

# Efficacy and Safety of Olive in the Management of Hyperglycemia

Eddouks M\*

Faculty of Sciences and Techniques Errachidia, Moulay Ismail university, BP 21, Errachidia, 52000, Morocco

Postprandial hyperglycemia indicates the abnormality in glucose turnover leading to the onset of type 2 diabetes. Therefore, correction of postprandial hyperglycemia is crucial in the early stage of diabetes therapy. One of the most effective strategies to control postprandial hyperglycemia is medication combined with intake restriction and an exercise program. However, along with the prevalence of chronic diseases with multi-pathogenic factor, drugs with single chemical composition are usually not effective. In this view, phytotherapy has a promising future in the management of diabetes, considered to have less side effects as compared to synthetic drugs. The World Health Organization estimates that in developing countries about 80% of the population now still depend on herbal treatment. Olive (*Olea europea*) (OE) has been used in traditional remedies in Europe and Mediterranean countries as a food and medicine for over 5,000 years especially for the prevention and treatment of chronic diseases such as hypertension, atherosclerosis, cancer and diabetes. In addition, olive is considered as the most important component of the Mediterranean diet with many health benefits. Several experimental studies have demonstrated the beneficial effect of OE on diabetes. This effect has been demonstrated in the animal models such as streptozotocin-induced diabetic rats, alloxan-induced diabetic rats and obese diabetic sand rats fed a hypercaloric diet. In these models olive extracts have been shown to exhibit a significant reduction on both blood glucose and insulin levels. Few randomized clinical trials have demonstrated the beneficial effect of olive and one study has shown that the subjects treated with olive leaf extract exhibited significantly lower Glycated hemoglobin (HbA1c) and fasting plasma insulin levels. Another study performed in recent onset type 2 diabetic patients has revealed that OE leaves exhibited antidiabetic activity when it added as a mixture of extract of leaves of *Juglans regia*, *Urtica dioica* and *Atriplex halimus*. The underlying mechanism seems to be the improvement of glucose uptake and no side effect was reported while extracts from OE have been found to exhibit cytotoxic effects only at concentrations higher than 500 µg/mL in cells from the liver hepatocellular carcinoma cell line (HepG2) and cells from the rat L6 muscle cell line. As far as the phytochemical analysis is concerned, it is now well-established that major fatty acid constituents and minor phenolic components in olives and olive oil exert important health benefits particularly for cardiovascular diseases, metabolic syndrome and inflammatory conditions. Hydroxytyrosol and oleuropein are considered as major polyphenolic compounds in olive leaf. Oleuropeoside, a phenylethanoid isolated from OE demonstrated a significant hypoglycemic activity in alloxan-induced diabetes and the hypoglycemic activity of this compound may result from both the increased peripheral uptake of glucose and potentiation of glucose-induced insulin secretion. In addition, Maslinic acid (MA), a natural triterpene from OE with hypoglycemic activity is a well-known inhibitor of glycogen phosphorylase in diabetic rats without affecting hematological, histopathologic and biochemical variables, thus suggesting a sufficient margin of safety for its putative use as a nutraceutical. More recently a study has showed that MA exerts anti-diabetic effects by increasing glycogen content and inhibiting glycogen phosphorylase activity in HepG2 cells. Furthermore, MA was shown to induce the phosphorylation level of insulin-receptor  $\beta$ -subunit, protein kinase B (Akt) and glycogen synthase kinase-3 $\beta$ . MA treatment

of mice fed with a high-fat diet reduced the model-associated adiposity, mRNA expression of proinflammatory cytokines and then insulin resistance, and increased the accumulated hepatic glycogen. Finally, a recent clinical study has revealed that supplementation with olive leaf polyphenols significantly improved insulin sensitivity and pancreatic  $\beta$ -cell secretory capacity in overweight middle-aged men at risk of developing the metabolic syndrome. In conclusion, OE has been and continue to represent a natural source of phytochemicals eliciting a beneficial effect in human health especially in the management of hyperglycemia [1-15].

## Grants:

This work has been supported by the “MESRSFC: Appel à projets dans les domaines prioritaires de la recherche scientifique et du développement technologique”.

## References

1. Bennani-Kabchi N, Fdhil H, Cherrah Y, El Bouayadi F, Kehel L, et al. (2000) Therapeutic effect of *Olea europea* var. *oleaster* leaves on carbohydrate and lipid metabolism in obese and prediabetic sand rats (*Psammomys obesus*). *Ann Pharm Fr* 58: 271-7.
2. Said O, Fulder S, Khalil K, Azaizeh H, Kassis E, et al. (2008) Maintaining a physiological blood glucose level with 'glucoselevel', a combination of four anti-diabetes plants used in the traditional arab herbal medicine. *Evid Based Complement Alternat Med* 5: 421-8.
3. Bouallagui Z, Han J, Isoda H, Sayadi S. Hydroxytyrosol rich extract from olive leaves modulates cell cycle progression in MCF-7 human breast cancer cells (2011) *Food Chem Toxicol* 49: 179-84.
4. Cumaoglu A, Ari N, Kartal M, Karasu Ç (2011) Polyphenolic extracts from *Olea europea* L. protect against cytokine-induced  $\beta$ -cell damage through maintenance of redox homeostasis. *Rejuvenation Res* 14: 325-34.
5. Nan JN, Ververis K, Bollu S, Rodd AL, Swarup O, et al. (2014) Biological effects of the olive polyphenol, hydroxytyrosol: An extra view from genome-wide transcriptome analysis. *Hell J Nucl Med* 17: 62-9.
6. Guan T, Qian Y, Tang X, Huang M, Huang L, et al. (2011) Maslinic acid, a natural inhibitor of glycogen phosphorylase, reduces cerebral ischemic injury in hyperglycemic rats by GLT-1 up-regulation. *Neurosci Res* 89: 1829-39.
7. Sánchez-González M, Lozano-Mena G, Juan ME, García-Granados A, Planas JM (2013) Assessment of the safety of maslinic acid, a bioactive compound from *Olea europaea* L. *Mol Nutr Food Res* 57: 339-46.
8. Liu J, Wang X, Chen YP, Mao LF, Shang J, et al. (2014) Maslinic acid modulates glycogen metabolism by enhancing the insulin signaling pathway and inhibiting glycogen phosphorylase. *Chin J Nat Med* 12: 259-65.
9. Liu YN, Jung JH, Park H, Kim H (2014) Olive leaf extract suppresses messenger RNA expression of proinflammatory cytokines and enhances insulin receptor substrate 1 expression in the rats with streptozotocin and high-fat diet-induced diabetes. *Nutr Res* 34: 450-7.

\*Corresponding author: Eddouks M, Faculty of Sciences and Techniques Errachidia, Moulay Ismail university, BP 21, Errachidia, 52000, Morocco, Tel +212535574497; Fax: +212535574485; E-mail: [mohamed.eddouks@laposte.net](mailto:mohamed.eddouks@laposte.net)

Received January 05, 2015; Accepted January 06, 2015; Published January 09, 2015

Citation: Eddouks M (2015) Efficacy and Safety of Olive in the Management of Hyperglycemia. *Pharmaceut Reg Affairs* 4: e145. doi:10.4172/2167-7689.1000e145

Copyright: © 2015 Eddouks M. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

- 
10. de Bock M, Derraik JG, Brennan CM, Biggs JB, Morgan PE, et al (2013) Olive (*Olea europaea* L.) leaf polyphenols improve insulin sensitivity in middle-aged overweight men: a randomized, placebo-controlled, crossover trial. *PLoS One* 8: e57622.
  11. Wainstein J, Ganz T, Boaz M, Bar Dayan Y, Dolev E, et al. (2012) Olive leaf extract as a hypoglycemic agent in both human diabetic subjects and in rats. *J Med Food* 15: 605-10.
  12. Gonzalez M, Zarzuelo A, Gamez MJ, Utrilla MP, Jimenez J, et al. (1992) Hypoglycemic activity of olive leaf. *Planta Med* 58: 513-5.
  13. Al-Azzawie HF, Alhamdani MS (2006) Hypoglycemic and antioxidant effect of oleuropein in alloxan-diabetic rabbits. *Life Sci* 78: 1371-7.
  14. Kadan S, Saad B, Sasson Y, Zaid H (2013) *In Vitro* Evaluations of Cytotoxicity of Eight Antidiabetic Medicinal Plants and Their Effect on GLUT4 Translocation. *Evid Based Complement Alternat Med* 2013: 549345.