

THE SEROTONIN CONNECTION IN INGESTIVE DISORDERS IN WOMEN WITH AND WITHOUT IRRITABLE BOWEL SYNDROME (IBS)

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ABSTRAK

Die studie het vrouens met Prikkelbare Dermsindroom (PDS) en vrouens daarsonder vergelyk ten opsigte van kenmerke van die ingestie verstourings, soos gemeet deur die "Eating Disorder Inventory-2". 'n Vergelyking tussen die groepe ten opsigte van bloed-serotonien vlakke is ook getref.

'n Steekproef (N = 30) van vrouens wat aan PDS ly en 'n kontrolegroep (N = 28) het die "Irritable bowel syndrome Client Questionnaire" en die "Eating Disorder Inventory-2" voltooi.

'n Deel van die studie het gepoog om te bepaal of daar 'n beduidende verskil is tussen vrouens met en sonder PDS ten opsigte van die volgende subskale op die "Eating Disorder Inventory-2": "Body Dissatisfaction", "Drive for Thinness", "Bulimia" en die "Introceptive Awareness" subskale. Die resultate dui op 'n statisties beduidende verskil tussen die groepe asook 'n statisties beduidende verskil op die "Bulimia" subskaal. 'n Statisties beduidende verskil tussen die groepe is ook getoon ten opsigte van die "Introceptive Awareness" subskaal.

Geen verskille ten opsigte van die "Drive for Thinness" en die "Body Dissatisfaction" subskale is gevind nie. Die resultate toon ook geen statisties beduidende verskil tussen die groepe ten opsigte van serotonienvlakke nie.

ABSTRACT

This study compared women with Irritable Bowel Syndrome (IBS) and women without IBS, with regards to characteristics of indigestion disturbances, as measured by the Eating Disorder Inventory-2. A comparison between the two groups was also made of their blood-serotonin levels.

A sample group (N = 30) of women that suffer from IBS and a control group (N = 28) completed the "Irritable bowel syndrome Client Questionnaire" and the "Eating Disorder Inventory-2".

A part of the study attempted to determine if there is a significant difference between women with and without IBS with regard to the following subscales on the Eating Disorder Inventory-2: "Body Dissatisfaction", "Drive for Thinness", "Bulimia" and the "Introceptive Awareness" subscale. The results show a statistical significant difference between the groups, as well as a statistical significant difference on the "Bulimia" subscale. A statistical significant difference between the groups was also shown with regard to the "Introceptive Awareness" subscale.

No differences were found with regard to the "Drive for Thinness" and the "Body Dissatisfaction" subscales. The results also did not show a statistical significant difference between the groups with regard to serotonin levels.

INTRODUCTION

Irritable Bowel Syndrome is a chronic, relapsing condition, characterised by abdominal pain and a change in bowel habit, in the absence of organic disease (Talley, Zinsmeister & Melton, 1995:76). The syndrome remains a diagnosis of exclusion (Cooper, in Weiss, 1996) as the syndrome is diagnosed only after other organic diseases have been ruled out (Tolliver, Herrera & DiPalma, 1994:176-178), and as there is no sign of disease when the colon is examined, the diagnosis is made by symptoms alone. IBS is hence referred to as a functional disorder (Walker, Roy-Byrne & Katon, 1990:565).

In Western countries it appears that 75% to 80% of adult patients with IBS, seen by physicians, are female (Drossman & Thompson, 1992:1009 -1016). Drossman, Thompson & Whitehead (1992:175) state that "Individuals who seek medical attention, ... are often young, white, and female, and at least see a physician for their symptoms before the age of 35".

DIAGNOSIS OF IRRITABLE BOWEL SYNDROME

The symptoms of IBS have, up until recently, been characterised best by the criteria of Manning and co-workers (Camilleri & Prather, 1992:1001-1008), but research has found that the Manning criteria are not as useful in predicting IBS in men (Smith *et al.*, Talley *et al.* in Lynn & Friedman, 1993:1940-1944). The Manning criteria have subsequently been refined at an international congress on gastroenterology in Rome (Walker *et al.* 1990:565-572) and may actually improve the accuracy of identifying the syndrome.

The congress defined IBS as follows: "Continuous or recurrent symptoms of: abdominal pain relieved by defecation, or associated with change in frequency or consistency of stool, and/or disturbed defecation (two or more of): looser stools frequency, altered stool form (hard or loose/watery), altered stool passage (straining or urgency, feeling of incomplete evacuation), passage of mucus, usually with bloating or feeling of abdominal distension" (Walker *et al.*

1990:565). Persistence of symptoms for at least three months has been deemed necessary for a diagnosis of IBS in children and adults (Apley & Naish, 1958:165-167).

The wide range of symptoms associated with IBS has prompted some authors to divide IBS into symptom-predominant subtypes, however others consider IBS to be a single entity with variable manifestations (Almy & Rothstein, 1987:257-265). It is Almy and Rothstein's (1987:257-265) opinion that investigations of the pathophysiological mechanisms and responses to treatment would be facilitated by grouping patients according to their dominant symptoms.

In this line, Thompson (in Guthrie, Creed, Whorwell & Tomenson, 1992:361-363) suggests that there may be different subgroups of IBS patients, which can be categorised according to dominant symptoms. Suggested categories are: a) spastic colon, b) painless diarrhoea, c) atonic constipation, d) gaseousness, and e) chronic abdominal pain.

It has also been proposed, on clinical grounds, that patients with IBS can be further subdivided into those who have either predominant diarrhoea or predominant constipation, or alternating constipation and diarrhoea (Talley *et al.* 1995:76-83). This proposition is based on the assumption that subjects with constipation versus diarrhoea-predominant IBS have different pathophysiologic conditions, and would therefore differ with respect to their epidemiological characteristics (Talley *et al.* 1995:76-83). Talley *et al.* (1995:76) evaluated the onset, prevalence and impact of these proposed IBS subgroups but found the results for each subgroup to be similar, suggesting that subdivision based on bowel habit alone can not identify clinically distinct entities. Other approaches pertaining towards the classification of IBS thus need to be explored.

ASSOCIATED FEATURES OF IRRITABLE BOWEL SYNDROME

Irritable bowel syndrome is no longer considered a motility disorder confined to the colon. Motor abnormalities of the oesophagus, small intestine and even of the urologic function have been described (Sood, Baijal, Lahoti & Broor, 1993). Other non-gastrointestinal symptoms have also been found to co-occur with IBS, including: heartburn, dyspareunia (painful intercourse), non-cardiac chest pain (Lynn & Friedman, 1993:1940-1944), nausea, dysphagia (difficulties in swallowing), early satiety, and slight weight loss.

Patients with IBS may also be presented with gynaecological problems (Whorwell *et al.* in Lynn & Friedman, 1993:1940-1944). Prior (1994:327-332) has documented that up to 50% of patients referred to gynaecological clinics with abdominal pain have IBS.

Orthopaedic or neurological conditions may also be inappropriately suspected, as colonic pain can be referred to the thigh (Prior, 1994:327-332) and lower back when the

spastic bowel pulls at its supporting mesenteries (Eloff, 1991).

Patients with IBS thus constitute a heterogeneous group, in that a wide anatomic spectrum of organs may be affected and several mechanisms may lead to the same symptoms or symptom complexes (Camilleri & Prather, 1992:1001-1008). These putative mechanisms may also interact within the same patient, and as these individual mechanisms are not mutually exclusive, a particular type of dysfunction may predominate, or more than one may be operative in any individual.

Despite the reported variability in symptom manifestation in some patients with IBS, a number of studies have found that typical symptoms of IBS, such as bloating, abdominal pain, flatulence, constipation and diarrhoea are common in patients with ingestive disorders (Crowell, Lawrence, Cheskin & Musial, 1994:387-391). Thus symptoms of IBS may actually be indicative of underlying psychiatric conditions, such as anorexia or bulimia nervosa (Waldholtz *et al.*; Kamal *et al.*; Smith *et al.* in Sullivan, 1994:23-27).

The following section investigates the postulated relationship between the ingestive disorders and irritable bowel syndrome, and the effects that chronic aberrant patterns of food intake, including deprivation, have on gastrointestinal functioning.

ANOREXIA, BULIMIA AND IRRITABLE BOWEL SYNDROME

Various studies have systematically addressed the prevalence and types of gastrointestinal symptoms in bulimic patients and binge eaters. Mitchell, Hatsukami, Eckert & Pyle (1985:482) found that 75% of 275 bulimic women in their study reported bloating, and 63% reported stomach pain. Binge eating also appears to be more frequently associated with symptoms of loose bowel movements, increased bowel movements, abdominal pain and the passing of mucus.

Alterations in gastric emptying and gastrointestinal transit times have been frequently reported in patients with anorexia nervosa, although research on patients with bulimia has produced conflicting results (Crowell *et al.* 1994:387-391). Some studies have reported significant delays in gastric emptying and mouth-to-caecum transit times, as well as abnormal electrogastrograms in patients with bulimia (Chami, Andersen, Crowell, Schuster & Whitehead, 1995:88-92), while other studies have found no differences in gastric emptying between bulimics and healthy controls (Robinson, Clarke & Barret, 1988:458; Hutson & Wald, 1990:41).

Several studies have also emphasised the connection between regular purgation and the subsequent development of IBS. Kirsner and Palmer (1958:490) found that laxatives, cathartics and enemas taken for relief of constipation frequently produced an irritable bowel, although they cite no specific evidence in support of this view.

Mangold (1961:120), on the other hand, in a study of 100 patients with irritable bowel syndrome, found that three-quarters were chronic users of laxatives.

Chronic vomiting can also affect gastrointestinal function, causing various symptoms to occur as a result of inflammation, electrolyte imbalances, metabolic disturbances and hormonal changes. Gastrointestinal dilation and impaired absorption, as well as swollen salivary glands, dental caries and the erosion of enamel are associated with alternative binge-purge cycles (Chami *et al.* 1995:90).

The aberrant eating patterns associated with anorexia and bulimia nervosa, and the subsequent disruptions in gastrointestinal activity may thus contribute towards the symptoms of IBS (Beumont, Russell & Touyz, 1993:1635-1640), which may, in turn, interfere with nutritional rehabilitation (Herzog & Copeland, 1985:295-303; Balaa & Drossman, 1985:5-52). Research has also found that the alternations between starvation and gorging have an effect on brain neurotransmitters (Russell, Storlein & Beaumont, 1987:167-176).

In recent years there has been much interest in the possibility that patients with ingestive disorders have a serious disturbance in neurotransmitter activity (Kaye & Weltzin, 1991:41). Various studies have analysed the role of serotonin in the control of appetite regulation, and have arrived at the conclusion that the ingestive disorders may represent a disruption of this regulation (Advokat & Kutlesic, 1995:59). This raises the possibility that serotonin may be aetiologically implicated in the ingestive disorders (Blundell & Hill, 1993:3-9).

THE ROLE OF SEROTONIN IN ANOREXIA AND BULIMIA NERVOSA

A considerable amount of evidence has accumulated suggesting that serotonin does in fact play an important role in the control of eating behaviour (Leibowitz, 1990:33), and that a serotonergic imbalance may thus indicate a reduced response to internal physiological controls which mediate satiety.

Coppen *et al.* (1976) and Johnston *et al.* (in Leibowitz, 1990:33-48) found that plasma tryptophan levels are reduced in anorexia nervosa. In addition, decreases in urinary 5-hydroxyindoleacetic acid (5-HIAA) have been detected in the cerebrospinal fluid of patients with chronic anorexia nervosa (Kaye, Ebert, Gwirtsman & Weiss, 1984:41).

Johnston *et al.* (in Leibowitz, 1990:33-48) also observed that plasma valine levels were elevated in patients with anorexia nervosa, which suggests a possible reduction in central availability of tryptophan and synthesis of serotonin.

It also appears that the responsiveness of hypothalamic-pituitary serotonergic pathways at, or distal to, the post-synaptic serotonin receptor mediating prolactin responses is blunted in patients with anorexia, whether at low weight or after the attainment of goal weight (Leibowitz, 1990:33-48). Thus, alterations in serotonergic function may perpetuate the symptomatology once the illness is set in motion.

Several lines of converging evidence from animal and human studies raise the possibility that brain serotonin may also be involved in the eating disturbances of bulimia nervosa (Leibowitz, 1990:33). Serotonergic dysfunction has been found to contribute to the impairments in mood and neuroendocrine regulations in patients with bulimia nervosa (Hudson *et al.* in Leibowitz, 1990:34-48).

According to Kaye and Weltzin (1991:41-42) reduced serotonin activity in bulimia nervosa patients could contribute to feelings of reduced satiety, an increased meal size, meal duration and rate of eating, as well as an increase in the amount of carbohydrate ingested. It also indicates that the post-synaptic responsiveness in hypothalamic-pituitary serotonergic pathways is reduced in bulimia nervosa. Alternatively, anorexia is consistent with hyperserotonergic activity. Increased serotonin activity reduces food intake, meal size and meal duration as well as slow rate of eating, causing weight loss.

Kaye and Weltzin (1991:42) propose two possible explanations regarding the relationship between the eating behaviour of patients with ingestive disorders and altered serotonin activity. Firstly, they suggest that pathologic eating behaviour could produce secondary alterations in serotonin activity. Alternatively, patients with eating disorders could engage in abnormal eating behaviours in order to "self-medicate" an intrinsic serotonin imbalance. Thus, it is not certain at this time as to whether serotonin abnormalities are "trait-related or state-related" (Kaye & Weltzin 1991:46).

The experimental association between serotonin and eating behaviour, has led to the "serotonin - hypothesis of bulimia" (Goldbloom *et al.* in Advokat & Kutlesic, 1995:61) which, in brief, states that "bulimia nervosa is the behavioural expression of functional underactivity of serotonin ... in the central nervous system". The serotonergic hypothesis also postulates that, "anorexia nervosa is associated with overactivity in serotonergic function - an increased sensitivity to, or excessive concentration of 5-HT".

According to Kaye *et al.* (in Advokat & Kutlesic, 1995:61) the ingestive disorders can thus be "viewed as reciprocal neurochemical dysfunctions, bulimia nervosa being the consequence of a hyposerotonergic condition, and anorexia indicating a hyperserotonergic state".

The large presence of the neurotransmitter serotonin in the enteric nervous system has also lead researchers to postulate that serotonin plays an important role in gastrointestinal functioning.

SEROTONIN IN THE GASTROINTESTINAL TRACT

A large number of studies have shown that serotonin modulates gastrointestinal function, and research has indicated that serotonin can both inhibit and facilitate gut motility. The role of serotonin in the gastrointestinal tract is however very complex owing to the large presence of multiple 5-HT receptor subtypes.

Several neuronal responses of the gastrointestinal tract have been attributed to serotonin (5-HT), for example, the regulation of the migrating myoelectric complex ascending peristaltic excitation in the colon, and vagal relaxation of the stomach and lower oesophageal sphincter (Costall & Naylor, 1990:769-770). Serotonin has also been implicated in playing an important role in activating mucosal afferent nerve fibres and regulating intestinal tone (Bulbring & Crema in Costall & Naylor, 1990:769-787).

Nonneuronal 5-HT, from platelets and enterochromaffin cells, may also be the primary source for stimulation of smooth muscle, cardiac muscle and endothelial cells (Olesen & Saxena, 1992). Based on animal studies, Talley (1992:273-289), suggested that 5-HT plays an important role in controlling inhibition and facilitation of motor functions of the oesophagus, stomach, small bowel, ileocolonic sphincter and colon. Serotonin is also believed to play a role in modulating small intestinal and colonic secretion and absorptive processes (Kadowaki, Nagakura, Tomoi, Jo Mori & Kohsaka, 1993:74-78). Please refer to Table 1.

TABLE 1: Physiological responses in the gut that may be mediated by 5-hydroxytryptamine (Adapted from Gershon et al. in Talley, 1992:273-289)

- Vagal relaxation of the lower oesophageal sphincter
- Mediate pressure-induced triggering of propulsion
- Vagal relaxation of the stomach
- Synaptic excitation of myenteric ganglion cells
- Modulation of the migrating myoelectric complex (MMC)
- Small intestinal fluid secretion
- Excitation of colonic motor activity
- Descending inhibition of vagal excitation of the colon
- Distal colon electrolyte transport
- Internal anal sphincter relaxation

From the above research it is evident that serotonin plays an important role in gastrointestinal functioning and that serotonergic alterations may thus contribute to the symptoms of IBS. It is also possible that disruptions in serotonin may be linked to symptoms of IBS in individuals with anorexia or bulimia nervosa.

CURRENT RESEARCH

Selection of subjects

The sample group of women with IBS were selected from a population of South Africans (N = 60) who were referred from gastroenterologists and general practitioners to the Centre for Gastroenterology at the Rand Afrikaans University. After excluding some subjects on the grounds of other gastrointestinal or medical disorders (N = 4) that might explain their symptoms, failure to consent to having a serotonin blood test (N = 19), age (N = 4) and race (N = 3), the final sample group of women with IBS consisted of 30 subjects.

The final comparison group consisted of 28 female volunteers from the north-eastern suburbs of Johannesburg who did not meet the criteria for IBS on the Irritable Bowel Syndrome Client Questionnaire, who were willing to go for the serotonin blood test and who matched the sample group in terms of age and race.

Age of the subjects

According to Prior (1994:327) the average age of presentation of symptoms of IBS is the mid-30's, though the onset of symptoms may occur much earlier. Several studies have found that IBS persists over time, and that patients continue to have symptoms many years after the initial diagnosis (Weber & McCallum, 1992:1447-1452). For these reasons women between the ages of 25 to 55 years were selected for this study.

Gender and Sociocultural Variables in Subject Selection

There do not appear to be any notable differences between the prevalence of symptoms in consulting and non-consulting IBS subjects. However, researchers have suggested that it may be possible that psychological and sociocultural factors, rather than the type or severity of symptoms, lead to differential health seeking behaviour in those suffering from irritable bowel syndrome (Hall & Barry, 1991:785-786).

It has also been documented that the frequency of IBS symptoms is not related to social class, nor does it appear to be affected by a smoking habit. Therefore psychosocial factors require careful attention in patient assessment, even though they may be of no value in the diagnosis of the syndrome. As white urbanised women with IBS appear to be the dominant group in reporting and seeking medical help for the disorder (Olubuyide, Olawuyi & Fasanmade, 1995:983-984), only white South African women, living in urban areas, was considered for this study.

Measuring Instruments

The subjects were requested to complete the Irritable Bowel Syndrome Client Questionnaire and the Eating Disorder Inventory-2 (EDI-2).

The Irritable Bowel Syndrome Client Questionnaire which was used as a diagnostic tool in this study, is a composite of aspects of the Functional Bowel Disease Severity Index (Drossman, Li, Toner, Diamant, Creed, Thompson, Read, Babbs, Barreiro, Bank, Whitehead, Schuster & Guthrie, 1995:986-995) and the Rome Criteria (Walker et al.

The first part of the Irritable Bowel Syndrome Client Questionnaire, based on the Rome Criteria, provides for a diagnosis of IBS and is comprised of seven questions regarding the nature of the IBS symptoms experienced. It also allows the clinician to determine whether the patient has diarrhoea-predominant IBS or constipation-predominant IBS.

The Rome Criteria does not provide a means to gauge whether groups vary with regard to symptom severity. Clearly, assessment of symptom severity in IBS must also be factored into any research study or treatment algorithm. For this reason Drossman *et al.* (1995:986) undertook a multisited study of patients suffering from functional bowel disease in order to quantify illness severity. The result of this study resulted in the development of a standardised scoring system known as the Functional Bowel Disease Severity Index (FBDSI).

The FBDSI allows clinicians to determine the amount and frequency of abdominal pain experienced from a 10-cm visual analogue scale. It also provides the means to determine whether the pain has interfered with the patient's daily activities and how many times the patient has needed to see a doctor as a result of bowel related complaints over a designated period of time.

Construct validity, for this questionnaire, was tested by comparing FBDSI scores to the degree of disability (degree to which symptoms interfered with daily activity). A significant association was found (Kruskal-Wallis test; Chi-square = 43.64 with degrees of freedom = 4; $P = 0.0001$) in the predicted direction.

The Eating Disorder Inventory-2 (EDI-2)

The EDI is a self-report inventory that was originally constructed in 1983 to assess psychological and behaviour traits in ingestive disorders, specifically anorexia nervosa and bulimia nervosa (Garner & Olmstead *in* Garner, 1991:5). The EDI-2 consists of 91 forced-choice items containing 11 sub-scales. These EDI-2 sub-scales measure a range of psychological symptoms that have been described as relevant to the development and maintenance of ingestive disorders. The EDI-2 can also be used as a screening instrument, to identify ingestive disorders in non-patient populations, and to distinguish individuals with serious emotional disturbances from normal dieters (Garner, 1991:10-11).

It is important to recognise that the EDI-2 serves only as an aid in formulating a specific diagnosis of either anorexia nervosa or bulimia nervosa, and is not intended to be used as the sole basis for making a diagnosis (Garner, 1991:5). In the non-clinical settings the EDI-2 provides a means of identifying individuals who have 'sub-clinical' eating problems or those who may be at risk for developing ingestive disorders. It also provides a psychological profile that is consistent with the understanding that ingestive dis-

orders are heterogeneous syndromes.

The following 4 sub-scales were deemed to be relevant for this study on IBS:

Drive For Thinness (DT):

This construct was derived from Bruch (*in* Garner, 1990:5) who described the "drive for thinness" or the "relentless pursuit of thinness" as the cardinal feature of ingestive disorders.

Russel (*in* Garner, 1991:5) on the other hand, describes its antithesis, the "morbid fear of fatness" as the core psychopathology of both anorexia and bulimia nervosa. Items on this sub-scale assess whether there is an excessive concern with dieting, a preoccupation with dieting, and fear of weight gain.

Body Dissatisfaction (BD):

Body dissatisfaction has been conceptualised as one aspect of the "body image disturbance" characteristic of ingestive disorders (Garner, 1991:6). Body dissatisfaction is generally viewed as a major factor responsible for initiating and sustaining the weight controlling behaviours of those with ingestive disorders. This sub-scale measures dissatisfaction with overall shape and with the size of those regions of the body that are of greatest concern to those with ingestive disorders (i.e. stomach, hips, thighs, buttocks).

Bulimia (B):

Research has shown that although bulimia may be common in individuals who do not meet all of the criteria to qualify for a formal diagnosis of an ingestive disorder (Pyle *et al.* *in* Garner, 1991:6), in most cases, severe bulimia is associated with marked psychological distress. The Bulimia sub-scale assesses the tendencies to think about and engage in bouts of uncontrollable overeating (bingeing). The presence of binge eating is one of the defining features of bulimia nervosa, and differentiates the bulimic and restrictor subtypes of anorexia nervosa (Garner, 1991:6).

Introceptive Awareness (IA):

Confusion and mistrust related to affective and bodily functioning have been repeatedly described as important in the development and maintenance of some cases of anorexia nervosa and bulimia nervosa (Garner & Bemis *in* Garner, 1991:7). This sub-scale measures levels of confusion and apprehension in recognising and accurately responding to emotional states (Garner, 1991:7). It also reflects whether one lacks confidence in recognising and accurately identifying sensations of hunger or satiety.

Reliability tests were done using anorexia nervosa patients and a female comparison group. Each sub-scale was required to have a coefficient of internal consistency above 0.80. Self-report scores on the EDI are all significant at the $p = 0.01$ level and the average item - total correlation is 0.63 (Garner & Olmstead *in* Garner, 1991:23).

STATISTICAL RESEARCH FINDINGS

After the questionnaires were hand scored and the raw scores captured onto computer, Hotelling's T-squared test and single t-tests were executed. The research findings revealed that there was a statistically significant difference ($p = 0.0023$) between the women with IBS and women without IBS with regard to the four sub-scales of the EDI-2. The results are presented in Table 2.

TABLE 2: Significance of differences between Group 1 (IBS) and Group 2 (non-IBS) regarding the four sub-scales of the EDI-2

Variables	GROUP 1 N = 30		GROUP 2 N = 28							
	X	SD	X	SD	Levene's F-ratio	P-Value	DF	T-Value	P-Value	DF
Drive for Thinness	6,2	6,2775	4,071	3,9264	10,46	0,002*	1,56	1,56	0,1254	49,1
Bulimia	2,9333	4,11	0,571	1,0338	26,17	0,0001***	1,56	3,05	0,0045***	32,9
Body Dissatisfaction	13,3	9,4801	10,67	7,8696	2,92	0,0931	1,56	1,14	0,2586	56
Introceptive Awareness	13,3	6,8418	1,571	1,6651	32,68	0,00001***	1,56	4,6	0,0001***	32,7

Mahalanobis D Square	1,3974	*	= $P < 0,05$
Hotellings T-Test	20,2384	**	= $P < 0,01$
F-value	4,7885	***	= $P < 0,001$
D.F.	4,53		
P-value	0,0023** (significant as $p < 0,01$ level)		

There is also a statistically significant difference ($p = 0,0045$), according to the Students t-test, between the women with IBS ($x = 2,9333$) and women without IBS ($x = 0,5714$) with regard to the Bulimia sub-scale of the EDI-2.

The Students t-test also reveals a statistically significant difference ($p = 0,0001$) between the women with IBS ($x = 7,5000$) and women without IBS ($x = 1,5714$) with regard to the Introceptive Awareness sub-scale of the EDI-2.

This investigation also tried to determine whether a disruption in serotonin levels could be contributing towards the manifestation of symptoms characteristic of IBS. The results are presented in Table 3.

According to the Students t-test there are no statistically significant differences ($p = 0,2218$) between subjects with IBS and without IBS with regard to serotonin levels.

DISCUSSION OF RESULTS

Differences between women with IBS and women without IBS in relation to the EDI-2

In interpreting the results of this study it is important to

keep in mind that the value of using the EDI-2 was to determine whether the eating and behavioural patterns associated with anorexia and bulimia nervosa were more prevalent in subjects with IBS than in the subjects without IBS, and not to make a diagnosis of anorexia or bulimia nervosa.

The Bulimia sub-scale assesses the tendencies to think about and engage in bouts of uncontrollable overeating,

a defining characteristic of bulimia nervosa (Garner, 1991:5). The statistically significant difference between the groups indicates that women with IBS tend to have behavioural and eating patterns similar to that of bulimic sufferers. It appears that women with IBS tend to think about and engage in more bouts of uncontrollable eating than do the subjects without IBS. It is however important to note that behavioural patterns characteristic of bulimia may also be common in individuals who do not meet all of the DSM-IV criteria to qualify for a formal diagnosis of bulimia nervosa (Pyle et al. in Garner, 1991:6).

The differences regarding the bulimic tendencies between the two groups in this investigation may be the result of the chronic use of laxatives in subjects with IBS as, according to the Irritable Bowel Syndrome Client Questionnaire, 73% of the women in this study had constipation-predominant IBS.

Kirsner and Palmer (1958:490) have emphasised the connection between regular purgation and the subsequent development of IBS. They found that laxatives, cathartics and enemas taken for relief of constipation frequently produced an irritable bowel. Mangold (1961:120) also documented, in a study of 100 patients with irritable bowel syndrome, that three-quarters were chronic users of laxatives.

TABLE 3: Significance of differences between Group 1 (IBS) and Group 2 (non-IBS) regarding serotonin levels

Variables	GROUP 1 N = 30		GROUP 2 N = 28		Levene's F-ratio	P-Value	DF	T-Value	P-Value	DF
	X	SD	X	SD						
Serotonin Levels	155,493	75,487	162,475	58,696	1,53	0,2218	1,56	-0,40	0,6936	56

How many of the women in this study used laxatives as a means of weight control before developing symptoms of IBS is not currently known and it can therefore not be determined whether the symptoms of IBS were precipitated by the use of laxatives, or whether the use of laxatives occurred after the symptoms of abdominal pain, bloating and constipation developed.

It is also possible that the aberrant eating patterns, associated with the ingestive disorders, may result in gastrointestinal disruptions and precipitate the development of IBS (Beumont *et al.* 1993:1635-1540), as gastrointestinal symptoms of abdominal pain, constipation and diarrhoea are common in patients with ingestive disorders (Crowell *et al.* 1994:387). Alternatively, the symptoms of IBS may be indicative of an underlying psychiatric condition, such as anorexia or bulimia nervosa (Sullivan, 1994:23-27).

A statistically significant score ($p = 0.0001$) on the Introceptive Awareness sub-scale of the EDI-2 revealed that patients with IBS ($x = 7.5000$) have a greater degree of confusion and apprehension in recognising and accurately responding to emotional states than the female subjects without IBS ($x = 1.5714$).

The psychodynamic explanation of the ingestive disorders rests on the assumption that aberrant eating patterns are a result of unconscious conflicts arising from childhood (Kaplan, Sallis & Patterson, 1993). There is also considerable evidence supporting the role that psychological factors play in IBS (Camilleri & Prather, 1992:1001-1008).

According to Tierney, McPhee & Papadakis, (1996) IBS is a manifestation of a psychiatric illness, as more than half the patients who have IBS manifest features of autonomic arousal which are common in mood, somatization and anxiety disorders.

According to Eidelberg *et al.* (in Meyer, Moore & Viljoen, 1997) unresolved psychic conflicts can be transferred into physical symptoms. So even though the women with IBS may appear to be managing effectively, the statistically significant findings indicate that they have an inability to correctly perceive and trust their own perceptions and feelings and may thus develop psychosomatic symptoms indicative of IBS. IBS may thus be psychogenic in origin and the symptoms a means of coping with underlying depression

and anxiety. Psychological factors may also provide the basis for the fluctuating symptoms characteristic of IBS (Talley, 1994:673-677).

The statistically significant score on the Introceptive sub-scale also reflects that patients with IBS have difficulties in recognising and accurately identifying sensations of hunger or satiety. According to the internality-externality hypothesis (Schachter in Kaplan *et al.* 1993) internal cues such as gastric motility, and central cues such as serotonin concentrations control eating. Patients with IBS are reported to have abnormal motility activity in response to meals (Simjee, 1995b), thus it is possible that the disturbances in gastric motility (Simjee, 1995a) contribute to this disruption. Serotonin is postulated to play a role in regulating gastrointestinal motility (Costall & Naylor, 1990:769-787). It has also been implicated in controlling internal physiological responses which mediate satiety (Leibowitz, 1990:33-48). The disruptions in recognising and accurately identifying sensations of hunger or satiety may thus also reflect an imbalance in serotonergic activity.

No statistically significant differences were found on the Drive for Thinness ($p = 0.1254$) and Body Dissatisfaction ($p = 0.2586$) sub-scales of the EDI-2.

Differences between women with IBS and women without IBS with regard to serotonin levels

No documented research could be found investigating correlation between specific serotonin levels and symptoms of IBS, even though there is a growing amount of evidence to indicate that there are a number of physiological responses in the gut mediated by serotonin.

According to Talley (1992:273) serotonin has been postulated to play a role in controlling both the inhibition and facilitation of motor functions of the oesophagus, stomach, small bowel, ileocolonic sphincter and colon. Serotonin has also been implicated in regulating small intestinal and colonic absorptive and secretory processes (Kadowaki *et al.* 1993:74). These findings suggest that the symptoms of IBS may be the result of a reciprocal neurochemical dysfunction, with the symptoms of constipation or diarrhoea being the consequence of a hyposerotonergic condition or a hyperserotonergic state.

According to the serotonin blood test results 64% of the

women without IBS ($x = 155,493$) had serotonin levels that fell within the normal range, compared to 53% of the women with IBS ($x = 162,475$). The research findings in this investigation were however unable to determine whether elevated or decreased serotonin levels were responsible for the symptoms of IBS, as no significant differences were found between women with IBS and women without IBS with regard to blood-serotonin levels ($p = 0.6936$). The observed frequency and Pearson's Chi-square test also revealed no significant differences ($p = 0.6235$) between the subjects with IBS and the comparison group with regard to the three serotonin levels (low, normal, high).

A number of confounding factors could have influenced the results, for example, neither medication nor dietary habits were controlled for. The time of day when the serotonin blood test was taken, and the particular menstrual cycle phases the female subjects were in when they went for the serotonin blood test were also not taken into account. The single serotonin blood test taken during the study also did not account for fluctuations in serotonin levels on a day-to-day and monthly basis. Psychological variables such as fatigue, depression and stress also may have contaminated the serotonin results.

CONCLUSION

Over the years a considerable number of research studies have been published pertaining to the functional gastrointestinal disease, irritable bowel syndrome (IBS). However, researchers are still far from understanding the complex dynamics that underlie this syndrome.

It is not surprising that the treatment of IBS still poses a difficult challenge for medical practitioners as patients with IBS constitute a heterogeneous group: a wide anatomical spectrum of organs may be affected and several mechanisms may lead to the same symptom complexes.

However, discoveries that the gut is only second to the brain in its concentration of neurones and neurotransmitters has lead researchers to study the effects of various neurotransmitters on gastrointestinal functioning. Serotonin (5-HT) is one neurotransmitter postulated to play a significant role in IBS due to its abundance in the gastrointestinal tract.

Data obtained from various studies have also indicated that serotonin contributes to the modulation of appetite and neuroendocrine function. Thus it is possible that serotonin plays a role in the ingestive disorders; and that the aberrant eating patterns, in turn, result in many patients experiencing symptoms of IBS.

The research findings of the current investigation revealed that there is a statistically significant difference between the women with IBS and women without IBS with regard to the EDI-2. There is also a statistically significant difference according to the Students t-test, between the women subjects with IBS and women without IBS with regard to the

Bulimia sub-scale of the EDI-2. The statistically significant difference between women with IBS and the comparison group, with regard to the EDI-2, indicates that women with IBS tend to have behavioural and eating patterns similar to that of bulimic sufferers.

On the basis of these findings it appears that women with IBS tend to think about and engage in more bouts of uncontrollable eating than do the subjects without IBS. The differences regarding the bulimic tendencies between the two groups in this investigation may also be the result of the chronic use of laxatives in subjects with IBS as, according to the Irritable Bowel Syndrome Client Questionnaire, 73% of the women in this study had constipation-predominant IBS.

A statistically significant score on the Introceptive Awareness sub-scale of the EDI-2 revealed that patients with IBS have a greater degree of confusion and apprehension in recognising and accurately responding to emotional states than the female subjects without IBS. The statistically significant score on the Introceptive sub-scale also reflects that patients with IBS have greater difficulties in recognising and accurately identifying sensations of hunger or satiety than subjects without IBS.

Even though serotonin is postulated to play an important role in the gastrointestinal tract and is speculated to contribute to the symptoms of IBS no statistically significant differences were found between subjects with IBS and the subjects without IBS with regard to serotonin levels (high, normal, low). These findings may have however been contaminated by a number of variables such as diet and fatigue.

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