



## ‘Psychological Stress Factor Inducing Juvenile Diabetes’

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### Abstract :

Type 1 diabetes mellitus is the most common Pediatric chronic endocrine illness. The prevalence of juvenile diabetes is 1% - 4% of the total diabetic population with the highest incidence during puberty (10-15 years age group).

**Hypothesis :-** Psychological stress has been hypothesized to be an environmental factor appears to play an significant role in the pathogenesis of childhood onset type 1 diabetes mellitus.

**Objective :-** To study the main psychosocial factors associated with the development of type 1 diabetes based on the review of the scientific literature

**Methodology :-** Research underscore the following risk factors , stressful life events, personal and interpersonal factors and also protection factors. Applied Implications of Ayurveda Principles in stress management, Behavioral intervention and positive parenting intervention and help them cope with their illness.

**Results :-** Parenting stress and negative stress events were associated with the induction of diabetes-related autoimmunity in early childhood.

**Conclusion :-** Psychological stress inducing increased cortisol levels leading to insulin resistance and beta-cell stress, could be involved in the development of Type 1 diabetes.

**Key words :-** Psychological stress, Juvenile Diabetes , Behavioral Intervention , Ayurveda

### Introduction :

Type 1 diabetes mellitus (T1DM) is the most common chronic endocrine disease in children, with the highest incidence during puberty( 10-15 years age group) and very low incidence in the first month of life . It is estimated that India is housing about 97,700 children with type 1 diabetes mellitus (T1DM) and the incidence is rising by 3%/year<sup>13</sup>. The prevalence of T1DM in children is 1,11,500 according to a World Health Organization report of the International Diabetes Federation for the South-East Asian Region<sup>13</sup>.

T1DM is an autoimmune disease, which is usually preceded by an autoimmune cell mediated destruction of the insulin-producing  $\beta$ -cells in pancreas which starts early in childhood in genetically susceptible individuals triggered by an environmental factors implicated to impaired glucose homeostasis ,insulin insufficiency ,& other complications. The consequences of the impaired assimilation of glucose are; paradoxical polyphagia, polyuria ,polydipsia & ketosis. Specific antigenic environmental triggers are infectious agents, dietary factors , perinatal factors , socioeconomic factors & psychosocial factors have been considered as the most important exposure for T1D. Psychological mechanisms are directly linked to hormonal and nervous signals that can change insulin sensitivity and affect immune system regulation. Increased psychological stress has been hypothesized to be an environmental factor associated with an increased risk of T1D. Psychological stress can be direct to the child or indirect via the family since psychosocial stress in the family induces stress in the child.

Ayurveda explains the pathogenesis of stress is imbalance of rajas *guna* and aggravation of *tamas guna* at psychic level and depletion of *vata dosha* and vitiation of *kapha dosha* at physical level are the contributing factors in stress. According to Ayurveda psychological factors are involved in almost all the disease

processes along with physical disturbance and manifested as psychosomatic disease like diabetes mellitus. *Charaka* quotes '*vishada rogavardhanam agrya*' means '*vishada*' is the foremost factor to worsen the disease condition and this is the first principle regarding psycho-neuro-immunology in Ayurveda<sup>8</sup>.

Applied implications of Ayurveda principles inclusive of *Nidanparivarjana*, *Ayurvedic* counseling and behavior modifications, Effective parenting, Nutritional Aspect, *sadvritta* and *Achar rasayan*, *Panchakarma therapy*, *Satwavajaya chikitsa* to cope up with stress.

### **The concept of stress in modern and Ayurveda :**

#### **Stress<sup>1</sup> :**

Acute stress is the physiological response to an environmental demand that activates the sympathetic division of the autonomic nervous system. Hormones i.e norepinephrine, epinephrine, cortisol are released in order to preparing the body for fight or flight, and the immune system prepares for a possible skin damage, this defines the adaptive response to challenging conditions as an 'Allostatic process'. It is an adjustment process in order to maintain stability in the body through change that is mediated by the Allostatic systems i.e nervous, endocrine and immune system.

This adaptive response to stress is positive in the short run by protecting the body during a challenge, but in the long run this stress response turns to be damaging. Chronic and/or repeated activation of the allostatic systems turns this adaptive response to maladaptive for health. It defines this as allostatic load, which is understood as the accumulated pressure on the body from a prolonged period of physiological stress-response.

#### **Psychological stress<sup>1</sup> :**

Psychological stress is defined as the experience of stress that occurs when an event is appraised as threatening or harmful and the individual perceives that she/he doesn't have enough resources to cope with the situation.

Negative chronic stress is defined as a chronic or repeated stress-responses due to environmental demands that the person perceives as stressful,

The individual physiological stress response depends on the individual person's cognitive perception of the demands. The perception of the demand does not need to correspond with the actual magnitude of it: the perception can both suppress very stressful events and amplify minor events.

The connection between environmental demands and the physiological stress-response is mediated by cognitive appraisal of the demand, assessment of the individual's resources, coping effort needed and other psychological factors - this is called the 'Appraisal process'.

#### **Concept of stress in Ayurveda<sup>6</sup> :**

Ayurveda illustrates health is the balanced state of *Tridoshas* – *vata*, *pitta* and *kapha*, *Trigunas* – *satwa*, *rajas* and *tamas gunas*, *Saptadhatu*s and *Agni*. According to Ayurveda the main three primal qualities i.e *trigunas* *satwa*, *rajas*, *tamas* are the main power of cosmic intelligence (*manas* or mind). The three *gunas* of mind are the most subtle qualities of nature that underlie matter, life and mind. *Trigunas* energies governs not only the surface mind but also the deeper consciousness function of mind. *Trigunas* are one of the prime themes in Ayurveda concept of *manas vyadhi*. They form a deeper level than the three biological humours and help us understand our mental and spiritual nature.

Our mind controls our body. The mind is responsible for perception, thinking, understanding and taking the right decision at the right time. The term '*Avashada*' is more applicable term to illustrate stress in Ayurveda and *manas* is used at the place on mind. Due to improper diet and action the state of mind gets disturbed then the body- mind apparatus is imbalanced and emits negative emotions and drives out the positive feeling. Healthy state of mind contains positive emotions and maintains the wellbeing physically, psychologically, spiritually

Ayurveda mentions causes for stress<sup>10</sup>:

1. Lack of co-ordination between psychological functions of *Dhi* (learning) , *Dhriti* (retention ) and *Smriti* (sustaining memory)
2. Imbalance of *Prana Shakti* (life force)
3. Improper dietary regimen implicating imbalance in *tridosha*
4. *Pragyapradha* ( violation of nature and virtues)

According to Ayurveda an imbalance at mental level is usually reflected and re-enforced at physical level and vice versa. Persistence of imbalance for prolong period leads to stress and stress inducing chronic diseases . Juvenile diabetes can be correlated with vataj prameha in ayurveda due to its clinical features and stress as a major causative factor triggering and influencing manavaha strotas and disturbing the conducive function of doshas and imbalance of sattva and raja guna

### **Psychological stress factors in children<sup>12</sup> :**

#### 1. Parent - child Emotional factors :

- Insecure attachment
- Low caregiving quality
- Insensitivity of the parent
- Parental unresponsiveness

#### 2. Family Environmental factors:

- Family atmosphere
- Chaotic family functions
- Inhibited family support
- Parent child relationship

#### 3. Parenting stress factors influencing children:

- Parental loss by divorce/separation/ death
- Unemployment & economic hardship of parents
- Stress at work place
- Inadequate parents social support

#### 4. Serious life events

- Threat /actual loss within the family
- Serious illness
- Injury or hospitalization
- Trauma of war among boys ,Peer Pressure ,Starting school
- Death of a pet
- Insecurity feeling - New sibling , friends
- Health events – Infections , Injuries
- Migration

#### 5 . Social Factors :

- Low socioeconomic status
- Economic hardship / poverty
- Low educational level
- Inhibition & acting out learning problems
- Problems with friendship
- Sleeping problems & nightmares

### **According to Ayurveda<sup>6</sup> :**

Imbalance of rajas and tamas guna of manasa dosha implicates to psychological conditions influencing stress in children. We can correlate 11 dharniya vega to parental stress, family , social , emotional factor influencing stress in children

- Kama ( lust)

- Krodha ( Anger)
- Lobha (greed)
- Moha (delusion)
- Irshya (jealousy)
- Mana (pride)
- Mada (euphoria)
- Shoka (grief)
- Chinta (anxiety)
- Udwega (neurosis)
- Bhaya (fear)

### **Hypothesis linking stress to type 1 diabetes<sup>1</sup> :**

Stress has been accounted as one of the environmental factor contributing to the development of the juvenile onset type 1 diabetes . Stress could trigger the start of the autoimmune process, contribute to its progression, and put it over the tipping point to clinical diagnosis. Prolonged exposure to stress affects hormonal balance, metabolism and immune function.

### **Role of stress in onset of Type 1diabetes<sup>12</sup> :**

1. In children chronic psychosocial stress and parenting stress early in child's life has been associated to high elevated levels of cortisol and progresses in dys-regulation of the circadian cortisol rhythm ..
2. The prolonged activation of the hypothalamus-pituitary-adrenal (HPA) axis, in particular, increases glucocorticoid levels, causing pathologies related to hypercortisolism. Furthermore, this condition promotes the alteration of the immune function and facilitates the development of peripheral tissue resistance to insulin and glucose intolerance which in turn increases pressure on the  $\beta$ cells.
3. Cortisol is one of the main factors mediating the effect of stress on metabolism in general, and on glucose metabolism in particular. Cortisol raises blood glucose levels by stimulating hepatic gluconeogenesis, and inhibiting the action of insulin and contribute to insulin resistance. These reactions - useful for initiating a fight or flight reaction - are not entirely suited to cope with the stressors triggered by psychosocial environmental factors
4. The glucose mobilized from the liver is not used due to insulin resistance and remains in the bloodstream, causing a rise in blood sugar.
5. Epinephrine (another hormone released during stress), in turn, inhibits the insulin secretion and leads to an increase in the need for insulin.
6. High psychological stress among children has been associated to low levels of c-peptide (released together with insulin), indicating exhausted beta-cells.
7. Chronic psychological stress has been shown to both suppress the immune response and contribute to an imbalance in the immune system which in turn could induce an immunological reaction against the beta-cells in genetically predisposed individuals.
8. Psychological stress in children affect their immune functions, altering the activity of the antigens GAD65, HSP60 and IA-2, responsible for diabetes-related autoimmunity
9. Exposures to stressors in childhood have been linked to increased risk for both autoimmune diseases as well as other common diseases in childhood

### **Therapeutic Approach<sup>1</sup> :**

1. Behavioral Interventions and Effective Parenting :
  - Positive Reinforcement & behavioral modifications
  - Supportive parental Communications
  - Increase parental support
  - Collaborative parental involvement
  - Promote problem solving skills
  - Coping skills training to school aged children
  - Improved social interaction
  - Promote regimen adherence

- Balanced family organization / balanced family cohesion
- Social support & confidence /security

### Therapeutic care in Ayurveda<sup>8</sup> :

1. *Nidanparivarjana* – Avoid causative factors of stress
2. Ayurvedic counseling & behavior modifications – Assessment of body constitution (*prakriti*) and advocate specific and comprehensive life regimen to stabilize mind
3. Nutritional aspect of stress – advocate *sattvik ahara* and *medhya rasayan*
4. Rasayan / Rejuvenation therapy – Drugs – *guduchi*, *Yashtimadhu*, *mandukparni*, *jatamansi*, *shatavari*, *ashwagandha*
5. *Sadvritta and Achar Rasayan* – code of conducts are practiced exclusively
6. Panchakarma therapy – Panchakarma treatment procedure like nasya, shirodhara, shirobasti to balance tridosha and strengthen the mental functions and relieves the stress.
7. *Satwavajaya Chikita* – *yama, niyama, asana, pranayama, dhyana, dharana*

### Conclusion :

Review of recent literature observed psychological stress is involved in induction of type 1 diabetes related autoimmunity in children through increased cortisol levels leading to insulin resistance and beta-cell stress, The study suggest early recognition of stress factors associated to children and initiate healthcare psychological and behavioral interventions with effective parenting counseling to prevent the progressive consequence of persistent negative stress in children and also promote psychosocial factors associated with type 1 diabetes by means of adequate campaigns.

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