

URINARY PH AND INSULIN RESISTANCE IN OFFSPRING OF DIABETIC PARENTS

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Background and Aim:

Recent studies try to find out parameters which can be used as predictors of type2 diabetes. Few investigations done in children of Type2 diabetic parents suggest the impact of family history and the presence of certain risk factors of the disease at an early age. We studied the presence of insulin resistance and changes in urinary pH in offspring of diabetic parents.

Materials and Methods:

Thirty subjects with one or both diabetic parents were compared with thirty subjects who are offspring of non diabetic parents.

Results:

No statically significant difference was observed between the two groups in any of the values.

Conclusion:

Using insulin resistance and urinary pH as predictors of type2 diabetes is questionable. We may have to do further studies associating other risk factors like increased BMI with the family history.

Evidences indicate that there is an increase in the prevalence of type 2 diabetes at an early age. An important genetic component in the development of type 2 diabetes has been documented by Radha V and Mohan V (2007). Studies by Shahid A *et al.*, (2008) have shown that the life time risk for type 2 diabetes in an offspring is more than double if both the parents are affected.

Recent studies have focused on finding out the parameters which may be used as predictors of type 2 diabetes. States Island University Hospital of United States has undertaken an investigation under the title "Urine pH as a Predictor of Diabetes" to check if a simple cheap study like a urine analysis can predict diabetes.

Few studies carried out in children by Altinli *et al.*, (2007), Lillioja *et al.*, (1993), Psyrogiannis *et al.*, (2003) and Osei *et al.*, (2004) regarding the impact of family history of Type 2 DM suggest the presence of certain risk factors of the to be significantly higher in offspring of diabetic parents than in offspring of nondiabetic parents. But the risk factors are more robustly expressed in offspring of BDP (both diabetic parents) as compared to the off spring of one diabetic parent.

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Recent studies by Maalouf *et al.*, (2007 and 2010), Abate *et al.*, (2004) Takahashi *et al.*, (2007) & Iba *et al.*, (2010) also show that low urinary pH is a novel feature of renal manifestation of insulin resistance. The current study was undertaken to determine the insulin resistance and urinary pH in offspring of diabetic parents and compare them with the values obtained in offspring of non diabetic parents. Though few studies have supported the evidence of changes in the parameters we studied, we wanted to analyze in our setup.

MATERIALS AND METHODS

Study Participants

The present cross sectional study, based on a total of 60 subjects aged 17-21 years was approved by the Human Research Ethical Committee. All participants were asked to complete a questionnaire on their family history of diabetes and any other major disease such as cardiovascular, respiratory and renal diseases. Subjects diagnosed as diabetics, with a history of T1DM in either of the parents, with conditions & on medications that are known to alter urine pH were excluded from the study. We wanted to evaluate individuals with a wide range of body weight; therefore, body weight and/or body mass index (BMI) was not used for the inclusion/exclusion criteria. Informed written consent was obtained from every subject. To prevent the effect of diet difference on urinary pH, the subjects were selected from people staying in the hostel. They were instructed to confine their meals only to hostel food.

Study Design

The subjects were divided into the following 2 groups:

Group I: Offspring of one or both parents with T2DM
(n=30, 19/30 – Males & 11/30 –Females)

Group II: Offspring without a family history of DM
(n=30, 13/30- Males & 17/30 – Females)-This group serves as control

Blood Collection & Urine pH Measurement

Three ml of venous blood was drawn from the cubital vein after overnight fasting of 12h for analytical purposes. Immediately after this urine pH was measured by pH electrode.

Analytical Determinations

All biochemical parameters were determined using standard procedures. Serum glucose levels were determined by the glucose oxidase method using a commercial reagent kit (ACCUREX). Serum insulin concentration was determined by ELISA using commercial kits (Immulite insulin – 100T – Siemens)

Insulin resistance index

Fasting glucose and fasting insulin levels were used to measure homeostasis model assessment of insulin resistance (HOMA-IR) index by the formula suggested by Matthews *et al.*, (1985)

$$\text{HOMA-IR} = \text{Fasting insulin } (\mu\text{IU/ml}) \times \text{Fasting glucose } (\text{mmol/l})/22.5.$$

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STATISTICAL ANALYSIS

All calculations were carried out with the SPSS version 17 (SPSS, Inc, Chicago, IL, USA). p value <0.05 was considered statistically significant

RESULTS

No statistically significant difference in any of the values was observed between the two groups. p value <0.05 was considered statistically significant. (Table – 1)

Table 1
Biochemical data of offspring of non-diabetic (NDP),
one/both diabetic (DP) parents.
Data are expressed as means \pm SD.

	DP (N=30)	NDP (N=30)	“p” value
Fasting glucose (mmol/l)	4.56 \pm 0.56	4.47 \pm 0.41	0.508
Fasting Insulin (μIU/ml)	12.53 \pm 5.75	10.03 \pm 6.38	0.116
HOMA-IR	2.53 \pm 1.23	2.01 \pm 1.38	0.128
Urine pH	6.41 \pm 0.19	6.39 \pm 0.23	0.635

DISCUSSION

Our study does not correlate with the findings of Adeela Shahid et al., (2008) who showed that insulin resistance was much higher in offspring of diabetic parents compared to offspring of non – diabetic parents. But their study has been done only in male subjects. Future studies should examine the gender difference in offspring of diabetic parents in expression of insulin resistance at an early age. Further studies are needed to confirm the prevalence of insulin resistance in offspring of diabetic parents at an early age.

Our results related to urinary pH values also do not correlate with the previous findings. Naim Moulaff *et al.*, (2008) found that urinary pH significantly decreases with increasing body weight. Naim M.Maalouf *et al.*, (2007) have published a study stating that unduly acidic urine is a feature of the metabolic syndrome and is associated with the degree of insulin resistance. But they have collected 24 hr urine sample (Analysis of pH of urine samples at intervals for 24 hrs and calculating the mean value). The results of our study go along with the results obtained by Workeneh B *et al.*, (2010) who concluded that fasting urine pH is independent of insulin sensitivity. As like in our study Biruh *et al* have collected 12 hr fasting urine sample (only one sample in the morning). So more studies involving large population of offspring of diabetic parents with the BMI & age in same range & also 24 hrs urine sample analysis for pH are needed to confirm the association of urinary pH and insulin resistance in the offspring of diabetic parents.

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