

## Role of psyllium (*Plantago ovata*) in the treatment of diabetic dyslipidemia

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### Abstract

Diabetic dyslipidemia is a metabolic syndrome growing exponentially in number during these last decade. Unhealthy diet such as fast food and sedentary lifestyle contributes to this increasing prevalence of metabolic syndrome. Diabetic dyslipidemia is characterized with increased blood level of triglycerides, LDL cholesterol, and decreased HDL cholesterol level. In most cases, patient with diabetic dyslipidemia is asymptomatic, yet has increased chances of complications of cardiovascular disease, including stroke and myocardial infarction. Although drugs such as statin are preferred to be used as main drug of diabetic dyslipidemia, lifestyle and diet modification still plays an important role in the therapy. Psyllium (*Plantago ovata*), commonly added in diet, is known to have hypocholesterolemic and hypoglycemic effect. The aim of this article is to review the role and effect of psyllium in patient with diabetic dyslipidemia.

**Keywords:** Psyllium; Metabolic syndrome; Diabetic dyslipidemia; Diet modification

### 1. Introduction

Diabetes and dyslipidemia are part of metabolic syndrome which are increasing exponentially during the last decade. It is estimated that around 2.8% of children and 4.8% of adolescent around the world in 2020 experiences metabolic syndrome, especially in low-income countries [1]. As the number of metabolic syndromes are expected to keep growing in further years, this disease has become a major health issue and challenge worldwide.

In most cases, patient with diabetes also experiences dyslipidemia, hence termed diabetic dyslipidemia. Lipid profile of patient with type 1 diabetes mellitus patient with good glycemic control is normal, while patient with type 2 diabetes mellitus might have abnormal lipid profile even with good glycemic control [2]. The exact mechanism of diabetic dyslipidemia is still unknown, but insulin resistance is thought to be playing major role in this disease. Insulin resistance in patient with type 2 diabetes causes release of free fatty acid from adipose cells into the blood, combined with the loss of normal inhibitory effect of insulin in hepatic triglyceride production causing increase in hepatic triglyceride production [3]. In general, patient with diabetic dyslipidemia shows abnormal lipid profile including increased triglyceride, VLDL, IDL, and other non-HDL cholesterol level along with decrease in HDL cholesterol level.

Treatment of diabetic dyslipidemia consist of both pharmacological and non-pharmacological therapy. Pharmacological therapy based on AHA/ACC recommendation using low to high intensity statin depending on the 10 year-cardiovascular risk score [4]. Meanwhile, non-pharmacological therapy of diabetic dyslipidemia includes lifestyle modification such as dietary management. One of the possible dietary managements of this disease is to add psyllium into food product, which has shown positive result in decreasing both glucose and lipid level.

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## 2. Potential Benefits of Psyllium

Psyllium is a water-soluble fiber made from *Plantago ovata* plants seed. This plant belongs to Plantaginaceae family which are commonly found in Mediterranean region such as West Asia and Southern Europe [5]. Psyllium has been used since ancient time as a medicinal therapy. Currently, psyllium is commonly used as laxatives because of its gut-stimulatory effect through muscarinic and serotonin activation along with its fiber property [6].

Further research shows that aside from its laxative property, psyllium also has other possible diverse pharmacological effect and role in treating diseases such as skin irritation, irritable bowel syndrome, colon cancer, obesity, hypertension, hyperuricemia, diabetes, and dyslipidemia [5, 7]. In some rare cases patient might develop allergy to psyllium after prolonged use of this medication.

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## 3. Psyllium and Diabetic Dyslipidaemia

Viscosity effect of psyllium as dietary fiber reduce absorption of cholesterol, glucose, slowing down blood glucose and lipid rise after eating along with slower gastric emptying time which causes longer satiety [8]. Psyllium viscous gel is also capable of binding with bile salt, increasing its excretion, stimulating liver to produce more bile salt, hence decreasing LDL cholesterol without affecting HDL cholesterol [9].

Research that has been done on type 2 diabetes patient shows that consumption of 10 grams psyllium, mixed into food twice every day for 12 weeks decreases blood fasting glucose by an average of 13.6 mg/dL ( $P=0.040$ ), cholesterol level by 21.5 mg/dL ( $P<0.001$ ) and triglycerides level by 20 mg/dL ( $P=0.021$ ), along with averagely 2 kg body weight decrease ( $P<0.001$ ) [10]. Another randomized controlled trial research of psyllium effect in type 2 diabetes mellitus patient shows that 16-week therapy with psyllium shows significant decrease in fasting blood glucose ( $P<0.05$ ) by an average of  $7.5 \pm 2.6$  mg/dL, compared to lifestyle modification ( $0.5 \pm 1.7$  mg/dL) and control group ( $1.53 \pm 1.7$  mg/dL) [11]. Meta-analysis study of psyllium benefit on patient with dyslipidemia for more than 2 weeks shows that compared to placebo, patient with psyllium diet has lowered blood cholesterol level by 0.375 mmol/L and LDL cholesterol by 0,287 mmol/L [12]. Another meta-analysis study of before meal psyllium in patient with type 2 diabetes mellitus shows decrease of fasting blood glucose by 37.0 mg/dL and HbA1c by 0.97% with the greater improvement in patient with type 2 diabetes compared to type 2 pre-diabetes patient [13].

There is no consensus on the recommended dosage of psyllium in diabetic dyslipidemia. Meta-analysis study of psyllium doesn't show any significant relation between increased dose (ranging 2.4-20.4 g) of psyllium and its correlation with LDL cholesterol ( $P=0.46$ ) or non-HDL cholesterol ( $P=0.58$ ) [14]. Long term clinical trial (52 week) of psyllium 10.5 g daily shows no clinically significance side effects and most of the side effects are minor [15]. However, it is important to note that allergic reaction to psyllium might occur, especially in long term usage, although rare. There are several case reports documenting patient experiencing anaphylactic shock and potentially fatal due to consuming psyllium [16, 17].

Through research showing significant improvement in blood glucose and lipid level by consuming psyllium, combination of statin and psyllium is recommended to achieve better results in patient with diabetic dyslipidemia. Randomized control study for 12 weeks of patient administered with only simvastatin shows decrease of LDL cholesterol level by 55 mg/dL (1.42 mmol/L) while combination of simvastatin and psyllium (15 mg daily) shows decrease of LDL cholesterol level by 63 mg/dL (1.63 mmol/L) ( $P=0.03$ ) [18].

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## 4. Conclusion

Plenty of research has shown significant effect of psyllium as a part of therapy in patient experiencing diabetic dyslipidemia. It reduces blood lipid and glucose level by decreasing absorption of nutrient in the gut, prolong satiety, and increase excretion of bile salt. Psyllium should be added as dietary modification along with pharmacological drugs such as statin to achieve better results. There is no recommended dose of psyllium daily intake and is generally safe to consume. However, there are rare cases of allergy against psyllium which need to be noted.

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## Compliance with ethical standards

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*Disclosure of conflict of interest*

There is no conflict of interest in this study.

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