STUDY ON THE QUANTITATIVE INSULIN SENSITIVITY CHECK (QUICKI) INDEX IN OBESITY

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Abstract:
Obesity is well known that in various human pathological states such as: essential hypertension, coronary heart disease, type 2 diabetes mellitus,... Insulin resistance plays an important role in pathological state of diabetes. Recently, Katz et al provided QUICKI index (Quantitative insulin sensitivity check index) for insulin resistance condition evaluation. We carried out this study t*o determine the prevalence of insulin resistance by the QUICKI index and to evaluate the correlation between QUICKI index and the fasting glucose, insulin concentration.* **Subjects and Methods:** Control subject group: 30 cases healthy, not obese. Obese subject group: 107 individuals were chosen in General Internal Medicine and Geriatric Department, Hue Central Hospital; never analyzed for glucose, diagnosis of diabetes, IFG/ IGT; They had at least one in two criteria: BMI ≥ 23 or/and waist to hip ration (WHR) > 0.9cm in men; > 0.8cm in women Obesity, defined as a high BMI (≥ 23 kg/m^2). Android (Central) obesity, defined as high WHR: > 90cm in men and > 80cm in women. Insulin resistance is defined as QUICKI < $\overline{X}$ - 2SD in control group. The value are given as mean ± SD. p value < 0.05 was considered statistically significant. The group frequencies were compared by X^2 or Fisher's exact tests. Spearman rank correlations were used to demonstrate relationship between variables. **Results:** Our QUICKI index, studying on 107 patients, was significantly lower in the obese group and healthy individuals (0.87 ± 0.16 and 1.07 ± 0.18). The prevalence of insulin resistance in our study was 14.95%. QUICKI were significantly lower in the moderately obese group by Hisayo Yokoyama, Masanori Emoro than our general obesity (0.338 ± 0.030; 0.87 ± 0.16, respectively). **Conclusion:** The prevalence of insulin resistance in obesity: 14.95%. There were inversely correlation between QUICKI and the fasting glucose, insulin concentration.

1. INTRODUCTION

The prevalence of obesity, is continuously rising along with rapid economic development. Obesity is a well known risk factor for various human pathological states such as essential hypertension, coronary heart disease, type 2 diabetes mellitus.

During the past decade, the prevalence of obesity in Vietnam has doubled: from about 1- 2.5% (1991); 4.9% diabetes and 5.9% impaired glucose tolerance (2001)

Insulin resistance played an important role in pathological state of diabetes. Besides, it also went along with obesity and other cardiovascular risk factors.

The view of L. Landsberg: Overconsumption of food, less thermo-production or both of these compared with insulin resistance caused hyperinsulinemia for controlling the hydrocarbon metabolic in normal level.

Today, the treatment of IFG (impaired fasting glucose) is too late, it is necessary to begin

the treatment of an insulin resistant state immediately.

There were many methods for evaluating insulin resistance: the euglycemic hyperinsulinemic clamp technique; the insulin suppression test; the intravenous glucose tolerance test; and the oral glucose tolerance test. However, these methods were not easily applied in large-scale or routine clinical investigations because they were laborious and expensive.

The HOMA index is simple formula and easy to perform, but insulin sensitivity evaluated by HOMA is less accurate in the case of greatly deteriorated β cell function and/or marked hyperglycaemia.

Recently, Katz et al provided QUICKI index (Quantitative insulin sensitivity check index) for insulin resistance condition evaluation.

Based on the fasting plasma glucose and fasting insulin concentration, we carried out this study to get the aim: * *Determine the prevalence of insulin resistance by the QUICKI index.*

* *Evaluate the correlation between the QUICKI index and the fasting glucose, insulin concentration.*

2. METHOD

2.1. Subjects

* The control subject group: 30 healthy, not obese cases.

* The obese subject group:

- 107 individuals were chosen from the General Internal Medicine and Geriatric Department, Hue Central Hospital

- Have never been analyzed for glucose, diagnosis of diabetes, IFG/ IGT

- Had at least one in two criteria:

BMI ≥ 23 or/and waist to hip ration (WHR) > 90cm in men; > 80cm in women

2.2 Methods

- BMI (Body Mass Index): BMI was calculated after body weight and height were measured with subjects in light clothing without shoes.

Formula: BMI= P (kg) / H^2 (m^2)

P: weight; H: height.

Obesity, defined as a high BMI (≥ 23 kg/ m^2)

- Waist to hip ration (WHR):

Waist circumference was measured with soft tape on standing subjects midway between the lowest rib and the iliac crest.

Hip circumference was measured over the widest past of the gluteal region. Formula: Waist / Hip

Android (Central) obesity, defined as high WHR: > 0.9 in men; > 0.8 in women.

The WHR was calculated as a measure of central obesity.

- The fasting plasma glucose concentration: to evaluate fasting glucose by enzyme glucose oxydase.

Normal range in machine: 3.05 - 6.4 mmol/l.

- The fasting plasma insulin concentration was measured by ECLIA in Hue Central Hopital.

Normal range in machine: 3 - 17 μU/ ml.

- QUICKI index: Quantitative insulin sensitivity check index

Formula:

$$QUICKI = \frac{1}{\log[glucose\ (mmol/l) + insulin\ (\mu U/ml)]}$$

$QUICKI_{IR}$ was not estimated in patients treated with insulin.

Insulin resistance is defined as QUICKI < $\overline{X}$ - 2SD in the control group

2.3. Statistics

The statistical analysis were performed with Execel97, SPSS program (Statistical Package for Social Scientists) for Windows. A p value < 0.05 was considered statistically significant.

The value was given as mean ± SD. The group frequencies were compared by X^2 or Fishers exact tests. Spearman ranked the correlations that were used to demonstrate the relationship between variables.

3. RESULTS

*3.*1. Insulin resistance in obesity

Table 3.1. I_0 and G_0 in obese and control group

Factors	Control group (n = 30)	Obese group (n = 92)	p
I_O (µU/l)	4.31 ± 3.38	11.83 ± 10.3	< 0.01
G_O (mmol/l)	5.57± 2.00	5.97 ± 2.39	> 0.05

The insulin value in obese groups was high statistical significance ($p < 0.01$)

Table 3.2 Distribution of QUICKI index to sex

	Men	Women
n	60	47
QUICKI	0.88 ± 0.18	0.85 ± 0.13
p	> 0.05	

There were no differences in the QUICKI value between men and women ($p > 0.05$).

Table 3.3. The value insulin resistance index by QUICKI

	Well- healthy group	Obese group
$\overline{X}$	1.07	0.87
$\overline{X}$ ± SD	1.07 ± 0.18	0.87 ± 0.16
$\overline{X}$ - 2SD	0.71	0.55

The value of the QUICKI index in the obese group was significantly lower than that in the healthy individuals group.

Table 3.4. Distribution of insulin resistance person according QUICKI

	< $\overline{X}$ - 2SD
value	< 0.71
n	16
percentage %	16/107 = 14.95

The prevalence of insulin resistance in our study was 14.95%.

Table 3.5. The QUICKI value

	Control group	Obese group	Insulin resistance
value	1.07 ± 0.18	0.87 ± 0.16	< 0.71
n	30	107	16
p	p < 0.01		

There were statistically significant differences of the QUICKI in the insulin resistance obese group in comparison with the other ($p < 0.01$).

3.2. Correlation between QUICKI and the fasting glucose, insulin concentration

- Inverse correlation between QUICKI and the fasting glucose concentration.

Regression: $y = 1.029 - 0.027x$; $r = - 0.405$ ($p < 0.01$)

- Inverse correlation between QUICKI and the fasting insulin concentration.

Regression: $y = 1.011 - 0.012x$; $r = - 0.784$ ($p < 0.01$)

4. DISCUSSION

4.1. Insulin resistance in obesity

Research on 55 healthy individuals, M.C. Foss Freitas and M.C. Foss (Brasil) resulted in a QUICKI value of 0.39 ± 0.006. Meanwhile, the results of Hisayo Yokoyama, Masanori Emoro (Japan) and Olga Gonzalez- Albarran, Rafael Garcia Robles (Tây Ban Nha) were 0.389 ± 0.041 and 0.605 ± 0.052.

QUICKI on normoglycemia person in study of Ulla Rajala, Mauri Laako (Finland): 0.335 ± 0.022.

All of these results showed the decreased QUICKI compared with the healthy individuals in our study: 1.07 ± 0.18.

On the other side, in Japan, according to Hisayo Yokoyama, Masanori Emoro QUICKI were significantly lower in the moderately obese group than that in the normal range-weight type 2 diabetic and healthy groups (n= 120): 0.338 ± 0.030; 0.371 ± 0.037; 0.389 ± 0.041; respectively.

Olga Gonzalez- Albarran and Rafael Garcia Robles (Spain) the QUICKI value (0.437 ± 0.011 for hypertensive- obese; 0.478 ± 0.045 for normotensive- obese) showed the decrease compared with the control subjects (0.605 ± 0.052).

The QUICKI value was carried out by M.C. Foss Freitas and M.C. Foss (Brasil) on 112 patients in various pathological states, including type 2 diabetes mellitus, essential hypertension and others: 0.39 ± 0.006. The value was also lower than that in the control subjects.

Our QUICKI index, studied on 107 patients, was significantly lower in the obese group than in the healthy individuals (0.87 ± 0.16 and 1.07 ± 0.18). This was similar to the conclusion from many authors. However, the QUICKI value in our study was higher compared with the other studies.

The prevalence of insulin resistance in our study was 14.95%. The ratio was lower than in the hypertensive- obese and in the normotensive-obese (85.8% and 58.5%) groups in the study by Olga Gonzalez-Albarran and Rafael Garcia Robles (Spain)

4.2. Correlation between QUICKI and the fasting glucose, insulin concentration

The QUICKI was significantly lower in the moderately obese group by Hisayo Yokoyama, Masanori Emoro than our general obesity (0.338 ± 0.030; 0.87 ± 0.16, respectively).

There were inverse correlations between QUICKI and the fasting glucose, insulin concentration.

5. CONCLUSION

- The prevalence of insulin resistance in obesity: 14.95%

- There were inverse correlations between QUICKI and the fasting glucose, insulin concentration.

6. SUGGESTION: We could early affect the treated obesity by using $HOMA_{IR}$ index.

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