

Diabetes Insipidus and Anorexia Nervosa

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Short Communication

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In today's health and technologically conscious society when people hear that someone has diabetes they usually think type 2 diabetes (associated with insulin resistance and generally associated with obesity/inactivity). However, it is not realized that there is another type, this "diabetes" is not related to insulin production but rather water production and kidney malfunction. It is called Diabetes Insipidus or "water diabetes". In this paper the hypothalamus and its functions, the different types of Diabetes Insipidus (DI) and its symptoms, and how this diabetes is affected in Anorexia Nervosa will be covered.

To begin, the hypothalamus gland plays an intricate part in controlling many physical functions of the body; including but not limited to: regulating body temperature, blood glucose, water balance, fat metabolism, feeding habits, sleep, sexual behavior, emotions, hormone productions, and the automatic nervous system. Its main function is homeostasis of the body. It does this through the production of two important hormones, oxytocin and vasopressin. The hormone vasopressin is important to keep in mind because it acts on the kidneys to increase absorption of water from urine, thereby maintaining the water level with the body. As can be imagined, because of its important role, many bodily functions can be affected when it is damaged. Ironically two disorders that can occur from its damage are Diabetes Insipidus and Anorexia Nervosa.

Diabetes Insipidus (DI) is often mistaken for Diabetes Mellitus but the two are not related. Diabetes Insipidus is a "clinical disorder in which large amounts of urine are excreted despite plasma serum hyperosmolality" [1]. Someone suffering from DI has frequent and increased urination causing liquid craving in such great quantities the body cannot keep up with the demand for liquids. The

body's inability to keep up with the increased thirst (polydipsia) and urination (polyuria) can result in dehydration. The challenge being presented is that the difference between Diabetes Insipidus and Diabetes Mellitus is not commonly known in the medical community. The basic difference between them comes in the meaning of the words Mellitus and Insipidus. Mellitus is the Latin term meaning "sweet" and Insipidus is the Latin term meaning "having no flavor". Thus, if the urine were tasted, a test formally used to determine Diabetes Mellitus, the urine of the Diabetes Mellitus patient would be sweet while no taste would be associated with the Diabetes Insipidus patient.

The three types of Diabetes Insipidus: pituitary (Central Diabetes Insipidus-CDI), nephrogenic (NDI), and psychogenic. "many conditions can cause DI, but common ones include trauma to the brain or head (pituitary DI), drugs such as lithium (nephrogenic DI), and psychogenic disorders or disorders associated with abnormal thirst (primary polydipsia" [2]. Although each type of DI is caused by different sources "the main symptoms are the same: polydipsia (excessive thirst) and polyuria (excessive urination)" [3]. If DI goes untreated "death from electrolyte imbalances, dehydration, hemodynamic instability, central nervous system depression, and circulatory collapse" can occur [2]. "DI occurs when either the secretion or action of anti-diuretic hormone (ADH) become abnormal. ADH is produced in the hypothalamus and stored in the posterior pituitary; ADH causes fluid retention or lack of diuresis" [3]. Kidney function is particularly sensitive to this because "ADH is sensitive to changes in hydration. If we drink too much its releases are inhibited so that we can easily excrete the added fluid and not get over hydrated. And when we do not drink enough fluids, ADH is released and prompts the kidneys to

reabsorb more water so that we don't get dehydrated. Any glitch in this system will cause the kidneys to lose their urine-concentrating ability" [4]. Testing for DI is done through a water deprivation test; although if the patient is critically ill it may not be done for fear of further harm. "In the water deprivation test, clinicians place the patient in mild dehydration to determine if the kidneys can concentrate urine with adequate ADH stimulation. The kidneys, if unable to concentrate urine, are the source of DI and the patient has nephrogenic DI. This is also used to differentiate between psychogenic polydipsia and DI. If the kidneys respond by concentrating urine, the cause of DI is central" [3]. Without kidney function the proper release of uric acid cannot take place.

In the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) Anorexia Nervosa (AN) has been classified as a psychiatric disorder resulting from an "intense fear of gaining weight, putting undue emphasis on body shape, having a body weight that is <85% of predicted, and missing three consecutive periods [5]. But unlike other psychiatric disorders many medical/physical complications are present. "Many of the mental and emotional symptoms common to anorexia nervosa are directly related to physical effects of starvations: energy level, mood, attitude, and behavior, mental ability, social, weight, food, eating and hunger" [6]. Besides the day-to-day mental taxation, physical complications are also present. These include electrolyte disturbance, kidney dysfunction, swollen glands, cardiac irregularities, bone abnormalities, gastrointestinal program, and endocrine complications; all areas affected are hypothalamus controlled. "Anorexia nervosa is the only psychiatric condition that , at present, requires an endocrine-linked abnormality" [7]. "Anorexia nervosa is associated with impaired or erratic release of vasopressin" [8]. Someone suffering from AN uses a variety of techniques to lower their weight. These can include excessive exercise, calorie restriction, diuretic use, and water loading resulting in water intoxication.

The combination of Diabetes Insipidus and Anorexia Nervosa can cause a variety of complications. Three in particular are electrolyte imbalance, dehydration, and hyponatremia. Hyponatremia or "water intoxication" (WI) can occur both as a symptom and as a complication in anorexic patients. "The syndrome of self-induced water intoxication (WI) is a well-known complication in patients with psychiatric illness" [9]. Water intoxication is "an excessive consumption of water (was) used to migrate hunger and to attempt to purify the body and eliminate 'toxins' and calories through urine" [9]. Severe hyponatremia can produce edema and lead to "ataxia,

seizures, coma, and death" [9]. Many times, excessive water ingestion is "an attempt by the patient to deceive others into believing (her) nutritional status was improved" [10]. The increased amount of water consumption directly relates to an increase in urine production thus, when continued over an extensive amount of time can be classified as Diabetes Insipidus. During that time the kidneys are unable to conserve water as they filter blood thus causing danger to the body. Water intoxication is dangerous because hyponatremia brings about an abnormally low amount of potassium in the blood; thus, imbalances the electrolytes. "The extreme action of repeated vomiting and laxative and diuretic abuse all contribute to abnormalities in acid-base balance and electrolyte changes. The presence of hypokalemia, hypochloremia, and metabolic alkalosis are of grave clinical importance since untreated these abnormalities lead to a variety of physical complications, ultimately causing cardiac arrhythmias and renal failure. The frequency of fatality in AN and the apparent lack of relation to the degree of emaciation is probably due to the potassium imbalance" [11]. "Potassium depletion can cause muscle weakness and constipation which in turn may lead to polydipsia" [11]. With electrolyte imbalance it is also important to check renal function. A case study on a 20-year-old Caucasian female found "water intoxication and potentially lethal hypokalemia and salt ingestion with the potential for dangerous hypernatremia could be seen as techniques for inducing a slow, agonizing death" [10] through causing self- dehydration. Dehydration is also a major complication because of the loss of too much fluid resulting in kidney and heart failure along with seizures. Dehydration can be caused through uncontrolled diabetes, diuretic use/abuse, and malnourishment. Diuretic use is a very common form of weight loss among eating disordered patients. As mentioned previously, without kidney function the proper release of uric acid cannot take place. Addressing dehydration symptoms in young adults is of most importance. Nicholls states "children dehydrate quicker than adults and assessment of electrolytes will identify the most compromised patients. As in adults, serum blood levels may be a poor reaction of electrolyte balance and clinical judgment together with vital signs (pulse, blood pressure), may be a better indicator of the need for rehydration" [12].

"It is important for the clinician to be aware of the biochemical changes which are found in AN [11]" and to address them completely to avoid additional complications in treatment. Although the long-term effects of severe dietary restriction and water intoxication can result in numerous complications. Through the refeeding process symptoms associated with Diabetes

Insipidus can be reversed since “increased body weight modifies the maintenance of fluid balance” [11].

In closing, both Diabetes Insipidus and Anorexia Nervosa are life threatening conditions originating from malfunctions of the hypothalamus. When the two are combined their complications: dehydration, low electrolytes, and hyponatremia are deadly but with early detection can be addressed with proper treatment.

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