



ORIGINAL ARTICLE

The Oxidative Stress State in Diabetes Mellitus Type 2 Patients with Different Medications Types

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KEYWORDS

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ABSTRACT: Diabetes mellitus become the big health problem in the world that increased in high percentages in last decade, the DM medications types are important to maintain the normal levels of glycemic parameters, in present study the association between types of DM medication types with oxidative stress represented by ROS and TAO were conducted. The results show non-significant differences observed in all glycemic parameters in addition to ROS and TAO, the present finding concluded that the DM medication should be Multi-Directional Therapy applied for oxidative stress controlling in DM type 2.

INTRODUCTION

Type 2 diabetes represents major disease that cause people death in percent reached to 80% , this will result from its complications represented by cardiovascular disease , amputations, end stage renal disease and blindness in the developed world [1]. There were several causes associated with exacerbate this condition but the most preferable hypothesis is the oxidative stress where the elevation of glucose and fatty acid and its accumulation in pancreatic cells , muscle and adipose tissue may result from the random nourishment and this will lead to elevation in reactive oxygen species (ROS) which represent the pathogenic factor that cause β -cell dysfunction , insulin resistance, impaired glucose tolerance (IGT) and finally lead to type 2 DM (T2DM) [2,3]. Several medication are used to lowering the levels of glucose in the blood such as Insulin therapy , Sulfonylureas [4] and metformin [5] in addition to the anti-diabetic activities of natural sweetener plant Stevia

[6]. This study aimed to detect role of diabetes medication in reduction of oxidative stress

MATERIALS AND METHODS

Cross match study was conducted on (40)DM type2 patients have age attended to clinical privet lab, data and samples were collected with written consents of patients, glycemic parameters (FBG, HbA1c , IN, IR and IS) and oxidative stress markers (ROS, TAO) were detection using routine lab works, then data analysis using SPSS software version 23, data represent as mean \pm SE and significant was detected by ANOVA-one way at $p < 0.05$.

RESULTS

The findings exhibit that the Metformin 500 mg was more using than other medications (30.76%), stevia low frequent among patients (15.38%) (Table 1).

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Table 1. The percentages of medications types of DM type 2.

Drugs	Percentages%
Metformin 500 mg	30.76%
Stevia	15.38%
Metformin 1000	28.20%
Without medications	25.64%

The effect of medications types in glyceimic parameters was studied, non-significant differences observed in all glyceimic parameters, although of increased of FBG and

HbA1c in patients used Metformin 1000. The Metformin 500 mg decreased in all glyceimic parameters and oxidative stress markers (Table 2).

Table 2. the effect of medications types in glyceimic parameters and oxidative stress markers

Drugs	FBG	HbA1c	IN	IR	IS	ROS	TAO
Metformin 500 mg	191.66±21.6	7.82±0.496	3.64±0.926	1.38±0.315	0.39±.025	107.68±13.27	10.13±0.55
Stevia	220.57±94.29	9.00±1.41	3.71±2.92	1.71±1.46	0.38±0.06	111.93±59.99	10.83±2.45
Metformin 1000	258.90±43.68	9.35±0.60	3.41±0.73	1.85±0.36	0.36±0.016	113.02±19.76	11.34±1.24
Without medications	227.30±39.37	8.50±0.59	5.28±0.90	2.55±0.56	0.35±.016	113.07±19.27	10.98±0.92
Sig	0.573	0.233	0.454	0.279	0.509	0.995	0.809

DISCUSSION

Medications that used in treatment of diabetes mellitus are varied but all of them have the same goal which is to reduce blood sugar .Metformin is one of the approved medication by FDA which act on reduce blood sugar via its binding with the receptors of insulin and trigger the reduction of glucose production in hepatic cells and induce the tissue to increase the uptake of glucose thus lead to reduce blood sugar levels and improve insulin sensitivity [5].

Metformin should be initiated at 500 mg orally daily or twice daily with meals and slowly titrated up over 3–4 weeks to 1000mg orally twice daily with meals as tolerated [7]. The results show non-significant differences observed in all glyceimic parameters in addition to ROS and TAO and this may related with the dose of metformin where it has lowering effect for HbA1c to 1.5%, its lowering effects of glyceimic control depend on the combination of therapeutic, the type of subjects recruited and the follow-up of the study [8,9].

In a study performed on 742 patients of type 2 diabetes with different doses of metformin 500 mg, 1000 mg, 1500 mg, 2000 mg, respectively once daily and placebo or 1000 mg twice daily for 16 weeks to comprise the effect of different doses in comparisons with placebo and found that the optimal dosages of metformin were 1500 mg and 2000 mg per day [10]. In a study find that

metformin act in the hyperinsulinemia patients to control the hyperglycemia by detect the appropriate mechanism for specific tissue where in muscle it enhance the sensitivity of insulin and that will lead to increase the uptake of glucose while in liver it will act on decrease the production of glucose by hepatic cells so that in the condition of hypoinsulinemia, the monotherapy by metformin only don't have the ability to reduce the level of blood glucose. The condition of hyperglycemia will lead to generation of oxidative stress by increase the ROS and thus lead to concluded that metformin act on reduce the ROS and TAO indirectly [11, 12].

Recently, there were increase in using of phytochemical Stevia as a natural and healthy alternative sweetener to sugar and its healthy effects on diabetic patients , so several studies tried to study the effects of stevia on glyceimic control to detect its benefits ,some studies found that stevia have an anti-hyperglycemic and antioxidant activity via its ability in increase insulin levels by pancreatic tissue and act in decrease the inflammation and oxidative response and thus lead to lowering the level of glucose.other study found that in the comparision between two groups of type 2 diabetes patients ,one of them consumed stevia while the other don't on the glyceimic control and found that there were no significant differences between the groups and

concluded that stevia have no effects on blood glucose, HbA1C, insulin and lipid levels and this agree with the current study [6,13].

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Conflict of interests

The authors declared no conflict of interest.

REFERENCES

1. Ceriello A., Motz E., 2004. Is oxidative stress the pathogenic mechanism underlying insulin resistance, diabetes, and cardiovascular disease? The common soil hypothesis revisited. *Arterioscler Thromb Vasc Biol.* 24, 816–23.
2. Maddux B.A., See W., Lawrence Jr J.C., Goldfine A.L., Goldfine I.D., Evans, J.L., 2001. Protection against oxidative stress—induced insulin resistance in rat L6 muscle cells by micromolar concentrations of α -lipoic acid. *Diabetes.* 50(2), 404–410.
3. Hirsh I.B., 2005. Intensifying insulin therapy in patients with type 2 diabetes mellitus. *Am J Med.* 118(Suppl. 5A), 21S–6S.
4. Vaidyanathan J., Choe S., Sahajwalla C.G., 2012. Type 2 diabetes in pediatrics and adults: thoughts from a clinical pharmacology perspective. *Journal of Pharmaceutical Sciences.* 101(5), 1659–1671.
5. TODAY Study Group, 2012. A clinical trial to maintain glycemic control in youth with type 2 diabetes. *New England Journal of Medicine.* 366(24), 2247–2256.
6. Jan S.A., Habib N., Shinwari Z.K., Ali M., Ali N., 2021. The anti-diabetic activities of natural sweetener plant Stevia: an updated review. *SN Appl. Sci.* 3(4), 1–6.
7. Rosenbloom A.L., Silverstein J.H., Amemiya S., Zeitler P., Klingensmith G.J., 2008. ISPAD Clinical Practice Consensus Guidelines 2006–2007. Type 2 diabetes mellitus in the child and adolescent. *Pediatric Diabetes.* 9(5), 512–526.
8. Nathan D.M., Buse J.B., Davidson M.B., 2009. Medical management of hyperglycaemia in type 2 diabetes mellitus: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement from the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetologia.* 52, 17–30.
9. Nathan D.M., Buse J.B., Davidson M.B., Ferrannini E., Holman R.R., Sherwin R., Zinman B., 2009. Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes Care.* 32(1), 193–203.
10. Fujioka K., Brazg R.L., Raz I., Bruce S., Joyal S., Swanink R., Pans M., 2005. Efficacy, dose–response relationship and safety of once-daily extended-release metformin (Glucophage® XR) in type 2 diabetic patients with inadequate glycaemic control despite prior treatment with diet and exercise: results from two double-blind, placebo-controlled studies. *Diabetes, Obesity and Metabolism.* 7(1), 28–39.
11. Akhileshwar V., Patel S.P., Katyare S.S., 2007. Diabetic cardiomyopathy and reactive oxygen species (ROS) related parameters in male and female rats: a comparative study. *Indian Journal of Clinical Biochemistry.* 22(1), 84–90.
12. Meyer L., Bohme P., Delbachian I., Lehert P., Cugnardey N., Drouin P., Guerci B., 2002. The benefits of metformin therapy during continuous subcutaneous insulin infusion treatment of type 1 diabetic patients. *Diabetes Care.* 25(12), 2153–2158.
13. Ajami M., Seyfi M., Hosseini F.A.P., Naseri P., Velayati A., Mahmoudnia F., Zahedirad M., Hajifaraji M., 2020. Effects of stevia on glycemic and lipid profile of type 2 diabetic patients: A randomized controlled trial. *Avicenna journal of Phytomedicine.* 10(2), 118.