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Full Length Research Paper

The incidence of pica in a sample of dialysis patients

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End Stage Renal Disease (ESRD) occurs when the kidneys are no longer able to function at a level necessary for day to day life. Pica refers to the persistent, compulsive craving for and ingestion of nonfood items and certain food items. ESRD may constitute a potent stress and stimulus for pica, especially in those patients with an underlying cultural predisposition. The occurrence of pica in a South Florida dialysis unit was studied via a carefully designed a pica questionnaire aimed towards creating a human connection. A significantly greater proportion of subjects endorsing pica practices were found in the dialysis group (38.3%) as compared to the control group (16%). Dialysis patients endorsing pica behaviors were significantly younger than those who denied pica behavior. Additionally there was a significantly greater proportion of females endorsing pica behaviors. Odds ratios analyses revealed greater odds of engaging in pica behaviors for Black participants than Hispanics or Whites. Pagophagia (ice pica) was the most frequently reported type of pica practice. The incidence of pica in this study was considerably higher than that which had been found in past studies. This likely resulted from the unique manner in which the information was educed. Implications and suggestions for future research directions are discussed.

Key words: Chronic kidney failure, dialysis, pica, pagophagia, geophagia, behavioral medicine, health psychology.

INTRODUCTION

Statement of the problem

The existence of pica in individuals receiving dialysis is a serious concern. Dialysis patients are often prescribed a diet restricted in potassium, sodium, phosphorus and fluids (Streltzer and Hassell, 1988). The nutrient composition of some of the substances ingested may contribute to excess amounts of these restricted nutrients. Life threatening hyperkalemia (the presence of an abnormally high concentration of potassium in the blood) as a result of geophagia (clay or soil pica) has been reported in dialysis patients (Gelfand et al., 1975). Pagophagia (ice pica) presents a problem for the fluid restricted patient (Coltman, 1969). Ward and Kutner (1999) found that patients who report eating dirt, starch and flour are at greater risk for interdialytic weight gain (IDWG). Anemia, metabolic disturbances, mineral imbalances, poisoning, nutritional concerns, excess fluid intake, bowel obstructions/perforations, parasite infections and dental injuries are all potential complications which arise as the result of dialysis patients engaging in this behavior (Scott and Cochran, 2002). Hence, it is clear that pica in dialysis patients presents unique and serious complications.

At the present time, however, there is a dearth of well-designed, empirical studies investigating the occurrence of this problem. The current state of the literature addressing this concern is lacking in clear data, due to the widely varied criteria used to identify the problem (differences in the definitions of the phenomenon), a lack of well designed surveys and methodological problems

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Abbreviations: APD; Automated peritoneal dialysis, **BUN;** blood urea nitrogen, **CAPD;** continuous ambulatory peritoneal dialysis, **DSM-IV;** diagnostic and statistical manual of mental disorders, 4th edition, **EPO;** erythropoietin, **ESRD;** end stage renal disease, **Fe;** iron, **Hg;** hemoglobin, **IDWG;** interdialytic weight gain, **OCD;** obsessive-compulsive disorder, **RTA;** renal tubular acidosis, **SES;** Socio-economic status and **URR;** urea reduction ratio.

(Fenves et al., 1995). Moreover, very few studies have detailed the epidemiological incidence of pica among dialysis patients (Rose et al., 2000). Much of the current research in the area of pica among dialysis patients is reliant on data obtained from case studies. Overall, the extent of pica in dialysis patients has been an overlooked problem; therefore, the occurrence of pica among this population is a concern which warrants clinical investigation.

Additionally, it is essential that dialysis centers be provided with descriptive patient characteristics such as age, race, ethnicity and socioeconomic status, which may serve as risk factors of possible pica behavior. Since the effects of this behavior are potentially devastating and the incidence of the behavior is hypothesized to be significantly high, it is imperative that such information be made public in the scholarly community so that preventive measures can be taken.

Finally, there is a paucity of well designed techniques in place to assess the occurrence of this problem. This issue is especially relevant to the field of behavioral medicine and clinical health psychology in that it offers a unique opportunity for said professionals to utilize their unique skills as integral members of the nephrology patient's medical team.

Review of the literature

End stage renal disease overview

Definition and prevalence

The kidneys are responsible for removing wastes from the body, regulating electrolyte balance and blood pressure and stimulating red blood cell production (Medline Plus Medical Encyclopedia, 2004, para.1). End Stage Renal Disease (ESRD) occurs when the kidneys are no longer able to function at a level that is necessary for day-to-day life. It begins as a chronic, progressive disease until function is less than 10% of baseline (General Health Encyclopedia, 1998, para.3). When this occurs, dialysis or transplantation is necessary to avoid further complications and death from the accumulation of fluids and waste products in the body. The lives of many individuals with ESRD have been prolonged by dialysis or transplantation (Molzah et al., 1996). Patients with renal disease must follow a rigid diet, strict medication regimen and make many lifestyle and behavioral changes. About 4 out every 10,000 people have end-stage renal disease, almost 100,000 people are on chronic dialysis and 20,000 people have a functioning kidney transplant in the United States (General Health Encyclopedia, 1998, para.4).

Causes, symptoms and diagnosis

End stage renal disease is the end result of a progressive deterioration in kidney function that is secondary to another chronic medical condition (Christensen and Ehlers, 2002). Approximately half of the individuals who suffer from ESRD are those with Diabetes Mellitus, however, other common causes are untreated hypertension, hereditary nephropathies and viral infections. Chronic renal failure may be present for 10 - 20 years before developing into ESRD (Medline Plus Medical Encyclopedia, 2004, para. 3). Patients with chronically diminished renal function may have unintentional weight loss, nausea, vomiting, fatigue, headache, frequent hiccups, itching, decreased or no urine output, easy bruising, decreased alertness, muscle twitching, seizures, nail abnormalities and decreased sensations in the extremities of the body (General Health Encyclopedia, 1998, Symptoms Section, para.6). Additionally, anemia [a lower than normal number of red blood cells (erythrocytes) in the blood] is also common among ESRD patients (Beers and Berkow, 1999).

As stated above, anemia is common in people with kidney disease. Healthy kidneys produce a hormone called erythropoietin (EPO), which stimulates the bone marrow to produce the proper number of red blood cells needed to carry oxygen to vital organs (Beers and Berkow, 1999). Diseased kidneys, however, often do not generate enough EPO. As a result, the bone marrow makes fewer red blood cells. Other common causes of anemia include loss of blood from hemodialysis (explained below) and low levels of iron and folic acid. These nutrients from food help young red blood cells make hemoglobin (Hgb), their main oxygen-carrying protein (National Kidney and Urologic Diseases Information Clearing House, 2008, Anemia in Kidney Disease and Dialysis, para. 2). If no other cause for EPO deficiency is found, it can be treated with a genetically engineered form of the hormone, which is usually injected under the skin two or three times a week. Hemodialysis patients who can't tolerate EPO shots may receive the hormone intravenously during treatment. The National Kidney Foundation's Dialysis Outcomes Quality Initiative (DOQI) recommends that patients treated with EPO therapy should achieve a target Hgb of 11 to 12 g/dL (National Kidney and Urologic Diseases Information Clearing House).

Chronic renal failure is common when serum creatinine concentration is greater than 1.5 to 2 mg/dl (Beers and Berkow, 1999). Creatinine is a protein produced by muscle and released into the blood. The amount produced is relatively stable in a given person. The creatinine level in the serum is therefore determined by the rate it is being removed, which is roughly a measure of kidney function. Normal is about 1 mg/dL for an average adult. If kidney function falls, the creatinine level in the blood will rise. A serum creatinine level of > 1.7 mg/dL is usually indicative of renal disease (Beers and Berkow, 1999).

Diagnosing ESRD is difficult, however and the definitive

diagnostic tool is renal biopsy. Renal biopsy is not performed unless ultrasonography indicates that the kidneys are small and fibrotic. Other measures that are useful in the diagnosis are elevations in blood urea nitrogen (BUN) which is usually over 20 mg/dl in ESRD patients. Blood urea nitrogen (BUN) measures the amount of urea nitrogen, a waste product of protein metabolism, in the blood. Urea is formed by the liver and carried by the blood to the kidneys for excretion. Because urea is cleared from the bloodstream by the kidneys, a test measuring how much urea nitrogen remains in the blood can be used as a test of renal function. Another diagnostic marker used in the detection of ESRD is acidosis (plasma CO2 content, 15 – 20 mmol/L). Renal tubular acidosis (RTA) is a disease that occurs when the kidneys fail to excrete acids into the urine, which causes a person's blood to remain too acidic.

Dialysis

Dialysis removes waste from the blood. Dialysis, or a kidney transplant, is needed when the kidneys have failed. There are 2 forms of dialysis, hemodialysis and peritoneal dialysis. During hemodialysis blood passes through a dialysis machine to be cleaned whereas peritoneal dialysis allows the blood to be cleaned inside the body.

Hemodialysis

Kidney failure produces the build up of harmful wastes in the blood and therefore, also in the body. This may cause blood pressure to rise and the body may maintain excess fluid and not make enough red blood cells that are needed to carry oxygen to the brain and body (National Kidney and Urologic Diseases Information Clearing House (2003), When Your Kidneys Fail Section, para. 2). Hence, the work of the kidneys needs to be replaced. In hemodialysis the individual's blood is allowed to flow, a few ounces at a time, through a machine with a special filter that removes wastes and extra fluids. The clean blood then returns to the body. Removal of the harmful wastes and extra salt and fluids helps maintain homeostasis by controlling blood pressure and keeping the proper balance of electrolytes like potassium and sodium (National Kidney And Urologic Diseases Information Clearing House).

One of the first steps for the beginning hemodialysis patient is preparation for the vascular access. The vascular access is the site on the patient's body where blood is removed and returned. Usually, the vascular access is prepared weeks to months before the start of dialysis in order to avoid complications (National Kidney and Urologic Diseases Information Clearing House, 2003, Getting Your Vascular Access Ready, para.1).

The dialysis machine itself is about the size of a large television and has 3 main purposes which are to pump blood and monitor flow for safety, clean wastes from blood and monitor blood pressure and the rate of fluid removal from the body. The dialyzer is a large canister containing thousands of small fibers through which the blood is passed (National Kidney and Urologic Diseases Information Clearing House, 2003, Equipment and Procedures, para.3). Dialysis solution is the cleansing fluid which is pumped around the fibers. The fibers allow wastes and extra fluids to pass from the blood into the solution which then filters them out. The dialyzer is sometimes called an artificial kidney. The dialysis solution is also called the dialysate. It contains chemicals that act like a sponge; specific dialysate solutions are prescribed based on how well the patient tolerates the treatment and on blood test results. 2 needles are inserted into the skin, 1 to carry blood to the dialyzer and 1 to return the cleaned blood to the body. Once a month patients are tested in order to assess dialysis adequacy; whether enough wastes are being removed. Both Kt/V and BUN levels are used for this purpose (National Kidney and Urologic Diseases Information Clearing House). Kt/V (dialyzer clearance multiplied by time of treatment and divided by the total volume of water in the patient's body) is a test performed to assess patient progress. A urea reduction ratio (URR) of 65% or higher and a Kt/V of at least 1.2 are considered the benchmarks of dialysis adequacy by the Kidney Disease Outcomes Quality Initiative (K/DOQI) of the National Kidney Foundation.

Hemodialysis is the most commonly used method to treat advanced and permanent kidney failure. Since the 1960's, when hemodialysis first became a practical treatment for kidney failure, many improvements have been made to increase the effectiveness and decrease the side effects associated with the procedure (Christensen and Ehlers, 2002). However, even with advances in medical technology, dialysis patients must undergo the rigors of regular treatments and a rigid dietary and medical regimen. Furthermore, they are still at risk of developing secondary complications, including anemia, hypertension, bone disease and sexual dysfunction (Molzah et al., 1996). Hemodialysis, therefore, is still a complicated process and requires the coordination of a whole medical care team which includes nephrologists, dialysis nurses, dialysis technicians, dieticians, social workers and psychologists.

Peritoneal dialysis: Peritoneal dialysis occurs inside the body using the peritoneal membrane as a filter. The membrane, a fine layer of tissue with a rich blood supply, lines the peritoneal cavity covering such organs as the stomach, liver, spleen and intestines. During peritoneal dialysis this membrane can be used to filter waste and extra fluid from the blood (Kidney Health Australia, 2005).

A catheter is used to fill the peritoneal cavity with dialysate. The catheter is a soft plastic tube (about 0.5 cm in diameter) surgically placed inside the body. The skin heals

around the tube and it stays in the body for as long as dialysis is needed. Some of the catheter protrudes outside the abdomen (belly). This allows dialysis fluid to be moved in and out of the body painlessly. It is usually placed below and to the side of the navel. This is referred to as the "exit site" (Kidney Health Australia, 2005).

Waste and extra fluid are drawn out of the blood vessels through the membrane and into the dialysate. After a time, the dialysate, carrying the waste and extra fluid, is drained out and replaced with fresh dialysate. Each time the cycle is repeated it is called "an exchange." The amount of dialysate used for each exchange depends on body size. Adults can comfortably hold 2 - 3 liters per exchange. Exchanges can be done manually or by a machine (Kidney Health Australia, 2005).

There are 2 types of peritoneal dialysis – Continuous Ambulatory Peritoneal Dialysis (CAPD) and Automated Peritoneal Dialysis (APD). With CAPD one always has dialysate in the body so the blood is constantly being cleaned. 4 exchanges are usually done each day. Each exchange takes approximately 30 min and can be done almost anywhere. During an exchange a dialysis solution bag is connected to the catheter. By raising the solution bag above shoulder level, the solution flows into the peritoneal cavity under the influence of gravity. After 4 to 6 h a drainage bag is connected to the catheter and lowered to the floor to drain the used liquid. Fresh solution is then put into the peritoneal cavity to start the process again. During APD a machine called a cycler performs the exchanges. It performs several exchanges, moving the dialysate in and out of the body during sleep. APD is done every night and usually takes between 8 - 10 h. During the day dialysate is left in the body so that dialysis continues. In the evening the dialysate is drained out automatically by the cycler (Kidney Health Australia, 2005).

Morbidity and mortality

Patients whose renal failure is attributed to diabetic nephropathy currently account for 30% of all patients initiating renal replacement therapy annually and constitute the fastest growing group of ESRD patients (Eggers, 1990). From 1982 to 1987, 1 -year survival on dialysis was 72.7% for patients whose renal failure was attributed to diabetic nephropathy and 79.8% for all other patients (Eggers, 1990). Survival decreases rapidly with advancing age at time of renal failure, from 95.1% among patients 15 to 24 years to 52.5% for patients over the age of 85 (for non-diabetics). Survival rates for whites are 5 to 6% lower than for other racial categories (Eggers, 1990).

Dietary restrictions

Restrictions are placed on fluid intake, potassium and protein (Streltzer and Hassell, 1988). For most patients, 1 of the most challenging aspects of the dialysis treatment regimen involves the restrictions placed on the amount of fluid that can be safely consumed (Christensen and Moran, 1998). Due to the periodic dialysis treatment in hemodialysis patients, fluid is cleared intermittently so that a restriction of 1 liter per day is placed on the patient's fluid intake. Failure to comply with these restrictions may lead to congestive heart failure (Beers and Berkow, 1999).

Patients with ESRD must follow a rigid and complex diet which restricts potassium, phosphorus, sodium and fluid. Compliance with dietary restrictions has been reported to reduce the risk of symptoms and medical complication, improve the patient's quality of life and increase life expectancy by 20 years or more (Durose et al., 2004). Prolonged fluid overload is associated with congestive heart failure, hypertension, pulmonary edema and shortened patient survival. Sustained elevations in serum phosphate are associated with a variety of complications including renal osteodystrophy (defective bone development; usually attributable to renal disease or to disturbances in calcium and phosphorus metabolism), serious increases in calcium and subsequent bone demineralization (Christensen and Ehlers, 2002). Increased levels of sodium can raise blood pressure, making breathing difficult and increase body weight as well as produce potentially life-threatening cardiac arrhythmia (Durose et al., 2004).

End stage renal disease is a life-threatening condition and proposes a host of serious medical complications for those individuals suffering from it. Therefore, it is absolutely imperative that individuals diagnosed with ESRD adhere to strict treatment guidelines; however, for a variety of reasons many patients find it difficult to do so. Of the several types of dietary non-adherence, 1 in particular is of special concern yet has received relatively little attention in the literature: pica.

Pica overview

Pica defined

The term "Pica" is derived from the Latin for "magpie bird, "known for its fickle appetite and habit of eating anything (Brown and James, 1986). Pica refers to the persistent, compulsive craving for and ingestion of food and nonfood items, including ice (pagophagia), laundry starch, clay or soil (geophagia), grass, leaves, plaster, paint chips, paper, cigarettes, etc. (Sayetta, 1986; Anderson et al., 1991).

As per the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (American Psychiatric Association, 1994, p. 103).

The essential feature of Pica is the eating of 1 or more nonnutritive substances on a persistent basis for a period of at least 1 month. The typical substances ingested tend

to vary with age. Infants and younger children typically eat paint, plaster, string, hair, or cloth. Older children may eat animal droppings, sand, insects, leaves, or pebbles. Adolescents and adults may consume clay or soil. There is no aversion to food. This behavior must be developmentally inappropriate and not part of a culturally sanctioned practice. The eating of nonnutritive substances is an associated feature of other mental disorders (e.g., Pervasive Developmental Disorder, Mental Retardation). If the eating behavior occurs exclusively during the course of another mental disorder, a separate diagnosis of Pica should be made only if the eating behavior is sufficiently severe to warrant independent clinical attention.

The DSM-IV (American Psychiatric Association, 1994) restricts the diagnosis of pica to behavior that is inappropriate to an individual's developmental level, not part of a culturally sanctioned practice and sufficiently severe to merit clinical attention.

Parry-Jones and Parry-Jones (1992) conducted a detailed historical examination of pica behaviors from the 16th to the 20th century. These authors concluded that there are several references throughout history suggesting that pica can also include the compulsive eating of food substances, in other words, normal food in abnormal quantities. Specifically, through their detailed historical examination, the authors aimed to locate and assess chronologically significant definitions of pica and to provide a broader clinical description of the condition. They concluded that, while the definitions of pica in both the DSM-IV and ICD-10 are confined to the persistent eating of non-nutritive substances, a form of pica has emerged in the last 3 decades which involves excessive craving for particular food items. They further proposed that subsequent revisions of these classification systems need to incorporate this variant into their current definition of pica.

The definition of pica in the literature, has hence, been modified in the past 40 years to include the persistent craving for and ingestion of any dietary constituent (e.g., food substances) as well as non-food items (Kettaneh et al., 2005; Scott and Cochran, 2002; Obialo, 2001; Rose et al., 2000; Ward and Kutner, 1999; Fenves et al., 1995; Parry-Jones and Parry-Jones, 1992; Anderson et al., 1991; Ojanen et al., 1990; Lacey, 1990; Sayetta, 1986; Shapiro and Linas, 1985; Litt, 1984; Kensit, 1979; Halsted, 1968). For instance, in Ward and Kutner's study (1999) a practice was classified as pica if the subject was found to be ingesting a nonfood substance or if a substance, such as ice, was consumed in excessive amounts, if the subject went to extremes to have the substance available, or if the subject reported having an extraordinary craving for the substance that would not typically be eaten for the nutrients, such as aspirin or vinegar.

Therefore, in light of the broadening perspective of what is considered pica behavior in the literature from the past decade and in an attempt to solidify an accurate, consistent definition of the phenomenon, this study will include the compulsive eating of food items not typically eaten for their nutritional content as well as the ingestion of non-food items in the overall definition of pica behavior.

Epidemiology

Pica is most frequently observed in pregnant women, patients of lower socioeconomic status and children (Edwards et al., 1994). It is also found in cases of iron deficiency anemia as well as in deficiencies of other nutrients, such as zinc (Lacey, 1990). Current population groups thought to be at high risk for pica behaviors are: young children, women (especially pregnant and/or African-American), developmentally delayed individuals, individuals who live in low SES areas, individuals who live in the Southeastern US, individuals with a family pica history, emotionally stressed individuals, individuals with iron or zinc deficiencies and dialysis patients (Scott and Cochran, 2002).

Ward and Kutner (1999) found that race/sex was significantly associated with pica among dialysis patients. African American women were more likely to report pica than were other race/sex groups. Moreover, patients reporting pica behaviors were significantly younger than those who did not report pica behaviors.

Etiology

Scott and Cochran (2002) propose cultural, psychological and physiologic factors as possible etiologies for this behavior. The following are several contemporary formulations of this problem:

Nutritional

Iron deficiency anemia has been frequently associated with the onset of pica. It has been further suggested that pica is secondary to iron deficiency and anemia (Rose et al., 2000). Nutritional theories frequently hypothesize mineral deficiencies (e.g., iron or zinc) as somehow producing cravings for dirt (Scott and Cochran, 2002).

Sensory and physiologic

It has been noted that the taste or texture of an item, such as: hard and crunchy (ice), soft and chewy (gum, rubber bands), sour and sweet (lemons, hard candy) and crumbly and smooth (dirt, powder), may play a role in its appeal (Sayetta, 1986). The smell can also trigger the behavior (Scott and Cochran, 2002).

Neuropsychiatric

A reduction in pica with administration of antipsychotic medication has been noted (Rose et al., 2000). Moreover, Scott and Cochran (2002) discussed that, among the mentally retarded, pica may be due to the inability to discriminate between edible and non-edible items; hence suggesting that markedly low IQ, or other neurological dysfunction may be associated with pica behaviors. McLoughlin (1967) suggested an effect of serum iron level and its action on the central nervous system. Faulty eating patterns have been noted in laboratory animals with lesions to the regulatory brain centers, such as the left temporal lobe and the amygdala (Sayetta, 1986). Hence, a neuropsychiatric theory is supported by evidence that certain brain lesions in laboratory animals have been associated with abnormal eating behaviors and it is postulated that pica might be associated with certain patterns of brain disorder in humans (Rose, et al., 2000).

Psychosocial

Studies have investigated intrapsychic explanations for this behavior. Psychodynamic accounts of the etiology of pica have focused on poorly characterized inadequacies of the parent-child relationship (Garfinkel, 1995). Studies have documented a high frequency of parental emotional deprivation among children with pica (Blinder et al., 1988). Goldstein (1998) discussed a case of pica in a 33 year old African American woman in which he explained her behavior as influenced by a history of shame and loss whereby the pica served a symbolic replacement for these feelings. Studies have associated pica as an expression of oral fixation (Danford, 1982).

There has also been recent evidence linking pica with obsessive-compulsive disorder (Luiselli, 1996). Patients have described their behavior as ritualistic, compelling and described their consumption as anxiety relieving (Zeitlin and Polivy, 1995). An association with stress was drawn from work done with pregnant women who stated that eating freezer frost or ice helped during stressful times (Cooskey, 1995). Edwards, et al. (1994) found that pagophagia was associated with a smaller social support network, and they hypothesized the behavior to be a method of alleviating stress. Some investigators speculate that neglect in children might be associated with pica (Rose et al., 2000). For instance, pica has been viewed as an infantile hand-to-mouth behavioral response to family stress (e.g., child abuse, parental neglect, separation, deprivation) (Singhi et al., 1981). Pica has also been associated with addictive behaviors similar to that with nicotine since the behaviors/cravings frequently continue long after the physiologic cause is alleviated (Rose et al., 2000).

Luiselli (1996) published a report in which he described pica as a manifestation of obsessive-compulsive disorder. He compared two case studies set forth by Zeitlen and Polivy (1995) and found that these patients, in addition to their pica, presented with similar behavioral profiles. For instance, they were hypervigilant and seemed anxious and over aroused and appeared to perseverate on arranging their physical surroundings (Luiselli, 1996).

Finally and of special interest to the study of pica within the context of behavioral medicine, Ward (2000) has proposed that pica practices may be a way of mediating stress associated with a serious health condition.

Cultural

Pica is accepted in many cultures as normal behavior. Cultural factors involving pica include societal beliefs attributing therapeutic and/or magical qualities to certain substances (Goldstein, 1998). Scott and Cochran (2002) explain that the Aborigines have been known to eat clay for relief of stomach discomfort and diarrhea. They further describe certain cultures where girls are taught that consumption of earth may increase fertility and areas in the southern United States where pregnant women may eat clay, cornstarch and baking soda to aid nausea and swollen legs and to ensure beautiful children. Clay, in particular, has figured prominently in the history of culturally-related pica (Garfinkle, 1995). In the United States, eating dirt and clay is regarded as a culturally learned practice that is especially likely to exist among African Americans living in the South and Southeast. Individuals who practice pica are likely to have learned it earlier in their lives and to have family members who practice pica (Ward and Kutner, 1999).

Medical complications of pica

Sayetta (1986) provided a list of potential medical complications of pica. These complications include: dental injury, achlorhydria (decreased production of gastric acid by the stomach), malabsorption, constipation (gastric or intestinal obstruction secondary to fecal impaction or bezoar) and enterocolitis (intestinal perforation, peritonitis and death). Sayetta further described potential complications resulting from pica behaviors which consist of metabolic aberrations (lead or mercury poisoning) and interference with the bioavailability of minerals; specifically, iron deficiency (anemia), zinc deficiency syndrome (nutritional dwarfism), hypokalemia (a condition whereby body fails to retain sufficient potassium to maintain health), hypoalbuminemia (an abnormally low level of albumin; blood protein), elevated serum copper levels and other possible vitamin or mineral defficiencies. Other complications noted include: parasitic infections, hightened suseptibility to infection (poor wound healing, fatigue

and lethargy), failure to thrive and pregnancy complications (toxemia).

Treatment

Pica treatment includes different modalities such as patient education, nutritional counseling and supplementation, or psychotropic medications. The use of behavior management with ongoing follow-ups is necessary to ensure long-term behavior changes (Scott and Cochran, 2002). These authors recommend that interventions be interdisciplinary, involving the physician, nursing staff, psychologist, social worker, dietitian, patient and family members or significant others.

Ward and Kutner (1999) propose that once trust is established, the consistent, repeated provision of information about the consequences of the behavior, as well as offering alternative behaviors and skills to help the patient reduce the behavior, are essential to helping the patient make the necessary changes. Educating family members is another important component in helping the patient modifies pica behaviors (Ward and Kutner, 1999).

Hence, it is clear that the study of pica has evolved over time and is a significant concern for those individuals practicing this behavior. Studies have demonstrated that this phenomenon occurs in several “high risk” populations, such as those previously mentioned and that no single determinant can account for the development of this behavior; rather, it is a combination of psychological, physiological and cultural factors. Given the serious medical complications resulting from this behavior, it is especially relevant among individuals diagnosed with a medical condition, particularly, ESRD patients receiving dialysis.

Pica in dialysis patients

Prevalence

Pica is quite common among dialysis patients. The reported prevalence ranges from 10 to 22% (Litt, 1984; Ojanen et al., 1990; Ward and Kutner, 1999; Obialo et al., 2001). Litt (1984) found that of the patients receiving regular hemodialysis at Biomedical Applications of Capitol Hill in Maryland, 10% admitted to some type of pica. Unfortunately, neither the size of the sample used to obtain the data, nor the demographic characteristics of the patients used are included in the study. The means by which these data were collected is also unavailable for the reader of this article.

Conversely, Ojanen et al. (1990) investigation of pica in renal patients at Tampere University Central Hospital in Finland provided some detailed methodological information. Of 41 dialysis patients (29 on hemodialysis and 12 on peritoneal dialysis), a total of 8 (about 20%) reported pica behaviors and of 34 patients with renal insufficiency, a total of 5 (about 15%) reported pica behaviors. An interview-based method was used to discover the pica; the interview strategies can not be replicated however, due to their unstructured format. Criteria for pica practices in this study were: a compulsion to eat something inedible or edible, continuation of the symptoms for longer than 1 week and in the case of food pica, an abnormal amount of some special food. A chi-squared test was used to compare the prevalence of pica in the study groups. The differences of the variables between pica and non-pica patients were tested by Wilcoxon’s ranking test for unpaired data. Unfortunately, the authors, similar to Litt (1984), did not include the demographic characteristics of the patients studied. Moreover, both the criteria used to define the pica behavior and the methods used to discover the pica are unquantifiable, subjective in nature and difficult (with the exception of duration of symptoms) to replicate. Furthermore, it should be noted that the high incidence of pica behaviors found in this group of subjects can not be attributed to cultural predispositions that exist among African Americans. The prevalence of pica behaviors is similar to dialysis patients with some cultural vulnerability (as discussed below) as to those with no cultural predispositions (as described above); hence, suggesting that the factors involved in acquiring this behavior may be due as much to the renal condition itself and the underlying stress surrounding the condition as it is due to cultural and demographic variables.

Ward and Kutner (1999) provide the most comprehensive, well designed investigation of this problem to date. In this study, pica behavior was examined during baseline interviews of patients (n = 226) who began chronic dialysis therapy in Metropolitan Atlanta, GA, during 1996-1997. Patients studied were ages 20 and older and were comprised of 117 men and 106 women. Of the 226 patients, 109 were African American and 114 were non-African American; 72 were on peritoneal dialysis and 154 were on hemodialysis. Structured interviews were conducted and the independent variable in the analysis was patient-reported pica behavior. The data were analyzed by the chi-squared test or Fisher’s exact test. Pica behaviors were defined as pica practices and/or reported history of pica practices. A practice was classified as pica if it was a nonfood substance or if a substance was consumed in excessive amounts, if the patient went to extremes to have the substance available, or if the patient reported an extraordinary craving for a substance that would not typically be eaten for the nutrients. Pica behaviors were reported by 37 of the 226 patients studied (16.0%).

End stage renal disease (ESRD) may constitute a potent stress and stimulus for pica, especially in those patients with an underlying cultural predisposition (Obialo et al., 2001). Obialo et al. (2001) conducted interviews of chronic hemodialysis patients at a medical school-affiliated

dialysis unit (n = 138). All of the patients studied were African American; aged 37 to 78 years (mean 57.0 ± 11.0 years). Of the patients interviewed, 30 admitted to some form of pica (21%). As abovementioned, the authors attributed the relatively high incidence as a result of dialysis related acquired pica. In other words, with time on dialysis, 47% of the patients with no prior history of pica where found to have developed the habit (Ojanen et al., 1990).

Etiology

The association of pica and iron deficiency has been well documented over the years. Kensit (1979) reported that the average American diet supplies 6 - 7 mg of iron per 1000 calories. Due to protein limitations, the diets of dialysis patients may contain even lesser amounts of iron. Furthermore, there seems to be a decreased absorption of iron across the gut wall in some dialysis patients (Kensit, 1979). Therefore, most dialysis patients have significant and irreversible anemia. Among 25 anemic patients at Wilford Hall United States Air Force Hospital, pagophagia (ice Pica) was demonstrated to be caused by the iron deficiency (Coltman, 1969).

In a study by Danford et al., (1982), which consisted of 66 mentally retarded individuals, 60 with pica and 6 without, it was reported that 30% of the group with pica had low hemoglobin; 45%, low hematocrit; 23%, low plasma iron and 28%, low ferritin. They also found plasma zinc levels were below normal range in 53% of the individuals with pica.

As aforementioned, dialysis patients are often prescrib-ed a diet restricted in potassium, sodium, phosphorus and fluids (Streltzer and Hassell, 1988). The nutrient composition of some of the non-food substances ingested may contribute to excessive amounts of these restricted items (Litt, 1984). While the cause of pica in dialysis patients has not yet been determined, Litt (1984) explained that dialysis patients often suffer from varying degrees of iron-deficiency anemia. Pagophagia (ice pica), however, has been demonstrated to be caused by an iron deficiency in anemic patients. In an effort to demonstrate the link between pagophagia and anemia, Coltman (1969) conducted a study in which he observed the lab values of anemic patients found to be engaging in excessive ice consumption. He found that iron deficient ice eaters lost the appetite for ice within 2 weeks after beginning iron therapy (Coltman, 1969). This is especially relevant in that the anemic state present in most ESRD patients, along with fluid restrictions as part of their treatment, make ice and freezer frost substances that dialysis patients may be especially likely to crave (Ward and Kutner, 1999). The initiation of pagophagia may result from an innocent suggestion to fluid–restricted patients to eat ice chips as a means to quench their thirst, and as noted earlier, may lead to interdialytic weight gain (Litt, 1984).

The association of pica and iron deficiency has been well documented over the years. In 1 study of non-dialysis patients, 28 out of 55 (50.9%) subjects with iron deficiency were found to be engaging in pica behaviors (Rector, 1989). Overall, the uremic state [the final stage of progressive renal insufficiency characterized by lab values consistent with those previously mentioned (iron deficiency, etc.)] seems to trigger pica behavior, but pica has received relatively little attention in the end stage renal disease (ESRD) population.

Common forms of pica among dialysis patients

Litt (1984) found that the most common forms of pica among hemodialysis patients include ingestion of clay, dirt, starch, baking powder and ice. Life threatening hyperkalemia as a result of geophagia has also been reported in dialysis patients (Gelfand et al., 1975).

Pagophagia was the most frequently reported type of pica behavior in Ward and Kutner's study (1999). Among patients engaging in pica practices in this study, approximately $^{2}/_{3}$ described a persistent craving for and consumption of, ice. They furthermore postulated, based on lab values collected, that there may be an association between pagophagia and lower hematocrits and iron levels in dialysis patients. Specifically, as demonstrated by studies such as Coltman (1969), a clear link has been identified between iron deficiency and pagophagia; ice consumption, while seemingly harmless, presents a problem for the fluid restricted patient. Ingestion of up to 750 g of ice has been reported (Coltman, 1965). This will contribute to excess fluid intake for the fluid restricted patient. In the study by Obialo et al. (2001) approximately 66% of subjects practicing pica craved ice, while the remainder preferred starch, dirt, flour or aspirin.

While the abovementioned studies addressed the occurrence of pica among dialysis patients, several critical observations should be noted. First, statistics were drawn examining the incidence of pica behaviors among dialysis patients; however, these statistics [16% (Ward and Kutner, 1999), 10% (Litt, 1984)] were not compared to a control group of non-dialysis patients. Therefore, one cannot assume that the relatively high rate of this problem is unique among the ESRD population or whether it was an effect of/merely a reflection of extraneous variables (that is, cultural predisposition, age, race, ethnicity, gender, chronic illness stress, etc.) Hence, it is unclear whether a sample of non-dialysis patients with similar demographic characteristics would have yielded parallel results.

Secondly, studies which have examined this problem have done so with samples limited to mainly White (European and Non-European) and African American individuals. This problem has yet to be addressed in dialysis centers with greater ethnic diversity, such as those with a large Hispanic population. A study which includes greater

cultural and ethnic diversity would be a vital contribution to the existing body of knowledge in the academic, medical and scientific community, given that Hispanics are the largest minority group in the United States (United States Census Bureau, 2005).

Additionally, with the exception of Obialo et al. (2001) and Ward and Kutner (1999), the medical community has not been updated on the occurrence of this problem in the form of an empirical study for the last 16 years internationally (Ojanen et al., 1990) and 22 years in the United States (Litt 1984) The severity and implications of such practices among this population has been clearly demonstrated and it is evident that current research in the context of a multi-cultural cross-section is crucially needed.

Lastly, studies such as Litt (1984) do not specify the manner in which these individuals are questioned regarding their pica practices, which brings into question the validity of the results obtained. Thus far, a structured, operationalzed approach to the discovery of this problem has yet to be developed. The present study aims to achieve such a goal by developing a survey which includes all substances known to be consumed by individuals engaging in this practice to date. Furthermore, the manner by which subjects are questioned will be standardized to avoid inter rater bias and the items will indicate the onset, frequency, and severity of the behavior.

Measuring pica

There are no accurate statistics on the incidence or prevalence of pica in end-stage renal disease (ESRD) patients because of a lack of well designed surveys (Fenves et al., 1995). Furthermore, patients rarely present complaining of pica and often guard against revealing it at all (Goldstein, 1998).

An interview-based method has been used to assess for pica behaviors. Ojanen et al. (1990) conducted interviews carried out according to a pattern prepared under instructions from a psychologist. Before interviewing, patients were informed about pica and its “naturalness” so that feelings of shame would not prevent them from telling about their eating habits (Ojanen et al., 1990). Litt (1984) found that when interviewing patients it may be necessary to give examples of non-food items consumed. Although they may be aware of the unusual nature of their consumption, they may classify the items as food (Litt, 1984).

Authors have discussed the reluctance of patients to disclose their pica practices. To facilitate the process of revealing these behaviors, Cooksey (1995) mention that caregivers must first establish an atmosphere conducive to such disclosure with a “conversational teaching” method. This entails “sharing” knowledge, concerns and insights between teacher and patient. Communication methods must be nonjudgmental and should focus on listening to the patient (Cooksey, 1995).

Fenves (1995) suggests using a casual, direct approach during a routine diet recall interview as a means of discovering pica behavior. Moreover, questions in relation to snacking and after meal foods may appear less threatening or judgmental and help to initiate disclosure of pica practices (Fenves, 1995).

Edwards et al. (1994) stressed the value of project-trained African American interviewers in their study of predominantly African American population because of subjects’ hesitancy to reveal culturally relevant practices to outsiders.

Discovery of pica behavior in a particular patient can be difficult. In the absence of complications that might signal such eating patterns, diagnosis depends on self reporting. Patients are likely to underreport pica behavior because of embarrassment or because they are not aware that such behavior might be worth reporting, particularly when they must acknowledge such behaviors in a face-to-face interview where anonymity is sacrificed (Rose et al., 2000). In the case of one patient, pica was documented in the patient’s medical records, but that individual did not disclose the behavior during his baseline interview despite assurances of confidentiality (Ward and Kutner, 1999).

In adult and child patients with OCD (obsessive-compulsive disorder) symptomatology or features, it is likely that the compulsive eating of nonfood substances will be secretive and thus difficult to elicit as part of a dietary history. Physicians must ask directly about the ingestion of nonfood substances that are common to pica (Rose et al., 2000).

A sense of shame or guilt may interfere with eliciting a history of pica. For instance, Grigsby et al. (1999) found that most individuals were not forthcoming in discussing their ingestion of kaolin and recognized that this behavior is seen as unusual from the perspective of mainstream culture. In attempting to elicit the history, one may attempt to disarm the patient by discussing the syndrome and its relation to iron deficiency (Crosby, 1971). Crosby (1976) further suggests spending several minutes conversing about pica with the patient and recounting other cases where there has been some reluctance to disclose the cravings, as an attempt to facilitate disclosure.

In light of the research conducted regarding measuring pica and methods of facilitating disclosure, the present study intended to develop a confidential, standardized, structured format (in the form of a questionnaire) whereby patients may be presented with a non-threatening medium in which to disclose their behavior and may yield more accurate results regarding the presence of pica in dialysis patients. For instance, the survey began by the researcher (in a standardized fashion) informing the patient of the purpose of the study and educating the patient about the behavior (give examples of non-food

items). Additionally, the researcher engaged the patient in a “conversational” manner and assured the patient of the anonymity and confidentiality of their responses. This process will serve as an attempt by the mental healthcare professional to normalize the practice so that feelings of shame will not prevent them from sharing their eating habits. A verbal portion was included in the questionnaire in order to establish a human connection with each patient and incorporate the Rogerian elements of the therapeutic relationship which include empathic affirmation of the patients concerns and creating a genuine, authentic environment in which the patient perceives that they will be regarded positively weather they believe they are engaging in abnormal behavior or not. It is in this manner, whereby the examiner exudes warmth to the patient, maintains eye contact, assures confidentiality and fosters a sense of trust, that the highest rate of disclosure may be achieved.

Physicians, often fraught with extensive caseloads, may not have the time to devote to each patient in such a manner that would elicit disclosure. Clinical Health psychologists serving as liaison or consultants to the medical team are essential in assuring the holistic service each patient warrants. The discovery of such practices is crucial in both intervening and preventing potentially fatal complications (Rose et al., 2000).

Purpose of the study and hypotheses

The existence of pica in individuals receiving dialysis is a grave concern. Dialysis patients are often prescribed a diet restricted in potassium, sodium, phosphorus and fluids (Streltzer and Hassell, 1988). The nutrient composition of some of the substances ingested may contribute to excess amounts of these restricted nutrients. Life threatening hyperkalemia as a result of geophagia has been reported in dialysis patients (Gelfand et al., 1975). Pagophagia presents a problem for the fluid restricted patient (Coltman, 1969). Ward and Kutner (1999) found that patients who report eating dirt, starch and flour are at greater risk for interdialytic weight gain (IDWG). Anemia, metabolic disturbances, mineral imbalances, poisoning, nutritional concerns, excess fluid intake, bowel obstructions/perforations, parasite infections and dental injuries are all potential complications which arise as the result of dialysis patients engaging in this behavior (Scott and Cochran, 2002). Hence, it is clear that pica in dialysis patients presents unique and serious complications. Therefore, the occurrence of pica among this population is a concern which warrants clinical investigation.

Moreover, it is essential that dialysis centers are provided with descriptive characteristics such as age, gender, race, marital status, income, etc. which may serve as risk factors of possible pica behavior. Since the effects of this behavior are potentially devastating and since the incidence of the behavior is hypothesized to be significantly high, it is imperative that such information be made public in the scholarly community so that preventive measures can be taken.

Finally, there is a paucity of well designed techniques in place to assess the occurrence of this problem. This issue is especially relevant to the field of behavioral medicine and clinical health psychology in that it offers a unique opportunity for said professionals to utilize their unique skills as an integral member of the nephrology patient’s medical team.

The problem addressed by the proposed research is the occurrence of pica in dialysis patients. The purpose of the proposed research was to investigate the incidence of pica among a sample of hemodialysis and peritoneal dialysis patients and compare those results to a non-dialysis control group of participants of similar demographic characteristics in order to gather accurate statistics on the incidence of this problem in the ESRD population, as well as to draw correlates between pica behaviors among these patients and factors such as age, race, gender, marital status an annual income. With this information, this study hoped to enrich the body of knowledge regarding pica practices present in the dialysis population as well as provide information which may serve as descriptors of future pica behavior among this population. It was imperative that research be conducted investigating this phenomenon among demographic groups for which no data exist, specifically the Hispanic population.

A survey was created in order to both qualitatively and quantitatively measure the occurrence of this problem. Subjects were identified as engaging in pica behaviors if they indicated that they had eaten non-food items either rarely, frequently or every day; or if they indicated they had eaten food items (that is, ice, cornstarch, flour, baking soda, coffee grounds) every day for the period of one month or longer. This study evaluated 4 hypotheses:

Hypothesis 1: There will be a statistically significant greater proportion of subjects found to be engaging in pica behaviors among dialysis patients than the proportion of subjects found to be engaging in pica behaviors among non-dialysis patients.

Hypothesis 2: It is hypothesized that average clinical lab values will differ significantly for dialysis patients found to be engaging in pica behaviors and dialysis patients found not to be engaging in pica practices, specifically: interdialytic weight gain (IDWG), hemoglobin and iron values.

Hypothesis 3: In accordance with the literature, a relationship will exist between those patients in the dialysis group reporting pica behaviors versus those not reporting the behavior and demographic factors, specifically: age, gender, race, marital status and annual income.

Hypothesis 4: It is hypothesized that pagophagia, as described in the literature, will be the most frequently reported type of pica behavior among all those individuals reporting pica behavior in the dialysis group.

METHOD

Subjects

A total of 292 subjects were recruited for the purposes of this study. Of these subjects, 217 were dialysis patients at a dialysis center in a large medical center in the South Florida area (classified as: Dialysis Group). The dialysis group consisted of both hemodialysis patients and peritoneal dialysis patients. 165 of these patients were on hemodialysis and 52 were on peritoneal dialysis. Hemodialysis occurs three times per week (Monday/Wednesday/Friday or Tuesday/Thursday/Saturday) and typically takes 3 to 4 h to complete. Patients are divided into shifts (1st shift: 7 - 11am, 2nd shift: 11am – 2 pm, 3rd shift: 2 - 5pm and 4th shift). Peritoneal dialysis patients come to the center once per month for scheduled appointments in order to have blood laboratory analyses. These clinics are held on Mondays, Thurdays and Fridays. All patients at the dialysis center were over 18 years of age.

The remaining 75 subjects were randomly selected from a rehabilitation center's outpatient waiting area at the same medical center (classified as the control group). All subjects were over 18 years of age. The purpose of the control group was to serve as a group of non-dialysis patients to which compare data results from the dialysis group.

Measures

Each subject was studied via an informal pica questionnaire consisting of demographic information and common pica substances (questionnaire; Appendix A). A standardized script was included at the beginning of the questionnaire and was read to the participant verbatim, before filling out the survey. The script reads as follows:

> Hello, good morning/afternoon, my name is "_____." I am doing a research project about dialysis patient's diets. As you might now, dialysis patients have very strict diets to follow and many find it pretty difficult. Since following such a strict diet is so difficult, many patients will eat a variety of different items in between meals such as ice, clay, baking soda and other things because they taste good, fill a craving or satisfy their hunger. We (the research team and I) are administering questionnaires to all of the dialysis patients that ask about different foods or items that dialysis patients may be eating throughout the day. Remember, the answers on this questionnaire are confidential and your participation would be greatly appreciated. Try to be as honest as you can. This study can benefit the care that dialysis patients receive, not just here at Jackson, but all over the country. Do you have any questions?

A total of 8 research assistants were trained on how to properly administer the verbal portion of the questionnaire. Specifically, research assistants were asked to have it memorized and were instructed to approach the subjects in a conversational manner, exuding warmth, genuineness and concern while maintaining appropriate eye contact and assuring confidentiality. They were told to address the subject's questions and discuss any concerns the subjects had. Moreover, they were advised to discuss pica behaviors openly and candidly.

Subjects were identified as engaging in pica behaviors if they indicated that they had eaten non-food items either 1 - 2 times per year, 1 - 2 times per month, 1 - 2 times per week, 3 - 4 times per week, 5 - 6 times per week, or every day, or if they indicated they had eaten certain food items (that is, ice, cornstarch, flour, baking soda, coffee grounds) every day for the period of 1 month or longer.

Procedure

Dialysis group

This study received full IRB approval at the institutions involved in the research prior to commencement. Both the hemodialysis and the periotneal dialysis patients were identified via the dialysis center's patient roster. After a patient had been seated and the dialysis session started, the researcher approached the potential participant. For the peritoneal dialysis patient the researcher approached the patient while he/she was waiting to be seen by a member of the dialysis team. The researcher asked the potential participant if he/she would like to participate in a study about the dialysis diet. If the participant agreed, an IRB approved consent form was explained and given to the patient. Once consent had been obtained the researcher asked the patient to complete one questionnaire consisting of 11 questions. It was estimated that the process of completing the questionnaire would take approximately 5 - 10 min. Once the subject completed the questionnaire the researcher thanked him/her for participating and proceeded to code the completed form and stored the results in a file cabinet under lock and key.

Control group

Participants in the control group were approached in the waiting area of the rehabilitation center and asked if they would like to participate in a study comparing the diet of dialysis patients with non-dialysis patients. If the participant agreed, a consent form was explained and given to the patient. Once consent had been obtained the researcher asked the patient to complete 1 questionnaire consisting of 11 questions. It was estimated that the process of completing the questionnaire would take approximately 5 - 10 min. Once the subject completed the questionnaire the researcher thanked him/her for participating and proceeded to code the completed form and stored the results in a file cabinet under lock and key. Control group subjects were approached over a period of 3 weeks until 75 individuals consented to participate.

Analyses

In order to determine a statistical difference between the proportion of subjects endorsing pica practices in the dialysis group and the control group (Hypothesis 1), these categorical variables were compared using Pearson's chi-square tests. Odds ratios for effect size were calculated. Hypothesis 2 (differences among average clinical lab values) was analyzed using independent sample t-tests. An alpha level of 0.05 was used for all statistical tests. Hypothesis 3 was tested using the following analyses: age and annual income were compared using independent samples t-tests and Cohen's effect size, gender was compared using a 2 X 2 chi square analysis, marital status was compared using a 2 X 5 chi-square analysis and race was compared using a 2 X 3 chi-square analysis. Odds ratios were also calculated. For the family of demographic variables, each variable was given an alpha level of 0.05. Among those subjects endorsing pica practices in the dialysis group, the diffe-

Table 1. Dialysis/control group characteristics.

Characteristics	Dialysis group (n = 149)	Control group (n = 75)
Pica Frequency (n)	38.3% (57)	16% (12)
Mean Age (SD)	49.94 (13.48)	48.28 (13.02)
Gender		
Male (n)	63.8% (95)	38.7% (29)
Female (n)	36.2% (54)	61.3% (46)
Race		
Black (n)	54.4% (81)	18.9% (14)
Hispanic (n)	40.9% (61)	78.4% (58)
White (n)	4.7% (7)	2.7% (2)
Marital status		
Single (n)	50.7% (75)	41.3% (31)
Married (n)	34.5% (51)	37.3% (28)
Divorced (n)	7.4% (11)	14.7% (11)
Widowed (n)	5.4% (8)	6.7% (5)
Separated (n)	2.0% (3)	
Mean income (n)	$19,159 (86)	$19,333 (41)

rence between the proportion of subjects reporting pagophagia and those reporting other forms of pica practices (Hypothesis 4) was compared using a chi-squared goodness-of-fit test. Analyses were performed with SPSS version 13.0 (SPSS, Inc., Chicago IL).

RESULTS

Descriptive statistics

A total of 224 subjects agreed to participate in the study. Table 1 presents a summary of the 2 groups. Of the 165 hemodialysis patients, 108 consented to take part in the study. Of the 52 peritoneal dialysis patients, 41 agreed to participate. 75 control group subjects consented to participate. The mean age of the participants in the dialysis group (Age M = 49) was nearly equal to the mean age of the control group participants (Age M = 48). The dialysis group, however, was largely composed of males (64% male, 36% female); whereas the control group was mostly comprised of females (61% female, 39% male). Both the dialysis group and control group were largely made up of Black and Hispanic individuals, with a very small proportion of White participants. The racial composition of subjects in the dialysis group was: 54% Black, 41% Hispanic and 5% White. The racial composition of subjects in the control group was: 19% Black, 78% Hispanic and 3% White. 50% of subjects in the treatment group self reported as single, 34% as married, 7% divorced, 5% widowed and 2% separated. 41% of the subjects in the control group were identified as single, 37% as married, 14% divorced and 6% widowed. The mean annual income, among those individuals who reported their income (n = 86) in the treatment group was $19,159. The mean annual income, among those individuals who reported their income (n = 41) in the control group was $19,333. The annual income and marital status of both groups was similar, with a majority of single individuals earning an annual income under $20,000. The assumption of normality for all continuous variables were evaluated and met.

Treatment effects

Hypothesis 1: Proposed that a larger proportion of subjects would be found to be engaging in pica behaviors in the dialysis group than in the control group. As listed in Table 1, of the 149 dialysis patients (108 hemodialysis, 41 peritoneal), 57 were found to be engaging in pica behaviors (38.3%) and of the 75 control group participants (non-dialysis patients), 12 were found to be engaging in pica behaviors (16%). Pearson's chi square analysis revealed a significant difference in the proportion of subjects endorsing pica practices in the dialysis group versus the control group [χ^2 (1, N = 224) = 11.592, p =.001]. Power for this analysis was found to be 0.85. Odds ratio for effect size was 3.252, indicating that dialysis patients were found to be approximately three times more likely to engage in pica practices than control group subjects. Table 2 presents the characteristics of the subjects who either endorsed or did not endorse pica behaviors in the dialysis group.

Hypothesis 2: As shown in Table 2, no difference was found [t(145) = .510, p = .611] in the average clinical labo-

Table 2. Pica group laboratory data, pica vs. non-pica.

Clinical variables	Pica reported (n = 56)	No pica reported (n = 91)
Iron (Fe) (SD)	70.68 (32.58)	70.50 (22.71)
Hemoglobin(Hg) (SD)	12.25 (3.43)	12.05 (1.02)

Table 3. Characteristics of dialysis group.

Characteristics	Pica reported (n = 57)	No pica reported (n = 92)
Mean Age (SD) (n)	46.65 (13.09) (57)	52.02 (13.38) (90)
Gender		
Male (n)	43.9% (25)	76.1% (70)
Female (n)	56.1% (32)	23.9% (22)
Race		
Black (n)	64.9% (37)	47.8% (44)
Hispanic (n)	33.3% (19)	45.7% (6)
White (n)	1.8% (1)	6.5% (42)
Marital status		
Single (n)	52.6% (30)	49.5% (45)
Married (n)	29.8% (17)	37.4% (34)
Divorced (n)	8.8% (5)	6.6% (6)
Widowed (n)	7.0% (4)	4.4% (4)
Separated (n)	1.8% (1)	2.2% (2)
Mean income (n)	$17,292 (38)	$20,636 (48)
Mean income SD	17480.76	22011.18

ratory hemoglobin values among dialysis patients endorsing engaging in pica behaviors and dialysis patients not engaging in pica practices. Effect size was small (d = 0.2) and power was 0.21. Average clinical iron values among dialysis patients engaging in pica behaviors and dialysis patients not engaging in pica practices were not significantly different following independent samples t-test analysis [t (145) = .041, p = .547]. Power for this analysis was found to be 0.20 and the effect size was small (d = 0.18).

Hypothesis 3: As listed in Table 3, the mean age of subjects in the dialysis group who endorsed pica behaviors (n = 57) was 46, whereas the mean age among subjects not found to be engaging in pica behaviors (n = 90) was 52. Analyses were run using only those subjects who reported their age. 2 participants did not provide age information. Independent samples t-test analysis revealed a significant difference in the mean age among pica endorsers versus non-pica endorsing dialysis patients [t (145) = 2.391, p = .018]. Power for this test was 0.65. The effect size was moderate (d = 0.41). Among dialysis patients found to be engaging in pica behaviors (n = 57), there was a greater proportion of females than males (56.1% female, 43.9% male); whereas, among dialysis patients not found to be practicing pica behaviors (n = 92) there was a greater proportion of males than females (76.1% male, 23.9% female). Chi square analysis revealed a significant difference in the proportion of females endorsing pica practices versus males [χ^2 (1, N = 149) = 15.819, p =.000]. Odds ratio for effect size was 4.07; hence, women were found to be approximately 4 times more likely to engage in pica behaviors than men. Power for this analysis was found to be 0.95. Of the 57 dialysis patients reporting pica practices, 37 were Black (64.9%), 19 were Hispanic (23.3%) and 1 was White (1.8%). Of the 92 dialysis patients found not to be engaging in pica behaviors, 44 were Black (47.8%), 42 were Hispanic (45.7%) and 6 were White (6.5%). Chi square analysis revealed no significant difference in the proportion of Black individuals reporting pica behaviors [χ^2 (2, N = 149) = 4.897, p = .086].

Power analysis revealed a power of 0.57. Odds ratio for effect size using only Black and Hispanic subjects was 1.86, indicating that Black individuals are nearly 2 times more likely to be engaging than Hispanic patients. Odds

Table 4. Food pica group characteristics.

Reason	Ice (n = 45)	Freezer frost (n = 6)	Baking soda /cornstarch (n = 7)	Coffee grounds (n = 4)	Raw rice (n = 4)	Raw oatmeal (n = 1)
Uncontrollable craving	33%	33%	28%	--	50%	--
Thirst	28%	16%	--	--	--	--
Taste	24%	33%	26%	75%	25%	--
Smell		--	--	25%	--	--
Temperature	6%	--	--	--	--	--
Texture	6%	16%	16%	--	--	100%
Nausea relief	--	--	16%	--	--	--
Other	8%	--	16%	25%	25%	--

ratio for effect size using only Black and White subjects was 5.04, indicating that Black individuals are nearly 5 times more likely to be engaging than white patients. The mean income among dialysis patients endorsing pica behaviors (only 38 out of the 57 pica endorsers disclosed their income) was $17,292 per year. The mean income among dialysis patients not endorsing pica behaviors (only 48 out of the 92 non-pica endorsers disclosed their income) was $20,636.50 per year. The independent sample t-test analysis did not demonstrate a significant difference [t (84) = .765, p = 0.447] in annual income and the power for this analysis was shown to be inadequate (0.07). The effect size was small (d = 0.17). The marital status composition of dialysis patients endorsing pica practices (52.6% single, 29.8% married, 8.8% divorced, 7% widowed, and 1.8% separated) was similar to those not sanctioning pica behaviors (49.5% single, 37.4% married, 6.6% divorced, 4.4% widowed and 2.2% separated) and was therefore, not found to be significant following chi square analysis [χ^2 (4, N = 148) = 1.351, p = .853]. Power for this test was 0.13.

Hypothesis 4: Pagophagia was the most frequently reported type of pica practice among all those individuals reporting pica behavior in the dialysis group. Of the 57 dialysis patients endorsing pica behavior, 45 were found to be engaging in pagophagia (78.9%). Chi square analysis revealed a significant difference in the proportion of subjects endorsing pagophagia versus other forms of pica [χ^2 (1, N = 57) = 19.105, p = .000]. Power for this analysis was found to be 0.94.

As shown in Table 4, other food substances subjects were found to be consuming amongst dialysis patients practicing pica behaviors included: freezer frost (n=6), baking soda/cornstarch (n=7), coffee grounds (n=4), raw rice (n=1) and raw oatmeal (n=1). Table 4 shows the different types of food items that subjects reported to be consuming, as well as the reason they indicated why they were ingesting them (that is, an uncontrollable craving, to quench their thirst, because of the taste, smell, temperature or texture of the food, possible relief of nausea, or other).

Non-food items, as shown in Table 5, that were reported among dialysis patients engaging in pica practices included: soap (n = 5), laundry detergent (n = 2), dirt (n = 2), cigarette butts (n = 2), stone (n = 1) and sponge (n = 1). Table 5 shows the different types of non-food items that subjects reported to be consuming, as well as the reason they indicated why they were ingesting them (that is, an uncontrollable craving, to quench their thirst, because of the taste, smell, temperature or texture of the substance, possible relief of nausea, or other).

Table 6 compares the clinical laboratory values for subjects reporting food pica versus non-food pica behaviors. Of those dialysis patients reporting pica behaviors, no difference was found [t (54) = 0.684, p = 0.497] in the average clinical laboratory hemoglobin values among dialysis patients endorsing food pica (n = 44; Hg M = 12.41, SD = 3.77) versus non-food pica behaviors (n = 12; Hg M = 11.64, SD = 1.64). The effect size was found to be small (d = 0.23) and the power for this test was 0.10. Of those dialysis patients reporting pica behaviors, a statistically significant difference was not found [t (54) = 0.939, p = 0.352] in the average clinical laboratory iron values among dialysis patients endorsing food pica (Fe M = 68.55, SD = 23.07) versus non-food pica behaviors (Fe M = 78.52, SD = 56.05). The effect size was found to be small to moderate (d = 0.31) and the power for this test was 0.15.

Table 7 compares the clinical laboratory values for subjects reporting non-food pica versus individuals who did not endorse any type of pica practice. Statistically significant differences in hemoglobin lab values [t (101) = 1.19, p = 0.235, d = 0.38] or iron values [t (101) = 0.923, p = 0.358, d = 0.29] were not found between subjects reporting non-food pica and non-pica dialysis patients. Moreover, effect sizes were small in both comparisons (d = 0.38; d = 0.29). Power analyses revealed a power of 0.22

Table 5. Non-food pica group characteristics.

Reason	Soap (n = 5)	Laundry detergent (n = 2)	Dirt (n = 2)	Cigarette butts (n = 2)	Stone (n = 1)	Sponge (n = 1)
Uncontrollable Craving	1		2	1*	1*	
Thirst						
Taste	2	2	1*	2	1	
Smell		1*		1*		
Temperature						
Texture						1
Nausea Relief						
Other	2					

*Concomitant

Table 6. Pica group laboratory data, food vs. non-food.

Clinical variables	Patients reporting food pica (n = 45)	Patients reporting non-food pica (n = 12)
Iron (Fe) (SD)	68.55 (23.07)	78.52 (56.05)
Hemoglobin(Hg) (SD)	12.41 (3.77)	11.64 (1.64)

Table 7. Pica group laboratory data, non-food vs. non-pica.

Clinical variables	Patients reporting non-food pica (n = 12)	No pica reported (n = 92)
Iron (Fe) (SD)	78.52 (56.05)	70.50 (22.71)
Hemoglobin(Hg)(SD)	11.64 (1.64)	12.05 (1.02)

for the mean hemoglobin comparison and 0.16 for the mean iron comparison.

It is important to note that there were a very small proportion of white participants in both groups in this study (5% in the dialysis group, 3% in the control group). All analyses were run excluding these participants and there were no major differences in any of the findings.

Also, analyses were conducted comparing dialysis patients who reported their annual income to those who did not on all demographic variables. No significant difference was found in the mean age, gender, or marital status of individuals reporting their income versus those not reporting their income. A significant difference was found, however, in the proportion of white participants reporting income. One hundred percent of white participants reported their income, as compared to only 60% of Black and 50% of Hispanic participants reporting their income [χ^2 (2, N = 149) = 7.206, p = 0.027]. Using data from only those subjects who reported their income revealed no difference in the overall incidence of pica among control versus dialysis group participants.

Finally, Chi Square analysis comparing the incidence of pica behaviors among hemodialysis patients versus peritoneal dialysis patients revealed a significantly greater proportion of hemodialysis patients engaging in pica behaviors (n = 47; 43.5%) than peritoneal dialysis patients reporting pica (n = 10; 24.4%) [χ^2 (1, N = 149) = 4.603, p = 0.032].

DISCUSSION

The hypotheses and findings relative to previous research

The incidence of pica in a sample of 149 dialysis patients who were surveyed in a large metropolitan area in Southeast Florida (38.3%) was considerably higher than that which had been found in other studies whose reported prevalence ranged from 10 to 22% (Litt, 1984; Ojanen et al., 1990; Ward and Kutner, 1999; Obialo et al., 2001). A likely explanation for the noticeably greater amount of pica reporters in this study may have to do with the man-

ner in which the information was educed. Taking into consideration the research conducted regarding measuring pica and methods of facilitating disclosure, the present study intended to develop a confidential, standardized, structured format (in the form of a questionnaire) whereby patients may be presented with a non-threatening medium through which to disclose their behavior. This may have yielded more accurate results regarding the presence of pica in dialysis patients. For instance, the survey began by the researcher (in a standardized fashion) informing the patient of the purpose of the study and educating the patient about the behavior (give examples of non-food items).

Additionally, the researcher engaged the patient in a "conversational" manner and assured the patient of the confidentiality of their responses. This process likely served to normalize the practice so that feelings of shame did not prevent the subjects from sharing their eating habits. As described in the methodology, the verbal portion of the questionnaire, aimed at establishing a human connection with each patient and incorporating the Rogerian elements, may have facilitated in creating a genuine, authentic environment in which the patient perceived a non-judgmental attitude from the examiner whether they believed they were engaging in abnormal behavior or not. It was in this manner, in which the examiner exuded warmth to the patient, maintained eye contact, assured confidentiality and fostered a sense of trust, that the highest rate of disclosure was likely achieved.

Unlike the studies conducted prior, the sample of dialysis patients in the present study was compared to a sample of non-dialysis patients (whose reported pica prevalence was 16%), demonstrating a significant difference in the reported occurrence of pica behaviors among the ESRD population as compared to individuals free from kidney disease and hence, not on dialysis treatment. This study provides unique, controlled data further demonstrating the higher risk dialysis patients are at for pica behavior. Specifically, results obtained indicate that dialysis patients are at 4 times greater risk for the behavior than individuals not undergoing dialysis treatment.

Among the patients studied, pica was most likely to be reported by younger (as compared to the mean age of non-pica patients) women, with greater odds toward a larger proportion of Black women. This finding is well supported by the literature (Edwards et al., 1994; Scott and Cochran, 2002; Ward and Kutner, 1999) and is especially interesting given that a large number of Hispanic individuals were included in this study, an ethnic group which had previously gone unstudied. A wealth of documentation on the phenomenon has explored the psychosocial and cultural predispositions that likely contributed to this finding (Garfinkle, 1995; Goldstein, 1998; Ward and Kutner, 1999; Ward, 2000).

Interestingly, there were a significantly smaller proportion of Hispanic individuals represented in the dialysis group (40.0%) as compared to the control group (78.4%) [X^2 (2, N = 224) = 28.05, p = 0.000]. According to the 2007 Annual Data Report of the United States Renal Data System (USRDS), 42% of non-Hispanic dialysis patients in the United States have ESRD caused by diabetes (Encyclopedia of Surgery, 2007, para. 3). Diabetes mellitus is the leading cause of ESRD. Hypertension is the second leading cause of ESRD in adults, accounting for 25.5% of the patient population, followed by glomerulonephritis (8.4%) (Encyclopedia of Surgery, 2007, para. 3). The incidence and prevalence of both hypertension and diabetes are significantly greater in the black population (Reddan et al., 2000). African-Americans are more likely to develop hypertension-related ESRD than whites and Hispanics (Reddan et al., 2000). Therefore, it is not surprising that there would be a larger proportion of Black dialysis patients, even though Hispanics comprise 60% of the population in Miami, FL (2004, October 17) The Boston Globe.

The dialysis group in the present study was largely composed of males (64% male, 36% female). This finding was generally consistent with data suggesting that that men are more prone to develop chronic kidney disease and to progresses to end-stage renal disease than are women (Iliescu and Reckelhoff, 2008). However, data derived from the U.S. Renal Data System indicated that men comprise 55% of the national dialysis population (USDRS, 2007). Therefore there seems to have been a slight overrepresentation of males among the dialysis patients whom participated in the study. This may have been due to the relatively random time period selected to conduct the study (larger than normal amount of male patients in the unit), or males may have been more amenable to participate in the study.

Average yearly income and marital status, was not found to be different for pica endorsers versus non-pica endorsers. This may have been due to the fact that the samples consisted of a relatively homogenous group of low SES participants. Research suggests that individuals engaging in pica behaviors are more often of lower SES (Edwards et al., 1994); however, the present study did not have a substantial representation of higher SES individuals with which to compare.

Pagophagia was the most frequently reported type of pica behavior reported in this study. Among the dialysis patients engaging in pica practices in this study, 78.9% described a persistent craving for and consumption of ice, every day, for the period of 1 month or longer. This finding is consistent with prior studies examining pica behavior among dialysis patients. Dialysis patients are often prescribed a diet restricted in fluids (Streltzer and Hassell, 1988). This is especially relevant in that, the fluid restrictions as part of their treatment make ice and freezer frost substances that dialysis patients may be especially likely to crave (Ward and Kutner, 1999). The initiation of pagophagia may result from an innocent sug-

gestion to fluid–restricted patients to eat ice chips as a means to quench their thirst and as noted earlier, may lead to interdialytic weight gain (Litt, 1984). This study, regrettably, did not evaluate the frequency and amount ingested by participants.

Clinical laboratory values for iron and hemoglobin were not found to be statistically different for pica reporters versus non-pica reporters, nor were they different among food versus non-food pica type, or non-food pica type versus non-pica dialysis patients. An explanation can be offered for the divergence in the present study's data, as compared to studies conducted prior which have demonstrated significant laboratory value data (Rose et al., 2000; Scott and Cochran, 2002; Gelfand et al., 1975; Ward and Kutner, 1999; Ojanen et al., 1990). The dialysis center from which patients were recruited employs a full time dietician who, along with the center's medical director, nephrology fellows, a full time nurse practitioner and nurses and technicians, continuously monitors each patient's clinical lab values to ensure that these are always at the indicated levels. Once it is noted that a patient's lab values have gone outside the normal range, necessary medication and dietary changes are made immediately. Therefore, those patients found to be consuming substances that could alter their clinical lab values were likely kept within the normal range via medical and dietary interventions and hence, were not found to have significantly different lab values from those patients not engaging in the behavior.

It is important to note, however, that a substantial difference in the range of clinical iron values was found among patients denying pica practices compared to patients endorsing non-food pica behaviors. Specifically, the iron laboratory values for dialysis patients not engaging in pica ranged from 27 to 133 (106), whereas the clinical iron values for patients practicing non-food pica ranged from 48 to 253 (205). This is a clinically significant difference, in that; normal iron values should range from 65 to 175 µg/dL. These findings suggest that, while a statistically significant difference was not found in the mean iron values among these 2 groups, the patients engaging in non-food pica in this study were clearly higher than the normal clinical range when compared to dialysis patients not practicing pica. While no conclusion can be made about this, it still requires further evaluation.

Limitations of the study

Several limitations of the present study exist and should be noted. First, it was not possible to obtain the interdialytic weight gain ((IDWG) of the patients in the renal unit for the months during which the study was conducted. IDWG has been very well documented as a serious complication resultant from pica behavior, particularly, pagophagia. The study was unable to obtain these records due to a change in the archival data system, and therefore, the effect of pica behaviors on these values could not be evaluated. Another limitation of the study was the unexpectedly large number of patients who opted to not participate. Of the 217 dialysis patients receiving treatment in the unit during the study, 68 chose not to participate. It may have been that many of these patients, after learning of the purpose of the study, refused to participate because they did not want to admit to non-compliant behavior.

The addition of those patients would have been beneficial in augmenting the statistical power and overall robustness of the study. Essentially, nothing is known about the possible pica practices of the 68 dialysis patients who did not participate. Interestingly, however, had all 217 patients participated in the study and the missing 68 patients had not reported pica behaviors, the overall incidence would have been 26%, a proportion still greater than that which has been demonstrated in past studies. Another limitation of the study exists in the characteristics of the groups compared. While the treatment and control groups were similar in age and SES, they were not similar in racial makeup (Hispanic/Black) or gender. This is a considerable limitation, in that, certain cultural predispositions for the behavior exist which include race and gender.

Implication for practice and future research

Dialysis patients fitting the characteristics that were found to be risk factors for pica behaviors (that is, Black females in their 40's) should be identified and questioned as to their eating practices. Since the effects of this behavior are potentially devastating and the incidence of the behavior has been found to be significantly high, it is imperative that such information be made public in the scholarly community so that preventive measures can be taken. The approach used to interview patients in this study was found to facilitate disclosure, as compared to previous studies conducted with similar populations with considerably smaller results. Therefore, a similar approach should be utilized when attempting to obtain this information from dialysis patients.

As noted earlier, patients with ESRD must follow a rigid and complex diet which restricts potassium, phosphorus, sodium and fluid. Compliance with dietary restrictions has been reported to reduce the risk of symptoms and medical complication, improve the patient's quality of life and increase life expectancy by 20 years or more (Durose et al., 2004). Pica affects interdialytic weight gain and can produce symptoms such as cramps, intestinal obstructions, constipation, bone and muscle pain and neurologic abnormalities depending on the type of pica practiced (Ward, 2000; Ward and Kutner, 1999; Delmez and Slatopolsky, 1992; Slatopolsky, 1987). Future studies should ensure that a reliable method of monitoring patient's

interdialytic weight gain is employed so that the fluid intake of patient's found to be engaging in pagophagia can be compared to those not practicing the behavior, as this study was unable to do so. Also, research should inco-orporate a method of obtaining the precise amount of ice being consumed by patients on a daily basis. This would help distinguish between mild, moderate and severe cases of pagophagia and would likely be useful in predicting and controlling IDWG. Pica has important implications for patients' nutritional status and morbidity and may affect patients' self-assessed quality of life (Ward and Kutner, 1999). Medical complications related to pica are in part a function of the frequency and nature of the non-nutritive substance ingested (Grigsby et al., 1999).

Many of the substances that patients were found to be consuming contain properties that may alter metabolic functions in dialysis patients. Correspondingly, dialysis patients practicing pica behaviors may complain of problems that are not reflected in abnormal lab values. Providers should be aware of these behaviors and the impact these behaviors have on the health of dialysis patients. Future research should incorporate other factors (not just lab values) that may be signs of dietary non-compliance and medical complications, such as, comparing the proportion of hospitalizations between patients found to be engaging in pica behaviors and those who are not. This may provide useful information that may demonstrate an increased health risk for patients engaging in pica behaviors. Moreover, comparing patient attendance (regularly attending dialysis appointments) may be an indicator of overall non-compliant behavior, possibly leading to medical complications which may be different among pica versus non-pica practicing dialysis patients.

Providing continued and consistent support and education that targets pica and compliance behavior is crucial for helping patients integrate health-related behavior changes into their daily dietary behavior (Ward and Kutner, 1999). Since eating behaviors are not easily changed, intervention for pica behavior should include a supportive atmosphere, consistency, repeated contact and developing a trusting, therapeutic relationship with the patient. Therefore, a clinical psychologist, preferably specializing in health psychology (behavioral medicine), should be involved along with the dietician, in identifying and intervening with these patients. Treatment should include educating the patient and family members about the behavior, the consequences of the behavior, and offering alternative behaviors and skills to help the patient reduce the high risk behavior. In those instances where it is believed that an underlying psychological disturbance is at the root, a gradual weaning process employing behavioral modification techniques may help to reduce the compulsion (Litt, 1984).

Future research should attempt to validate an instrument similar to the one utilized in this study to accurately and reliably measure the occurrence and quantity of pica behaviors in dialysis patients. A formal pica questionnaire would be an invaluable resource for dialysis centers across the world to precisely detect this problematic behavior among patients, especially those who have been identified as being at greater risk. Future research studies should also attempt to study the personality, mood and quality of life profiles of dialysis patients reporting pica behaviors, in order to further investigate possible psychological etiologies that may be interacting with the biological states of these patients which may contribute to either the initiation or exacerbation of these behaviors. Additionally, recruitment practices should be implemented such that the highest possible number of patients agrees to participate, by way of further encouragement and persuasion. Moreover, future research should attempt to obtain a control group whose demographic characteristics are as closely matched to the treatment group as possible (possibly by using larger, more representative samples). Finally, the significantly greater proportion of hemodialysis patients found to be engaging in pica practices as compared to peritoneal dialysis patients presents an interesting area for future researchers to investigate factors that may have contributed to this finding.

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It is therefore, that this study is presented in honor of Mrs. Mary Pennell and Dr. J. Phillip Pennell (1938 - 2007), a physician who touched the lives of hundreds.

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Appendix A

Date: _____

Pica questionnaire **Client ID:**_____

Age: _____

Sex:

1. Male
2. Female

Are you a peritoneal or hemodialysis patient?

1. Peritoneal
2. Hemodialysis

Marital status:

1. Single
2. Married
3. Separated
4. Divorced
5. Widowed

Race:

1. White/Non-Hispanic
2. Black/Non-Hispanic
3. Hispanic
4. Asian or Pacific Islander
5. American Indian or Native Alaskan
6. Other _____

Ethnicity:

1. Caucasian
2. African American
3. Puerto Rican
4. Mexican
5. Cuban
6. Other Hispanic
7. Haitian
8. Other _____

What is your average household income? _____

How many years have you been on dialysis? _____

Have you ever eaten any of the following? (Please indicate all that apply)

A. Ice

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

B. Freezer frost

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

C. Cornstarch, flour or baking soda

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

D. Coffee grounds

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1- 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

E. Soap

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

F. Dirt

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

G. Grass/Leaves

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

H. Chalk

1. Never

2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

I. Paint or Paint chips

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

J. Plaster

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

K. Laundry detergent

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

L. Clay

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

M. Cigarette ashes or burnt matches

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

N. Charcoal

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week

5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

O. Stone

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

P. Rust

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

Q. Raw rice

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

R. Tablets (that is, aspirin, antacids)

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

If you have eaten any of the above substances, how long have you been doing so?

1. Since childhood
2. Over 10 years
3. 9 - 10 years
4. 8 - 9 years
5. 7 - 8 years
6. 6 - 7 years
7. 5 - 6 years
8. 4 - 5 years
9. 3 - 4 years
10. 2 - 3 years
11. 1 - 2 years
12. 1 year
13. 11 months
14. 10 months
15. 9 months
16. 8 months
17. 7 months
18. 6 months
19. 5 months
20. 4 months
21. 3 months
22. 2 months
23. 1 month
24. 3 weeks
25. 2 weeks
26. 1 week
27. Less than 1 week

If you have eaten any of the above substances, what attracted you to eat it?

1. Taste
2. Smell
3. Texture
4. Relief of nausea
5. Unexplainable craving
6. Weight loss or weight gain
7. Pregnancy
8. Someone else was doing it
9. Other: _____

Appendix B

Date: _____

Pica questionnaire: _____ Client ID: _____

Age: _____

Sex:

1. Male
2. Female

Are you on dialysis? If so, are you a peritoneal or hemodialysis patient?

1. Peritoneal
2. Hemodialysis
3. Not on Dialysis

Marital Status:

1. Single
2. Married
3. Separated
4. Divorced
5. Widowed

Race:

1. White/Non-Hispanic
2. Black/Non-Hispanic
3. Hispanic
4. Asian or Pacific Islander
5. American Indian or Native Alaskan
6. Other_____

Ethnicity:

1. Caucasian
2. African American
3. Puerto Rican
4. Mexican
5. Cuban
6. Other Hispanic
7. Haitian
8. Other_____

What is your average household income? _____

If you are a dialysis patient, how many years have you been on dialysis? _____

Have you ever eaten any of the following? (Please indicate all that apply)

A. Ice

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

B. Freezer frost

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

C. Cornstarch, flour or baking soda

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

D. Coffee grounds

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 -4 times per week
6. 5 - 6 times per week
7. Every day.

E. Soap

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day

F. Dirt

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day

G. Grass/Leaves

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

H. Chalk

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

I. Paint or Paint chips

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

J. Plaster

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

K. Laundry detergent

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

L. Clay

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 -6 times per week
7. Every day.

M. Cigarette ashes or burnt matches

1. Never

2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

N. Charcoal

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

O. Stone

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

P. Rust

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

Q. Raw rice

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

R. Tablets (that is, aspirin, antacids)

1. Never
2. 1 - 2 times per year
3. 1 - 2 times per month
4. 1 - 2 times per week
5. 3 - 4 times per week
6. 5 - 6 times per week
7. Every day.

If you have eaten any of the above substances, how long have you been doing so?

1. Since childhood
2. Over 10 years
3. 9 - 10 years
4. 8 - 9 years

5. 7 - 8 years
6. 6 - 7 years
7. 5 - 6 years
8. 4 - 5 years
9. 3 - 4 years
10. 2 - 3 years
11. 1 - 2 years
12. 1 year
13. 11 months
14. 10 months
15. 9 months
16. 8 months
17. 7 months
18. 6 months
19. 5 months
20. 4 months
21. 3 months
22. 2 months
23. 1 month
24. 3 weeks
25. 2 weeks
26. 1 week
27. Less than 1 week.

If you have eaten any of the above substances, what attracted you to eat it?

Taste
Smell
Texture
Relief of nausea
Unexplainable craving
Weight loss or weight gain
Pregnancy
Someone else was doing it
Other: _____