ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Body mass, level of glucose and serum myeloperoxidase in offsprings of diabetic and non-diabetic parents.

Dambel Suman S[1], Kumari Suchetha N[2*], Kathyayani P[2], Geethashri A[3], Ramitha K[3], Chethana KR[3]

[1]Department of Biochemistry, Karnataka Institute of Medical Sciences, Hubli, Karnataka.
[2]Department of Biochemistry, Nitte University, Deralakatte, Mangalore, Karnataka.
[3]Central Research Laboratory, A.B.S.M.I.D.S, Deralakatte, Mangalore, Karnataka.

ABSTRACT

The offspring of Diabetic mellitus have a higher risk incidence of impaired glucose tolerance and elevated body mass index (BMI) at the age of 20 years compared with the offspring of non-diabetic healthy parents. Myeloperoxidase (MPO) heme enzyme found in the azurophilic cytoplasmic granules of polymorphonuclear leucocytes or neutrophils and in the lysosomes of the monocytes. In Type II Diabetes mellitus the Myeloperoxidase level is found to be higher. The aim was to investigate the relationship between body mass index, glucose and serum MPO, in the offspring of diabetic and non-diabetic parents. The study was approved by the ethical committee of the A. B. Shetty Dental College. Informed consent was obtained from the offspring. 97 offspring (age 18-26) of diabetic parents were investigated in the study and compared with the age and sex matched offspring of non-diabetic parents. There was correlation between BMI, FBS and serum MPO level in offspring of both diabetic and non-diabetic parents. In our study 26% of offspring of diabetic were found to be overweight and only 6% of the offspring of normal parents were overweight In the offspring of Diabetic parents FBS level (105$\pm$ 23.75) mg/dl, Serum MPO level (69.99$\pm$31.76) pM/L. In the offspring of healthy parents FBS level (89$\pm$15.54) mg/dl, Serum MPO level (63.00$\pm$ 23.64) pM/L. The higher BMI, FBS and Serum MPO level in the offspring of diabetic when compared to the offspring of non-diabetic may be the marker for the risk of developing diabetic.

Key words: Body mass, Fasting blood sugar, Diabetes, Myeloperoxidase.

Corresponding author
E-mail: suchetha.shetty@rediffmail.com

ISSN: 0975-8585

INTRODUCTION

The diabetes epidemic is driven, in part, by a parallel epidemic of obesity. Whereas obesity is a major risk factor for type 2 Diabetes, the mechanisms whereby excess body fat leads to diabetes or diabetes related complication remains uncertain. Oxidative stress may be one of the pathways whereby increased BMI lead to type 2 diabetes in humans [1]. Oxidative stress is caused by an imbalance between the production of reactive oxygen and a biological system's ability to readily detoxify the reactive intermediates or easily repair the resulting damage. All forms of life maintain a reducing environment within their cells. This reducing environment is preserved by enzymes that maintain the reduced state through a constant input of metabolic energy. Disturbances in this normal redox state can cause toxic effects through the production of peroxides and free radicals that damage all components of the cell, including proteins, lipids, and DNA.

The oxidative stress is strictly influenced by glycometabolic control either in type 1 or type 2 diabetics. In type 2 diabetics, if glycemic control improves, the oxidative stress parameters, such as thiobarbituric acid reactive substances (TBARS), partially decrease; the same trend seems to occur for the NO_2^-/NO_3^- ratio and cyclic guano sine monophosphate content. The latter should be considered a marker of endothelial dysfunction. Others found, after improving the glycemic control of type 2 diabetics using insulin treatment, a decrease in conjugated dienes production rate, but no decrease in TBARS or LDL oxidation. The earlier studies have confirmed that insulin treatment nearly corrects the oxidative stress in type 1 diabetics but only improves it in type 2 diabetics.

The oxidative stress also impairs insulin action, as has been demonstrated in type 2 diabetics, and this impairment might be due to several factors, such as membrane fluidity alterations, decreased availability of NO and increased intracellular calcium content. Also our group found an increase in erythrocyte cytosolic Ca^{2+} concentration in diabetics of both types. Myeloperoxidase (MPO) is a heme peroxidase enzyme involved in the generation of oxidative stress .MPO is an inflammatory enzyme produced by activated leukocytes that predicts risk of coronary heart disease. Myeloperoxidase (MPO) is a peroxidase enzyme (EC 1.11.1.7) most abundantly present in neutrophil granulocytes (a subtype of white blood cells). It is a lysosomal protein stored in azurophilic granules of the neutrophil. MPO has a heme pigment, which causes its green color in secretions rich in neutrophils, such as pus and some forms of mucus.
MPO produces hypochlorus acid (HOCl) from hydrogen peroxide (H_2O_2) and chloride anion (Cl^-) (or the equivalent from a non-chlorine halide) during the neutrophil's respiratory burst. It requires heme as a cofactor. Furthermore, it oxidizes tyrosine tyrosyl radical using hydrogen peroxide as an oxidizing agent. Myeloperoxidase (MPO) is a human enzyme in the azurophilic granules of neutrophils and in the lysosomes of monocytes. Its major role is to aid in microbial killing. Some patients with MPO deficiency have impaired microbial killing, but most are asymptomatic.MPO, a heme-containing protein, is found in the azurophilic granules of neutrophils and in the lysosomes of monocytes in humans; however, monocytes contain only about a third of the MPO present in neutrophils. When neutrophils become activated

during phagocytosis, they undergo a process referred to as a respiratory burst. This respiratory burst causes production of superoxide, hydrogen peroxide, and other reactive oxygen derivatives, which are all toxic to microbes. During respiratory bursts, granule contents are released into the phagolysosomes and outside the cell, allowing released contents to come into contact with any microbes present. Experiments conducted in the 1960s showed that MPO catalyzes the conversion of hydrogen peroxide and chloride ions (Cl) into hypochlorous acid [4]. Hypochlorous acid is 50 times more potent in microbial killing than hydrogen peroxide. With this background the present work was undertaken to investigate the Body Mass Index, level of fasting blood glucose (FBS) and MPO in the offspring of diabetic and non diabetic parents and also to investigate whether, MPO is associated with increased BMI and FBS in the offspring of diabetic and non diabetic parents.

MATERIALS AND METHODS

The present work was carried out at central research laboratory of A.B.Shetty Memorial Institute of Dental Sciences, Deralakatte, Mangalore. The ethical clearance was obtained from the institution and also an informed consent from all the participants was taken.

The participants were grouped into offspring's of diabetic parents and offspring's of normal parents. About 97 participants were recruited for our study. About 5 ml of venous blood was collected from offspring of both diabetic & non-diabetic parents.FBS and serum MPO level was measured by GOD-POD and Matheson's method respectively. BMI was calculated by the formula of Body weight (kg) / height (m^2).

STATISTICAL ANALYSIS

The data collected were expressed as Mean $\pm$ S.D. and statistically analyzed for their significance using Students t-test.

RESULTS

The results obtained in our study were expressed in Table-1 and Fig-1, 2 and 3. The data obtained analyzed for their significance. The data obtained for BMI was significantly increased in offspring's of Type II DM parent as compared to the offspring's of normal parent($p<0.001$). The data obtained for Serum MPO was also significantly increased in offspring's of Type II DM parent as compared to the offspring's of normal parent ($p<0.001$). Further the values of FBS was also significantly increased in offspring's of Type II DM parent as compared to the offspring's of normal parent ($p<0.001$).

DISCUSSION AND CONCLUSION

Studies have shown that an increased BMI causes a rise in systemic IL-6 and CRP [2]. CRP stimulates the release of MPO from monocytes [3]. The released MPO is known to

ISSN: 0975-8585

Table 1: Average values of various parameters in Offspring of Type II DM parent and Offspring of Normal parent. The values are expressed as Mean ± SD, n=97). p<0.05 considered as significant.

Parameters	Offspring's of Type II DM parents	Offspring's of Normal parents	P value
BMI (kg/m^2)	23.00±3.44	21.94±4.39	P<0.001
FBS (mg/dl)	105±23.75	89 ±15.54	P<0.001
MPO (pM/L)	69.90 ± 31.76	63.00± 23.64	P<0.001

Note: BMI= Body mass index, FBS= Fasting blood sugar, MPO= Myeloperoxidase.

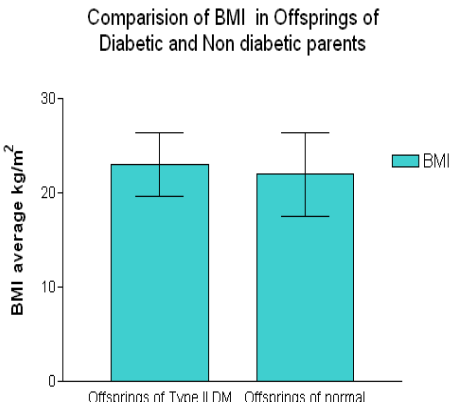

Fig-1: Levels of BMI in Offspring of Type II DM parent and Offspring of Normal parents. N=97 in each group.

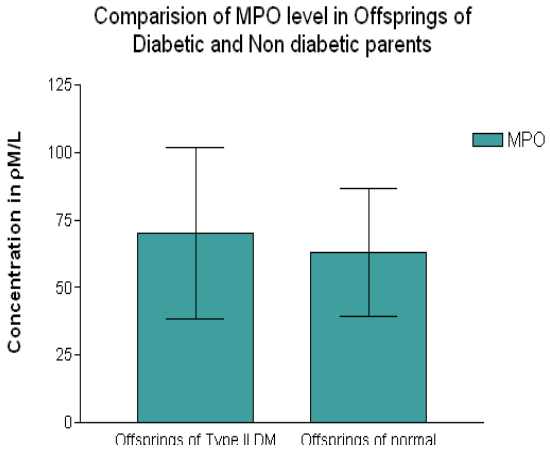

Fig 2: Levels of MPO in Offspring of Type II DM parent and Offspring of Normal parents N= 97 in each group.

ISSN: 0975-8585

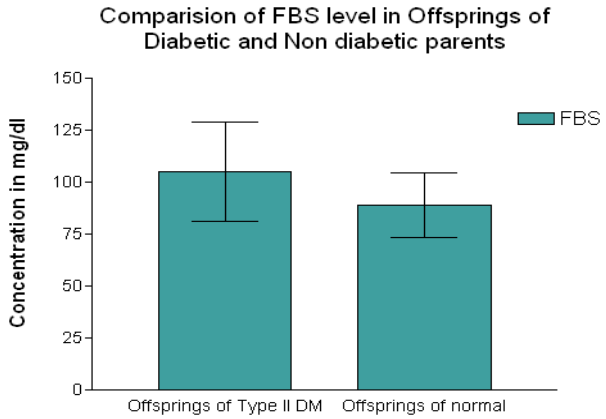

Fig 3: Levels of FBS in Offspring of Type II DM parent and Offspring of Normal parents. N= 97 in each group.

chlorinate the tyrosine residues of its target proteins which may cause endothelial dysfunction. Recent studies have shown endothelial dysfunction as a cause of insulin resistance.

Increasing evidence in both experimental and clinical studies suggests that oxidative stress plays a major role in the pathogenesis of both types of diabetes mellitus. Free radicals are formed disproportionately in diabetes by glucose oxidation, nonenzymatic glycation of proteins, and the subsequent oxidative degradation of glycated proteins. Abnormally high levels of free radicals and the simultaneous decline of antioxidant defence mechanisms can lead to damage of cellular organelles and enzymes, increased lipid peroxidation, and development of insulin resistance. These consequences of oxidative stress can promote the development of complications of diabetes mellitus. Earlier studies have demonstrated the changes in oxidative stress biomarkers, including superoxide dismutase, catalase, glutathione reductase, glutathione peroxidase, glutathione levels, vitamins, lipid peroxidation, nitrite concentration, nonenzymatic glycosylated proteins, and hyperglycemia in diabetes, and their consequences [4]. There is a need to continue to explore the relationship between free radicals, diabetes, body mass and its complications, and to elucidate the mechanisms by which increased oxidative stress accelerates the development of diabetic complications with the parental history of Diabetes. The higher BMI, FBS and Serum MPO level in the offspring of diabetic when compared to the offspring of non-diabetic may be the marker for the risk of developing diabetic.

REFERENCES

[1] James B, Martin G, Larson SD, Caroline S. Fox, John F. Keaney Jr, Ramachandran S. Vasan, Emelia J. Benjamin. Diabetes Care 2007.
[2] Uma Singha, Sridevi Devaraj and Ishwarlal Jialal. Department of Medical Pathology and Laboratory Medicine, UC Davis Medical Center, Sacramento, Myeloperoxidase research, 2008.
[3] Pinkney JH, Stehouwer CD, Coppack SW. Diabetes 1997; 46(2):S9-S13.
[4] Heinecke JW, Li W, Francis GA, Goldstein JA. J Clin Invest 1993; 91:2866-72.