

# INSULIN RESPONSE AT STANDARD GLUCOSE LOAD IN CHILDREN WITH NORMAL, LOW AND EXCESSIVE BODY MASS

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## OBJECTIVES

Diabetes and associated cardiovascular events reflects the obesity burden (1). There are some basic studies, shown impaired  $\beta$ -cell function and insulin response respectively in overweight (2-3). Meanwhile, dysglycemia due to insulin resistance is a stepwise process and might be seen in skinny subjects as well (4).

## METHODS

62 adolescent males aged  $13.56 \pm 2.47$  were examined with grouping on BMI Z-score: 1 gr.  $< -1SD$  - skinny ( $n=6$ ), 2 gr.  $+1SD$  ( $n=11$ ) – normal weight (NW), 3 gr.  $+1.1-2.0SD$  ( $n=14$ ) - overweight, 4 gr.  $+2.1-3.0SD$  ( $n=18$ ) - obese, 5 gr.  $> 3SD$  ( $n=13$ ) - obese. Standard two hours oral glucose tolerance test (OGTT) was performed with further calculation of AUC for blood glucose (BG) and insulin (Ins.) for increments: 0-30 min (AUCgl.0-30; AUCins.0-30), 30-60 min (AUCgl.30-60; AUCins.30-60), 60-120 min (AUCgl.60-120;

## RESULTS

- Diabetes mellitus wasn't diagnosed. Dysglycemia was revealed in 51.11% of all overweight: impaired fasting glucose – in 15 overweight and obese patients, impaired glucose tolerance – in 4 obese, impaired fasting glucose together with impaired glucose tolerance – in 4 severely obese children.
- Fasting BG wasn't different in skinny and normal weight, and was statistically higher in all overweight. ( $p < 0.01$ ). There were no significant differences between groups in mean blood glucose.
- BG dynamics was different during the test despite of no difference in mean level (Fig.1). Thus, AUC gl. was highest in skinny and severely obese (Fig.2).
- Fasting insulin was gradually increasing from group to group as well as HOMA-IR and mean insulin concentration during the test ( $p < 0.01$  for all) (Fig.3).
- Peak insulin concentration was registered in skinny at 30 min and in normal weight and overweight at 15 min. Than insulin levels in lean and normal weight started to decrease. Meanwhile in overweight was stable (Fig.3).
- At 120 min Insulin dropped down in all subjects with minimal level in normal body mass. Simultaneously, insulin at 120 min was higher than fasting for 67% in NW, for 156% in overweight, for 100% in obese and for 387% in skinny (Fig.3).
- Insulin dynamics demonstrates high variability in skinny and overweight together with the least result in BMI  $+ > 3SD$  (Fig.4).

MEAN INSULIN AND BLOOD GLUCOSE CONCENTRATION IN CHILDREN WITH DIFFERENT BODY MASS

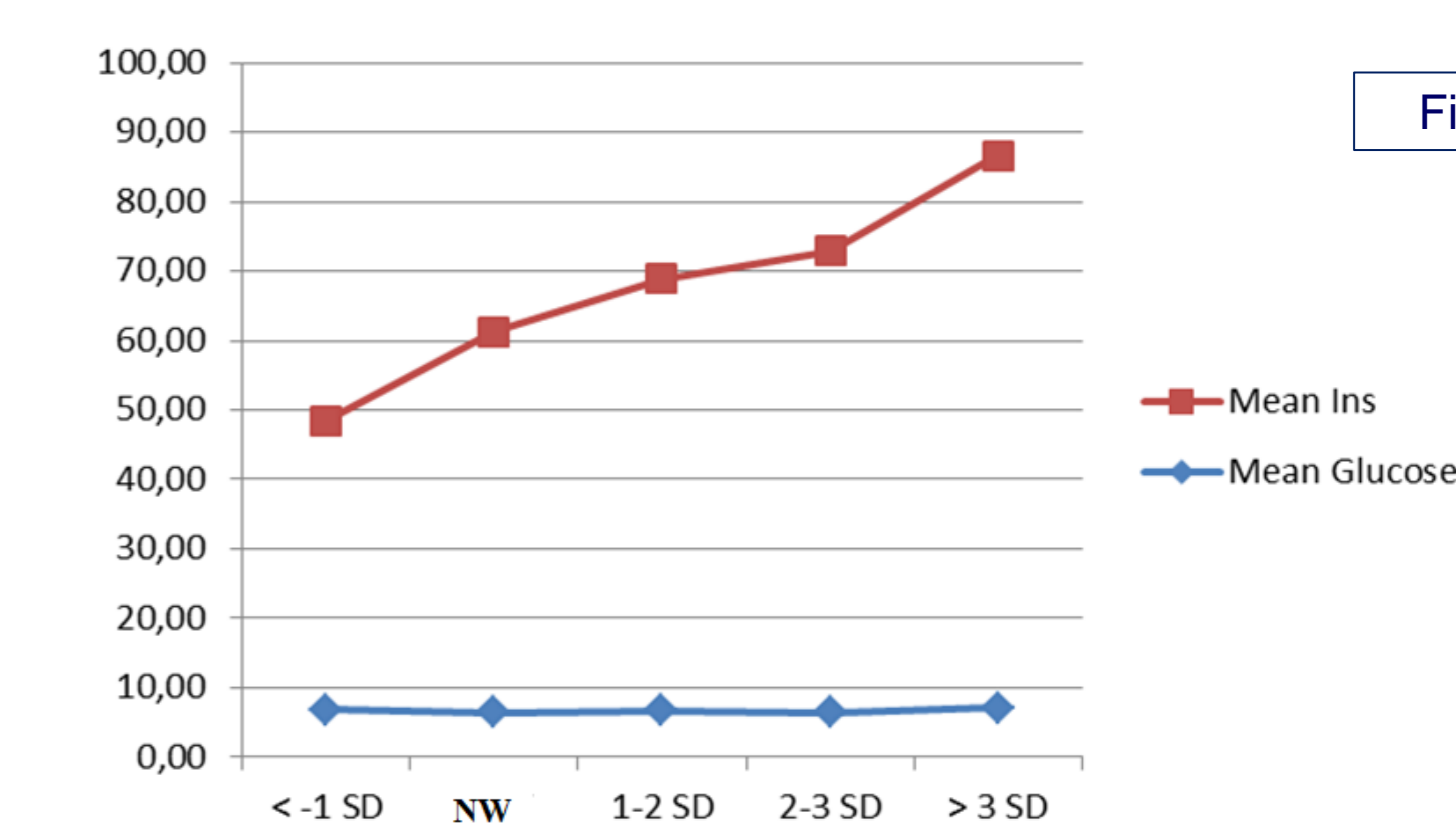


Fig. 1

AREA UNDER THE GLUCOSE CURVE IN CHILDREN WITH DIFFERENT BODY MASS

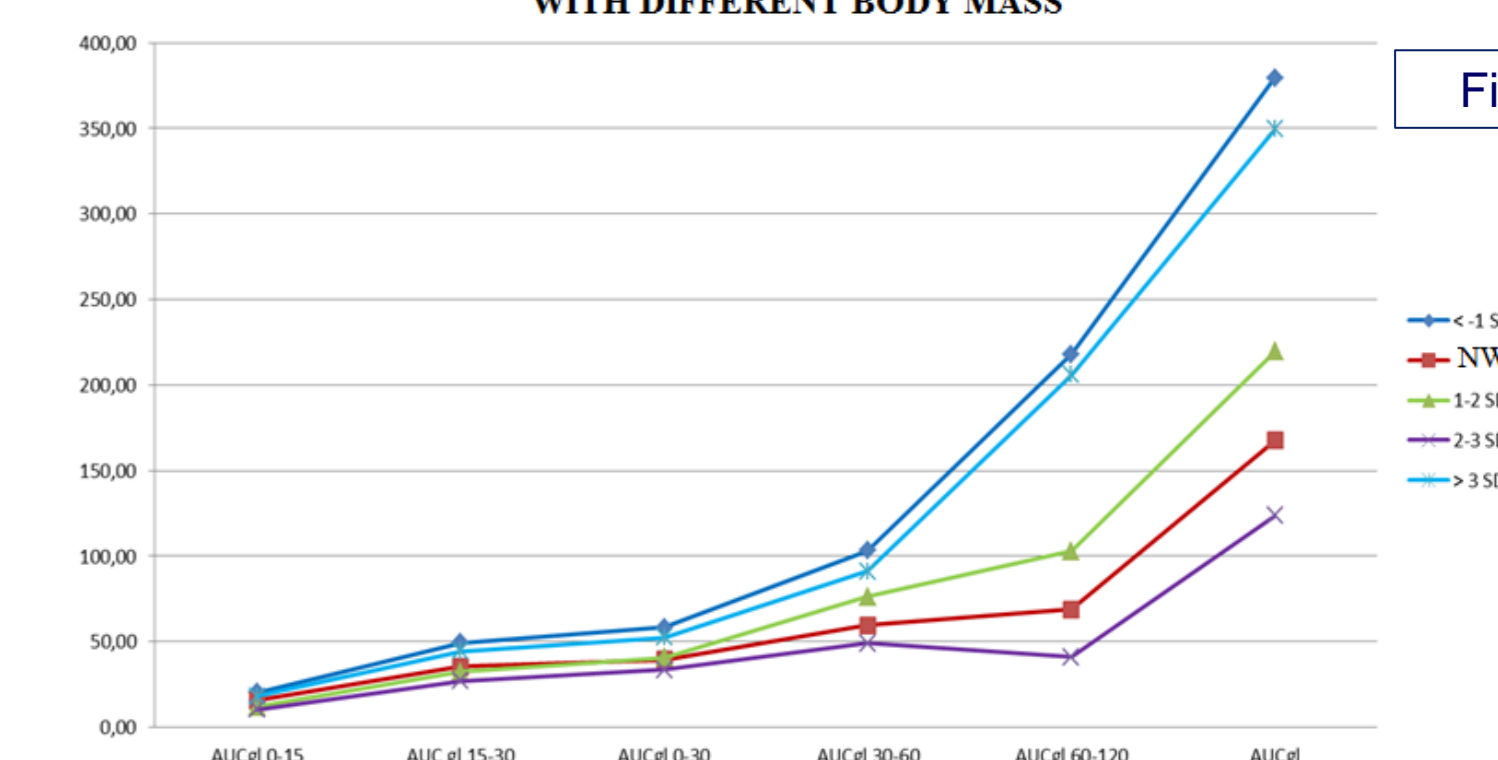


Fig. 2

INSULIN RESPONSE AT THE GLUCOSE LOAD IN CHILDREN WITH DIFFERENT BODY MASS

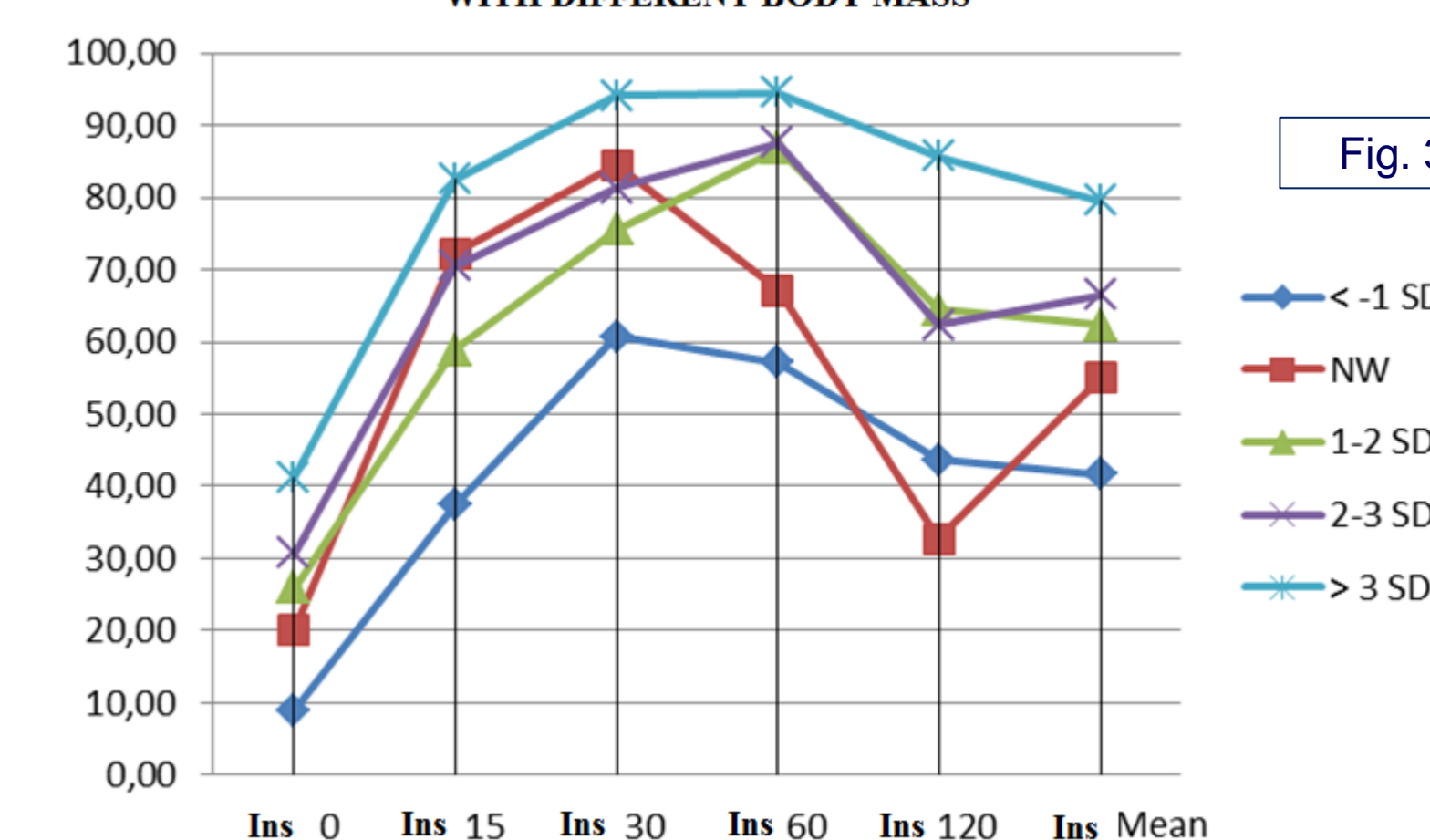


Fig. 3

INSULIN DYNAMICS WITHIN STANDARD GLUCOSE LOAD IN CHILDREN WITH DIFFERENT BODY MASS

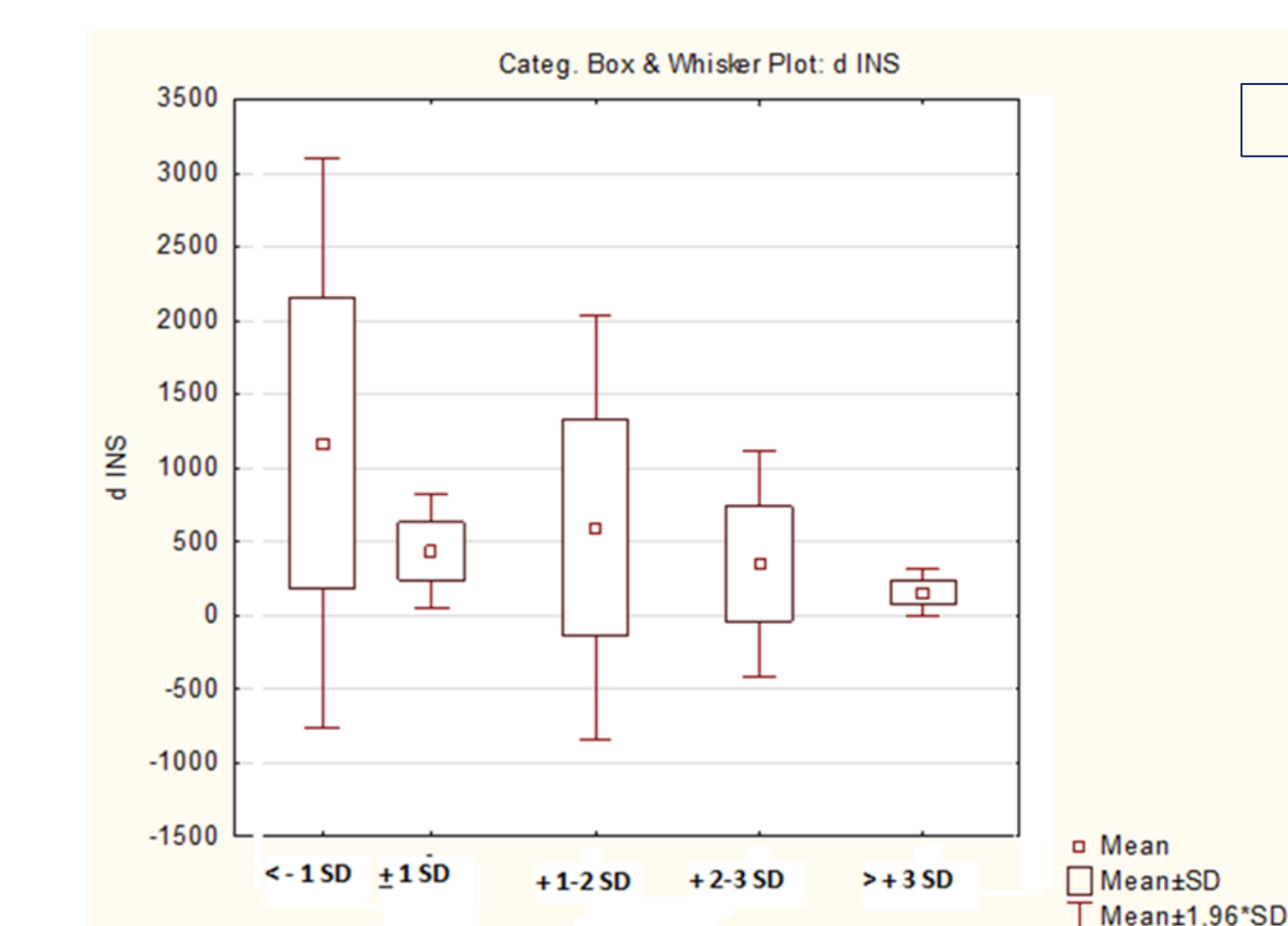


Fig. 4

## CONCLUSIONS

1. There is a linear dependence of fasting and average insulin concentration on BMI. There is a strongest insulin response in skinny and normal weight subjects during the first phase, in overweight and obese during the second one.
2. Low insulin variability during glucose load together with absent decrease of insulin level after 60 min might reflect problems with  $\beta$ -cell function in overweight even despite of absent significant dysglycemia.
3. Exaggerated insulin response in skinny subjects can be adaptive and needs some further study.

## References

1. Interim report of the Commission on Ending Childhood Obesity. World Health Organization 2015. Available from URL: <http://www.who.int/end-childhood-obesity/commission-ending-childhood-obesity-interim-report.pdf?ua=1>
2. E.Cersosimo, C. Solis-Herrera, M.E. Trautmann, J.Malloy, C.L. Triplitt. Assessment of Pancreatic  $\beta$ -Cell Function: Review of Methods and Clinical Applications // Current Diabetes Reviews, 2014, 10, 2-42
3. Matsuda M, DeFronzo RA. Insulin sensitivity indices obtained from oral glucose tolerance testing: comparison with the euglycemic insulin clamp. Diabetes Care 1999;22:1462-1470. Vol.68, September-October 2011
4. Rodríguez-Cruz, M., Sánchez, R., Escobar, R. E., Cruz-Guzmán, O. del R., López-Alarcón, M., Bernabe García, M., ... Velázquez Wong, A. C. (2015). Evidence of Insulin Resistance and Other Metabolic Alterations in Boys with Duchenne or Becker Muscular Dystrophy. International Journal of Endocrinology, 2015, 867273. <http://doi.org/10.1155/2015/867273>

