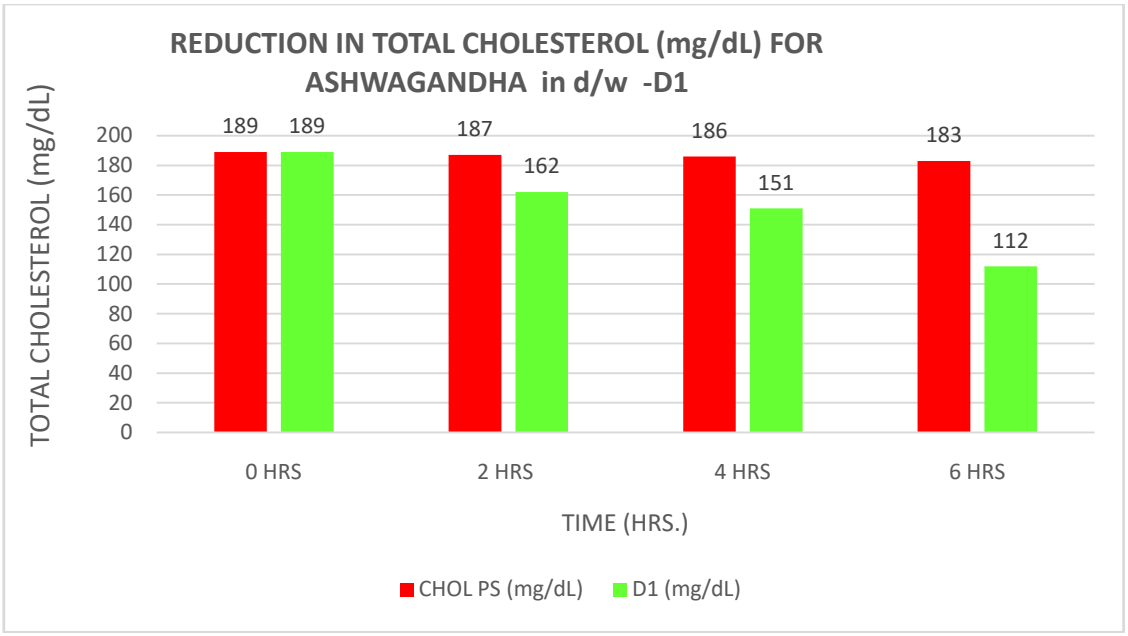

Figure 3.

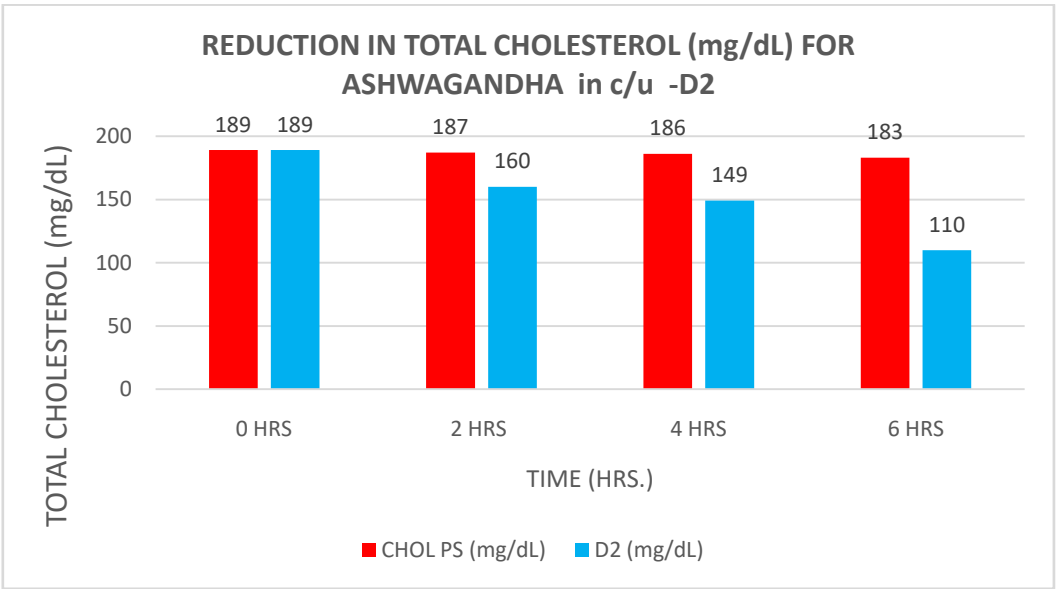

Figure 4.

Result

Hence , the cholesterol-reducing activity of both Ashwagandha root powder & Karela fruit powders, both branded , soaked in distilled water (d/w) & cow's urine (purified , distilled & branded) at 2 hours, 4 hoursand 6 hours showed encouraging results .

DISCUSSION

Hence, cholesterol is neither unhealthy nor dangerous instead, it is a material that is essential for the structure of each cell as well as for the smooth operation of the brain and nervous system. [16] Even though having high blood cholesterol is not a disease, it might lead to cardiac problems in future , thus requires monitoring and proper management. Due to bad dietary habits, exposure to stress, decreased physical exercise, and lifestyle changes, the body's cholesterol levels have increased in recent times.[17.]

In the present study, we examined the total cholesterol-lowering potential of Karela *(Momordica charantia L.)* fruit powder and Ashwagandha *(Withania somnifera L.)* root powder.

In comparison to the contemporary medical system, herbal treatments are safer to use and effective at lowering cholesterol. It is suggested that many herbs, including , garlic, cinnamon, tulsi, ginger, fenugreek, and Indian gooseberry, can treat hypercholesterolemia[17-19]. On the pooled healthy serum samples that were discarded, an in vitro study was conducted using the CHOD-PAP (cholesterol dynamic extended stability testing) method. It is a colorimetric technique, and the amount of cholesterol found in the serum is correlated with the colour intensity that results. In our investigation, the treatment of Ashwagandha & Karela powder on serum was done using d/w and c/u respectively. The action of Karela powder and Ashwagandha powder is increased or potentiated by the cow urine, which functions as a bioenhancer.[20]

Hypercholesteremia develops as a result of oxidative stress, which is exacerbated by reactive oxygen species scavenging activity[18,19].

Many of the herbs utilised in the Ayurvedic medical system include saponins. By encouraging the liver to produce bile from plasma cholesterol, the saponins lower the levels of plasma cholesterol in the blood. This is frequently caused by decreased gastrointestinal absorption of cholesterol, which the liver needs to produce bile[21]. High-density lipoprotein, the good cholesterol, may be increased by flavonoids, whereas low-density lipoprotein oxidation, the bad cholesterol, may be decreased[22]. Oxidized low-density lipoprotein contributes to the development of plaque and atherosclerotic disease.

Roots, stems, leaves, and fruits of *M. charantia* contain saponins, primarily triterpenoid saponins. Studies have revealed that *M. charantia* seeds have a total saponin content of about 0.432%. Saponins of various sorts, such as stigmasterol and sitosterol saponins, have been isolated from *M. charantia*which are effective in lowering blood TG levels, enhance oxidation in the liver and adipose tissue, and decrease visceral fat weight and glucose levels. [23] Bitter melon fruit-fed hyperglycaemic group rats in week four demonstrated improvement of lipid profile as evidenced by blood total cholesterol decreasing by 49%, triglyceride decreasing by 35%, raised faecal cholesterol production and significantly reduced cholesterol absorption. [24]

In addition to its use as a digestive tonic and brain stimulant, Ashwagandha has immunological modulatory, anti-aging, syncope-treating, and cardiovascular protecting properties. [25] The three main active phytoconstituents of ashwagandha are lactones, steroidal glycosides, and alkaloids. [26] In a study on the lipid profile of rats following treatment with Ashwagandha Rishta for 51 days, the active components in Ashwagandha, particularly the root part, were ascribed to the herb's ability to decrease cholesterol. [25] In a study, it was noted that therapy with Ashwagandha Rishta in rats resulted in lower serum levels of triglycerides, low-density cholesterol, and total cholesterol. Due to the antioxidant qualities of ashwagandha, oxidative stress reduction directly contributes to decreasing cholesterol levels.

The development of coronary heart disease, hypertension, cancer, inflammation, and atherosclerosis, among other conditions, are all significantly influenced by oxidative stress. [27,28]

CONCLUSION

Ayurveda is a practise that dates back thousands of years and is safer and more holistic than contemporary medicine. In the current study, we have shown that Karela powder and Ashwagandha powder have cholesterol-lowering properties. Therefore, we suggest that Karela and Ashwagandha, which are frequently used to treat high plasma glucose levels, syncope and are used asstrength-providers, etc., need additional research to determine their

impact on cholesterol levels. Preclinical and clinical research should be done in the future to verify the anti-hypercholesterolemic effects of Karelaand Ashwagandha herbs.

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