



The Protective Effect of Phaseolus Vulgaris on Cataract in Type 2 Diabetes: A Profitable Hypothesis

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ABSTRACT

The pathophysiology of major ocular complications in type 2 diabetes mellitus (T2DM) among Bantu is not well understood. Several studies have been conducted to determine the basic reasons of visual deficiencies (VD) (blindness, visual impairment, and ocular eye diseases) in T2DM among Bantu from Central Africa. The quality of dietary intake was assessed in patients along with other ophthalmological assessments for diabetic retinopathy, cataract, glaucoma, and macular edema. Beans (*Phaseolus vulgaris*) and leafy vegetables are rich in antioxidants. The consumption of at least 3 ladles per meal, 3 times or more per week, has been identified as a potential protective factor against cataract. The anti-radical activity of beans is well known in the literature. Beans are considered to have a comparatively higher antioxidant activity than in many other vegetables. Our findings from previous epidemiologic studies establish that the antioxidant activity of *P. vulgaris* helps control blood glucose. We, therefore, hypothesize that the dietary supplements of bean can be a low-cost prevention approach to reduce cataract and much other visual comorbidity associated with T2DM. However, further epidemiological studies combined with molecular research need to be conducted to prove this hypothesis.

KEY WORDS

Phaseolus vulgaris; Visual deficiencies; Antioxidant ; Cataract; Diabetes Mellitus; Anti-radical Activity

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a lifelong disease, which is characterized by high levels of glucose in the blood. Worryingly, it is growing at an alarming rate in sub-saharan Africa. From the literature, it has been elucidated that the major risk factors are westernization, sedentary lifestyle, metabolic syndrome (MetS), and nutritional transition contributing to overweight (1-3). The leading causes of blindness in diabetic patients

comprise diabetic retinopathy (DR), cataract, glaucoma, macular edema, age-related macular degeneration, (AMD) and optic nerve atrophy. T2DM is also associated with high incidence of risk factors for developing cardiovascular disease (CVD) (4-11). An eye survey showed that in the US, almost 3.4 million of adults aged 40 or more were visually disabled and main causes were DR and age-related eye diseases (cataract, AMD, and glaucoma) (12). Likewise, DR, cataract, glaucoma, and



AMD also appear to be the major causes of blindness in ophthalmic practice in Kinshasa, Matadi, Boma, Muanda, and Mayombe (MvituMuaka, Unpublished Data). We reported 12% cases of DM in Central Africa, which was more than that reported in the prior published manuscripts. This finding clearly indicates that the prevalence of diabetes in this part of world is increased. The study showed that the three main causes of blindness accounting for 47%, 33%, and 19.8% of cases were DR, cataract, and glaucoma, respectively (13).

Ample evidence is available confirming that oxidative stress increases in patients with T2DM (14,15). Several studies in the literature support that the antioxidant rich diet—the diet based on beans and vegetables—prevents cataract formation by inhibiting the oxidation of lipids and proteins in the crystalline lens (16,17).

P. vulgaris or bean (Figure 1) is a mass-consumed food in Central Africa, and its anti-radical activity, blood glucose control property, and weight loss property have been substantiated by a growing body of evidence (18-26). The nutritional composition of bean includes the following: trivial fat and an insignificant amount of saturated fat, phytate and phenolic compositions (which act in the same way as glucose-lowering alpha-glucosidase or alpha-amylase inhibitors, e.g., metformin and acarbose), high folate, Fe, Mg, Zn, omega-3 fatty acids, and antioxidants (27-32). It has also been elucidated that the antioxidant content of red beans is the highest among vegetables (33).



Figure 1. *Phaseolus vulgaris* (Bean)

HYPOTHESES

Considering the evidence which has been discussed, we hypothesize that beans can be a cheap and healthy dietary supplement to effectively prevent or at least retard the progress of cataract and visual comorbidities associated with T2DM in diabetic patients.

DISCUSSION

Among the native populations of Congo, the consumption of red beans was considered as a preventive measure for metabolic syndrome (34) and cataract (35) and other visual impairments. We conducted a cross-sectional study in Congo using 244 patients with T2DM. This was the first African study on the prevention of cataract that involved the consumption of vegetables rich in antioxidants, in general, and red beans, specifically. The result showed an independent and protective role of dietary antioxidant-red beans and vegetables-against cataract development, and only red beans were independent and significantly possible protective factors against cataract surgery. Therefore we suggested the intake of antioxidant-rich vegetables, including red beans (35).

In another cross-sectional study conducted among 500 type 2 diabetic patients in Kinshasa, Africa, we found that with regular intake of *P. vulgaris* (beans), the absolute risk of cataract significantly reduced (36).

Likewise, a majority of literature suggest that the regular intake of antioxidants, e.g., red beans and vegetables, precludes cataract development as these antioxidants inhibit the oxidation of proteins and lipids oxidation (37-39) in the lens.

CONCLUSION

In conclusion, *P. vulgaris* might be a cost-effective dietary supplement to prevent or stop cataract formation in diabetic patients because of its well-known antioxidant activity, especially its blood glucose control property. However, further good quality designed epidemiological studies combined with molecular research are required to explore the molecular details of these properties, which may open new horizons with less side effects and more cost-effective pharmacologic management of cataract.



DISCLOSURE

The authors report no conflicts of interest in this work.

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