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"Evaluation of Glycemic Load and Lipimic Response of some Traditional and Fast Foods Consumed by Egyptians using Rats"

Thesis Submitted By

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ABSTRACT

The glycemic index and lipemic response are two parameters nowadays used to measure the extent of glucose tolerance and lipemic impact of different meals consumed by the population. In this study, glucose tolerance and lipemic response of some popular meals usually and frequently consumed by the public were measured. These meals were koshary, tamia, stewed bean, besara, koskosi, shawerma, hawawshi, hamburger, kentaki fried chicken and pizza. The main ingredients composing the plant based meals are rice, lentils and chickpea in case of koshary and mainly beans in the other meals namely Tamia or Besara. The main ingredients used for the animal based meals are either meat or chicken. Among the plant based meals the highest values for GI and GL were obtained for koshary and koskosi. The values obtained were72.8 and 16.5 for koshary and 74.9 and 29.8 for koskosi The other meals namely, tamia, broad bean or besara have glycemic indexes that may be classified as moderate. It is worth mentioning that combination of tamia with bread or with bread and salad caused a slight increase in the values reported for the glycemic index and glycemic load.

The values reported for the glycemic index and glycemic load of the animal based meals are remarkably higher than the corresponding ones of the plant based meals except for koshary and koskosi .The highest value was reported for pizza (70.3) and the lowest for hawawshi (55.45). In this study, the aim was to modify some meals that are most popular in the local market and also those which have the highest either glycemic index or lipemic response. Trials were made to modify koshary and tamia from the plant based group, pizza and hawawshi among the animal based ones. The modification was to improve the glycemic index and lipemic response of these meals to avoid complications that can occur to consumers.

Koshary meal was modified by reducing the amount of rice and increasing the amount of lentils. Rice was reduced from 136 to 111g while lentils were increased from 42 to 102 g. Chickpea was also increased from 11 to 43g.

Concerning tamia meal, the amount of bread was decreased from231 to 198 g salad was increased from 175 to 308g, the amount of tamia itself was reduced from 527 to 461g. In addition tamia was prepared from bean and chickpea in the ratio of 1:2 As a result of these modifications have remarkable changes occurred in the values obtained after measurement of the glycemic index and glycemic load of the modified meals. GI of koshary changed from 72.8 to 22.96. The glycemic load from 16.5 to 5.4. In case of tamia the GI changed from 35.3 to 18.5 and GL from 7.7 to 2.4. Animal based meals were also modified. In case of hawawshi , soybean was added (112g/kg) on the expense of meat, besides, broccoli was added (56g/kg) to the meal. This modification caused a slight increase in protein content of hawawshi from 28.2 to30.7g% and a drop in fat content from 25.2 to18.2g% and there was a moderate increase in carbohydrate content. In case of pizza, mackerel fish was added (107g/kg) and souses was removed from the meal. As a result of this modification the protein content of pizza dropped from 32.6g% to 18.1g%, (table 12). The fat content also dropped from 17.1 to 2.8g%, while the carbohydrate increased from 41.1 to 70.2g%. Although the increased amount of carbohydrates in the modified meal is against the concept to decrease the glycemic index and load of either hawashi or pizza meal, yet the change of the ingredients agree quite well with health aspects. In spite of the relative increase of the carbohydrate content of the modified meals, yet the determined glycemic index and the calculated glycemic load of both meals were markedly decreased relative to the case before modification. The GI of pizza dropped from 70.30 to 25.01 and that of hawawshi from 56.13 to 32.45; The GL changed from 15.68 to 6.20 in case of hawawshi and from 11.64 to 8.26 in case of pizza. The animal experiment was done to assess the effect of modification of the 2 meals namely koshary and pizza on glucose level and lipid pattern of experimental animals. The animals were rendered diabetic by injection of alloxan. The choise of alloxan diabetic rats was based upon the fact that the main target of meal modification is to minimize the rise of blood sugar concentration following consumption of the meal. The blood sugar of diabetic rats before feeding, measured 2 hours after meal was significantly higher

(157.89±5.75 mg/100 ml) than that of control rats 78.24±1.59). Rats fed on koshary meal showed relatively high values similar to that of control diabetic rats (173.43±6.77 for koshary before modification and 182.82±6.65 after modification).When blood sugar is measuredfeeding, significantly lower values were obtained (148.43±5.18 for koshary before modification and 143.5±3.1 after modification). This shows that in spite of the effective action of modified koshary meal on normal animals yet this effect on diabetic ones is not appreciable. However, after feeding the effect started to be observable. More or less similar findings were reported in case of pizza, the effect of modification was clear only after feeding.

It was concluded that consuming meals with low GI by diabetic persons can help to improve the condition and participate in reducing blood sugar level. It is not only the quantity of sugar but the nature of this sugar decided by the value of the GI.

The lipid profile of rats fed on the modified meals either koshary or pizza showed considerable improvement. Plasma total lipid, triacylglycerols, total cholesterol and LDL-chlesterol were markedly reduced. In the same time, there was an improvement in the value of HDL- cholesterol as a result of consumption of the modified meals. Thus, it can be stated that, the modified meals succeeded to minimize hyperglycemia following consumption of the meal and in turn decreasing the counter regulatory hormone action thus lead to partial correction of hyperlipidemia.

The conclusion is that, this study succeeded to give values perhaps for the first time to the glycemic index, load in and the lipemic response to a number of popular meals usually and oftenly consumed by Egyptians. The glycemic index was used to modify some of these meals in a trial to reduce the value of their glycemic index and lipemic response. This was to minimize their health hazards and make them safe to the consumers. The modification was effective proved by the feeding experiment which showed that animals fed on the modified meals have better blood glucose tolerance and lipid profile.

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List of Abbreviations

ADA	American Diabetes Association.
AHA	American Heart Association.
AMD	Age-related macular degeneration.
AOAC	Association of Official Agricultural Chemists.
AUC	Area Under Curve.
BG	Blood Glucose.
BMI	Body Mass Index.
BP	Blood Pressure.
CETP	Cholesterol –Ester Transfer Protein.
CHD	Cornoary Heart disease.
CHO	Carbohydrate.
CRP	C-reactive protein.
CVD	Cardio – vascular disease.
DHA	Docosahexacnoic acid.
DM	Dry matter.
DNA	Deoxyribo nucleic acid.
EDTA	Ethylene Diamine Tetracetic Acid.
EpA	Eicosapentaenoic acid.
FAO	Food and Agriculture organization.
FDA	Food and Drug Administration
GGE	Glycemic Glucose Equivalent.
GI	Glycemic Index.
GIP	Gastric inhibitory poly peptide.
GL	Glycemic Load.
HbA1c	Glycated hemoglobin.
HDL-C	High Density Lipoprotein Cholesterol.
IHD	Ischemic Heart Disease.
LDL-C	Low Density Lipoprotein – Cholesterol.
LPL	Lipoprotein Lipase.
LSMP	Life Style Modification Programmes.
MOH	Minister of Health.