

# A Comparative Study of Stress Induced Diabetes Mellitus in Mother and Foreign Language Speakers

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## ABSTRACT

Death of  $\beta$ -cells has been suggested a common feature of diabetes including both types 1 and 2. Expression of inflammatory cytokine especially IL-1 $\beta$  triggers apoptosis of  $\beta$ -cell. Progressive loss of these cells leads towards the diabetes. Short-term as well as long term stress is also responsible for damaging of  $\beta$ -cells. The current study was designed to investigate the hypothesis that stress induces damaging of  $\beta$ -cells. Total 110 teachers were selected for this study. 55 subjects were used to teach in Mother Language and 55 were used to teach in Foreign Language. 55 healthy individuals served for control. Blood pressure, glucose level and serum cortisol level were evaluated. The results were found to be statistically significant ( $P < 0.05$ ) in studied groups. It was concluded that stress during speaking the foreign language may affect the secretory defects of  $\beta$ -cells and lead to the diabetes.

**Keywords:**  $\beta$ -cells, diabetes, blood pressure, glucose, cortisol, language

## INTRODUCTION

Language is a fundamental form of communication. Inner thoughts and emotions are expressed in the form of language. Left side of the human brain controls speech. The left part of the temporal lobe helps children to acquire language. The first language which a person learns and uses in his homeland is called mother tongue or native language<sup>1</sup>.

The second language that a person learns in his life normally undergoes a stress situation during speaking. This stress situation can be observed when second language is not spoken regularly. If the stress is not handled properly it makes biochemical as well as physiological changes.<sup>2</sup> Stress in humans is due to the interaction with environment and between persons. In biological context, stress is emotional, physical as well as mental factor that is responsible for bodily and psychological tension<sup>3</sup> and it may be due to external as well as internal factors<sup>4,5</sup>.

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## MATERIALS AND METHODS

The current study was designed to investigate the hypothesis that stress induces damaging of  $\beta$ -cells. Total 110 teachers were selected for this study. 55 subjects were used to teach in Mother Language and 55 were used to teach in Foreign Language. 55 healthy individuals served for control. Blood pressure, glucose level and serum cortisol level were evaluated by sphygmomanometer, standard glucometer (Accu-check) and ELISA technique, respectively.

## RESULTS

Blood pressure of foreign language speakers (Table-01) was found to be raised during their lectures in the class rooms. 15.38% increase was observed in diastolic blood pressure while 13.76% increase in systolic blood pressure was noted. Blood glucose levels were statistical insignificant ( $P > 0.05$ ) among the control (120 $\pm$ 9.14) and mother language speakers (115 $\pm$ 5.80), but statistically significant ( $P < 0.05$ ) raised level of blood glucose was observed in Foreign language speakers (167 $\pm$ 15.29). Moreover, serum cortisol level was found to be raised 32.69% in foreign language speakers as compared to the Mother language speakers.

Table1: Comparison of blood pressure and serum glucose and cortisol levels among the Mother and Foreign language speakers

	Control (n=55)	Mother speaker(n=55)	Foreign speaker(n=55)
Diastolic (mmHg)	79 $\pm$ 4.06	77 $\pm$ 5.80	91 $\pm$ 4.23*
Systolic (mmHg)	114 $\pm$ 15.76	119 $\pm$ 15.88	138 $\pm$ 17.71*
Glucose (mg/dL)	120 $\pm$ 9.14	115 $\pm$ 5.80	167 $\pm$ 15.29*
Cortisol ( $\mu$ g/dL)	15.12 $\pm$ 4.02	16.43 $\pm$ 3.76	24.41 $\pm$ 2.37*

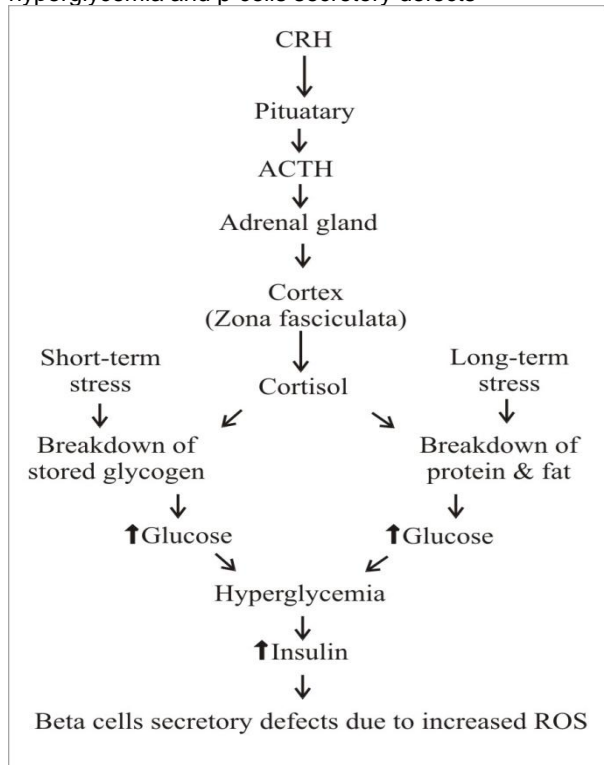
\* indicates  $P < 0.05$

## DISCUSSION

Levels of blood glucose and hormone are altered in stressful conditions<sup>6,7</sup>. In diabetic conditions, blood glucose level is raised due to mental stress, particularly in type 2 diabetes. Stress blocks the synthesis of insulin that is responsible for the management of blood glucose in biological system. Stressful environment unmask diabetes (hyperglycemic) state<sup>8</sup>. At cellular level oxidative stress is increased in response to hyperglycemia in vascular tissues in diabetic condition. As a result, not only cellular membrane lipids undergo peroxidation but also oxidative based modification of DNA as well as amino acids is enhanced<sup>9</sup>.

Stress hormones that are synthesized to cope with short-term stress are also associated with long-term stress condition including mental stress (Fig.-1). In response, hyperglycemic condition persists for long duration in the blood because stress hormone directly antagonizes the effect of insulin.<sup>10</sup> In present study, the glucose level was raised in Foreign language speaker ( $167 \pm 15.29$  mg/dL) as compared to the Mother language speakers ( $115 \pm 5.80$  mg/dL) during their lectures because Foreign language was not their mother language and they felt stress for continuous one to two hour lecture.

Fig.1: Long-term and short-term stress leading to hyperglycemia and  $\beta$ -cells secretory defects



Stress hyperglycemia is associated with enhanced whole-body glucose uptake in which GLUT-1 transporters are involved (non-insulin-mediated glucose transport). Post-receptor insulin signaling defects lead to the insulin resistance (reduced glucose uptake), as a result, reduced GLUT-4 mediated glucose transport is observed in insulin sensitive tissues including muscle, liver and fat. Due to disorganized hepatic gluconeogenesis, glucose synthesis is usually up-regulated<sup>11</sup>.

## CONCLUSION

Subjects of current study had no previous diabetic conditions. But the above discussion gives the idea that Foreign language speakers may develop diabetes in near future due to long-term hyperglycemic condition because they have to deliver their lectures in Foreign language and have to face language stress and their other activities of daily life belongs to their mother language. On the other hand, Mother language speakers do not have such issue of language stress.

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