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research

Communicating the Diagnosis of Down Syndrome to Families

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research

Abstract
The authors examined how parents of babies with Down syndrome were told that their infants were affected by the syndrome and studied the different ways in which males and females interpreted the information and lived the experience.

69 parents were sampled and the results reported, pointing out the differences between the genders. An association between perceived level of the experience and that of the positive or negative way parents live it has emerged. This aspect was correlated with the assessment of the disease. Some ways to improve parents' experiences and to broaden the research are suggested.

Keywords: Down syndrome, communication of diagnosis, parental reaction, influence of gender

Introduction
Communicating or receiving the diagnosis of DS (CDDS) is not easy. Even experienced doctors claim that they have had neither enough information nor sufficient instructions on how to communicate a new diagnosis of DS in a sensible and effective way.

In a survey of 2500 people, including many doyens of schools of medicine, students and directors of boarding-schools, 81% of medical students reported that they did not receive any training course on people with intellectual disability and 58% of doyens of medical schools claimed, following this statement, that this kind of training has no high priority.

Mothers and fathers of newborns with DS mention feelings such as "shock", "anger", "devastation" "upset", "depression", "bewilderment", "powerlessness", at the moment when first told of the diagnosis.

Authors like Seltzer et al (2001) and Soresi & Nota (2004) say that "when the child is born with Down Syndrome (DS), the need for changes and adjustments becomes so pressing and stressful that one can think of this event as a turning point, that is to say a point in time when life takes a significant course change" (Soresi, Nota, Ferrari 2006).

Some authors state that "in the very moment when a couple is informed that their child has DS, they abruptly are confronted with disability, which was commonly considered a very unlikely situation, a "far away" experience that could not have troubled their existence" (Soresi 2007), and that "parents from everywhere in the world (Great Britain, Scotland, Ireland, Spain, Sweden, Australia and USA) have reported deep dissatisfaction with the way they received the communication of the diagnosis and with the inadequate support they were given in the postnatal period". (Skotko, 2005).

Purpose of the study

The purpose of the present study is to verify if there are ways people of different genders look at DS, in particular as regards to:

a. the perception of expertise.
b. the positive/negative way the parents live the experience.
c. the positive /negative way the parents live the disability of their child.
d. the knowledge parents have of DS.

We moreover wanted to find out the level of expertise possessed parents; in particular, we expected it to be independent from the time when the communication is given (before or after birth).

We want to verify whether an association exists between the level of expertise perceived by parents believe they possess, and:

a. the positive/negative way the parents look at the disability.
b. the level of knowledge of the parents regarding DS.

In this study we expected to find correlations between the level of perceived expertise and the positive/negative way with which the parents live the experience some time after the communication of the diagnosis. We expected moreover that the evaluation is associated with the level of the positive/negative way with which parents look at their child disability.

Methods

69 parents (33 males and 36 females) participated to this study. We used a multiple response questionnaire, including 5 questions about:

a. the number of diagnosis effected before and after birth.

b. the level of expertise perceived by parents at the moment of the communication of the diagnosis.

c. what parents think of the experience they lived.

d. what parents think of the disability.

e. what parents know of DS.

In table I there are some examples of items of the questionnaire.

ITEM	***ANSWER***
When did you become aware that your child had DS?	Before birth -After birth
How do you evaluate the expertise level of the person that communicated the diagnosis?	Professional - Not professional
How do you evaluate this experience at present?	Positive - Negative
What is your opinion about the condition of disability of your child?	Acceptance - Non acceptance
How much do you think to know about DS?	Much – Enough - Little

Table 1. Examples of items and answers present in the questionnaire that was delivered to the parents.

Procedure

The questionnaire was delivered after a meeting with both parents:. They were asked to read the questions and then answer, indicating with an X the assessment which they thought was nearest to their feelings and to the ideas related to their experience of the communication of the diagnosis.

The questionnaire was answered separately by the parents, who didn't communicate with each other while completing the task. A person, who could remove doubts and remained extraneous to the choice of the answer, was always present.

The time elapsed from the moment in which the parents had received the CDDS and the delivery of the questionnaire did not exceed 3 years. The considerations of the parents were not altered by upsetting recent news and gave an effective evaluation of the experience they lived.

RESULTS

Times and ways of the communication of the diagnosis

15% of the parents that were involved received the diagnosis before birth, 85% after birth. Of t he total number of parents, 58% declared that the diagnosis was announced in a professional way, while 42% considered the communication not professional, 54% of the parents said they had positive feelings referring to their experience, while 46% had negative feelings.

Table 2 shows gender differences related to the positive/ negative feelings of the parents in the assessment of the communication. Table 3 shows the answers regarding the perception of the professional preparation at the moment of the CDDS. In many cases the parents abstained from answering the question. This made us believe that parents felt either discomfort or pain in expressing an opinion and in recalling the experience: Specifically 6% of women and 18% of men abstained, while 14% of women and 12% of men did not express a judgment on the perceived expertise.Table 2: Gender differences in the evaluation of the experience.

	Positive	***Negative***	
Male	13	14	**27**
Female	20	14	**34**
Total	**33**	**28**	**61**

Table 2: Gender differences in the evaluation of the experience.

	High Expertise	***Low Expertise***	
Male	19	10	**29**
Female	16	15	**31**
Total	**35**	**25**	**60**

Table 3: Gender differences in the perception of the expertise.

In table 4 the results of the correlation between the answers of the parents referring to the perceived level of expertise and the positive/negative assessment of their experience are shown.

	Positive Evaluation	***Negative Evaluation***	
High Expertise	21	9	**30**
Low Expertise	7	16	**23**
Total	**28**	**25**	**53**

Table 4 Association between perceived expertise and evaluation of the experience.

In the analysis we considered only the parents who answered both questions about the perceived expertise and about the positive/negative level with which they lived the experience. In this preliminary analysis 23% of participants did not evaluate both questions, but preferred to answer only one or even none. This fact allowed the parent not to express a judgment: for instance, at the question " how

do you evaluate this experience?" some parents answered "different", "binding", "something to carry on".

The Chi square points out that there are neither significant differences in the evaluation of the experience (Table 2) (Chi square = 0.69 g.d.l. 3.84 p < n.s.) nor in the perception of the expertise level (Table 3) (Chi square = 1.19 g.d.l. 3.84 p < n.s.) as gender function.

Significant differences emerge between the perceived level of expertise and the positive/negative level with which the experience is felt by the parents (Table 4) (Chi square = 8.18, g.d.l. p < 0.01)

Moreover, chi square points out that perception of expertise by the couple is not connected with the birth of the child (Chi square = 0.57, g.d.l. 3,84 n.s.).

Emotions and relationships

What parents think of the disability of their own child is strictly connected with the positive/negative feeling with which they evaluate the experience: 72.5% of parents who participated to the study expressed positive feelings about the disability, while 27.5% had a negative feeling. In table 5 the gender differences of the feelings related to the disability are shown.

69.4% of women and 78.8% of men answered the questionnaire. In this situation we observed abstentions by some parents as well, showing dynamics similar to the answers related to the assessment of the experience.

	Positive Feeling	***Negative Feeling***	
Male	20	6	**26**
Female	17	8	**25**
Total	**37**	**14**	**51**

Table 5 Gender differences in the feeling related to disability.

	Positive Feeling	***Negative Feeling***	
High Expertise	24	5	**29**
Low Expertise	11	7	**18**
Total	**35**	**12**	**47**

Table 6 Association between perceived expertise and positive/negative feeling.

The Chi square pointed out that there are no significant gender differences in the positive/negative level with which the parents consider the disability (Table 5) (Chi square = 0.51 g.d.l. 3.84 p < n.s.). No significant association is evident between the expertise level perceived during the CDDS and the level of acceptance of the child's disability (Table 6) (Chi square = 2.74, g.d.l. p < n.s.).

	Positive Feeling	***Negative Feeling***	
Positive Evaluation	23	3	**26**
Negative Evaluation	10	11	**21**
Total	**33**	**14**	**47**

Table 6 Association between perceived expertise and positive/negative feeling.

We verified the presence of the existence of associations between the evaluation of the experience and that of the disability. A significant association was found between the positive level with which parents evaluate the event and the positive/negative level of feelings about their child disability (Table 7) (Chi square = 9.27, g.d.l. p < 0.01).

Knowledge of the parents

We studied the level of knowledge of DS claimed by parents. They could chose among the following: a good knowledge (19%), an average knowledge (20%) and a poor one (61%). In a preliminary way, we evaluated whether gender differences existed.

The results are shown in Table 8.

	High knowledge	***Intermediate knowledge***	***Low knowledge***	
Male	5	7	19	**31**
Female	2	5	15	**22**
Total	**7**	**12**	**34**	**53**

Table 9 Association between perceived expertise and knowledge.

We investigated also if the expertise level perceived by parents at the moment of CDDS was associated with the level of knowledge of DS. The Chi square did not show any significant difference about these variants (Table 9) (Chi square = 0.58 g.d.l. 5,99 n.s.).

Discussion

The results of the present study are spelled out in relation to specific areas. We must point out that the obtained results refer to a limited sample of parents. We intend to increase the number of people participating to the study, allowing a further perspective on the subject.

In particular, from the analysis we have done, it emerges that:

a. Gender does not appear significantly associated with the analyzed variables in the context of the communication of the diagnosis.

b. The level of expertise perceived by parents was neither correlated with the time of the communication of the diagnosis nor with cultural specificities about DS and beliefs of the parents about the disability.

As we hypothesized, an association has emerged between

perceived level of expertise and that of the positive/negative aspect with which the parents live this experience. This result is significantly associated with the assessment of the disability.

This study points out the fundamental role of the parents' experience at the time they are informed of the disability and emphasizes the importance of CDDS in developing the concept the family will have of the child and in the acceptance of the disability.

Conclusions

The present study agrees with current literature, as to the ways that are perceived by parents in relation to the communication of the diagnosis, even if not specifically for DS.

Case (2001) says that "the great majority of parents of children born with impairment or disability would have preferred being told in a more professional way; with attention paid to the emotional state they were experiencing, in a more measured and personalized fashion..... In addition, the information was often incomplete, not up–to-date and especially lacking consequences and likelihood of intervention in the short, medium and long term". Answers were often given in a "technical" language, not always easy to understand (Soresi et al, 2006).

Fox et al, (2002) also mention the distress expressed by parents who received the diagnosis, pointing out that the time of the communication was characterized by the scarce information obtained from the services "which was unclear, ambiguous and superficial" (Soresi et al 2006).

Certainly the moment of the CDDS is very delicate and the awareness of the parent that his/her child has DS is an experience carrying discomfort and sadness. This experience is characterized by anger and depression caused by the psychological grief the parents are facing. The study points out the parents' remembering, their present evaluation of the experience and the assessment of the disability.

In conclusion we want to stress out that all people who are concerned with CDDS (medical doctors, nurses, psychologists, etc) must be aware of the family distress. They must also bear in mind they should transmit the knowledge in the most positive way. They should not abandon the parents after the diagnosis, but offer them support, following them in the first years of the child's life, forming and orienting them. This support could begin a serene, binding educational way, that could become rich of opportunities for the whole family.

Application perspectives.

It would be interesting to increase the present study by considering different ages of the babies, to assess how much the principles of the CDDS have changed and to underline evolutions and mutations of the level of expertise during time.

It would be important to pick out the factors influencing the parents' answers and above all the reasons that brought some subjects not to answer some questions. These data can be the basis to initiate a prospective study on the subject.

Considering the relevance of the familiar context where the child with DS grows, it would be useful to investigate the ways of the CDDS, giving the parents more explicit information, asking them to specify some indications which, according to them, could make the communication more professional .

Moreover, a prospective study could be useful to analyze whether the expertise level perceived at the moment of the CDDS could affect the development of a more or less restrictive parental style. This could either anticipate or delay the cognitive and social development of the child with DS, considering the importance of the environment where the child lives.

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Gastrointestinal Symptoms Survey for Children and Adults with Down Syndrome

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Abstract
The Gastrointestinal Symptoms Survey was developed by Patti and Gavin (2006) at the New York State Institute for Basic Research in Developmental Disabilities It was distributed to parents and caregivers of children and adults with Down syndrome in the United States, Canada and the United Kingdom between 2005 and 2009. It was developed to assess the prevalence and degree of gastrointestinal (GI) problems and celiac disease in individuals with Down syndrome (DS). A total of 350 surveys were completed. Survey data revealed that certain GI problems were present in individuals with DS. Over 21% of the survey participants reported having one or more food sensitivities, intolerances or allergies. Milk, wheat and dairy products being the most common. The most frequent gastrointestinal complaint was constipation, followed by bloating, diarrhea, bowel incontinence and vomiting. The reported gastrointestinal diseases were celiac disease (6%), irritable bowel syndrome (4%), H. pylori infection (2%) and Crohn's disease (1%). Celiac disease appears to be under-recognized and under-diagnosed in individuals with DS. Lack of awareness of celiac disease must be addressed because of the high prevalence in this population; those who have not been tested should be, and the testing needs to be repeated at regular intervals because celiac disease can develop at any age.

Keywords: Down syndrome, survey, gastrointestinal, celiac, allergy

Background
Research suggests that in children and adults with Down syndrome (DS), gastrointestinal (GI) symptoms are often under-reported and therefore not treated. People with DS are more likely to have GI disorders than the general population (Cohen, 1999). It is imperative to raise the awareness of assessment and treatment of GI issues in people with DS, as untreated GI conditions can decrease the quality of life for many individuals. There are many GI issues that can affect people with DS, including irritable bowel syndrome, Crohn's disease, Helicobacter pylori (H. pylori) infection and celiac disease. Irritable bowel syndrome is characterized by cramping, pain, bloating, constipation and diarrhea; it does not permanently harm the intestines. Crohn's disease is an ongoing disorder that causes inflammation of any part of the GI tract. The intestinal swelling may extend deep into the lining of the intestines and cause pain and diarrhea, and healthy bowel may be found between diseased sections of the bowel. H. pylori is a type of bacteria that weakens the protective mucous coating of the stomach, which allows the stomach acid and bacteria to irritate the lining of the stomach and eventually cause an ulcer. Infection with H. pylori is more likely to be acquired during childhood, but the longer the duration of the infection, the greater the risk for developing peptic ulcer disease or gastric cancer (Wallace & Dalton, 2006). H. pylori infection can be diagnosed with a blood test, stool test or the carbon urea breath test and can be treated with medication.

One of the most commonly under-diagnosed diseases is celiac disease—an intolerance to gluten, a substance found in wheat, barley, malt and many other food products. It is also known as celiac sprue, nontropical sprue and gluten-sensitive enteropathy (Green & Jones, 2006). Celiac disease is a disease of malabsorption, in which nutrients are not properly absorbed, and there is an abnormal immune reaction to gluten (National Digestive Diseases Information Clearinghouse, 2008). Celiac disease can be triggered by severe illness or stress. The classic symptoms include diarrhea, abdominal pain and constipation. However, many people with the disease are asymptomatic (Fasano et al., 2003). When a person with celiac disease ingests food containing gluten, the immune system responds by damaging the villi that line the intestines. Once the villi are damaged and atrophied, the person cannot absorb nutrients and becomes malnourished. Untreated celiac disease can lead to long-term complications, including malnutrition, vitamin and mineral deficiencies and osteoporosis (National Institutes of Health Consensus Development Conference Statement, 2004). Several studies have demonstrated a close association between celiac disease and endocrine disorders, certain cancers and neurological disorders (Alaedini & Green, 2005).

Celiac disease can be diagnosed using several different methods. A specific panel of blood tests is performed. One of the blood tests in the panel, for IgA endomysial antibodies

(EMAs), is very specific for celiac disease. These antibodies correlate with the degree of villous atrophy (Green & Jones, 2006) present in the intestines. The other tests in the panel include IgA tissue transglutaminase (tTG), IgG tissue transglutaminase and total IgA antibodies. Celiac disease can be diagnosed with an intestinal biopsy, which is performed during an endoscopic procedure with sedation. During the biopsy, it is necessary to obtain biopsy samples from multiple sites, as celiac disease does not cause uniform damage to the intestines (Green & Jones, 2006). Genetic testing also can be performed; HLA-DQ2 and HLA- DQ8 are the specific genes identified in celiac disease. If these genes are present, a person may develop celiac disease; if the genes are not present, a person cannot develop celiac disease (Green & Jones, 2006). If a person tests negative for celiac disease and has GI symptoms, a wheat or gluten intolerance or allergy may be present, but there is not an abnormal immune reaction to gluten. Prior to 1999, there were no recommended testing guidelines for celiac disease; therefore, many people born before 1996 may never have been screened for celiac disease.

The prevalence rate of celiac disease in the general population is 1 in 133. The rate of celiac disease in people with DS is higher, with a prevalence rate of 1 in 11 (9.1%) (Fasano et al., 2003). A multicenter research study in Italy found that of the 55 patients with DS who tested positive for celiac disease, 69% had a classic presentation, 11% had atypical symptoms and 20% had silent celiac disease (Bonamico, et al., 2001). A cross-sectional study in Spain found that of 18 people with DS who tested positive for celiac disease, 15 had typical signs, and 3 had silent celiac disease (Carnicer et al., 2001).

The Gastrointestinal Symptoms Survey (unpublished) was developed to assess the prevalence and frequency of GI problems and celiac disease reported in children and adults with DS. Questions assessing the prevalence of food sensitivities, intolerances, allergic reactions, gastrointestinal issues, celiac disease, diet and the health history of the individual and the family are included. A Family Version of the survey was devised for a parent or family member as the informant, and a Non-Family Version was devised for paid staff or a caregiver as the informant.

METHOD

Design of the Gastrointestinal Symptoms Survey

The survey consisted of 11 questions with 72 items:

- Two questions assess the incidence of food sensitivities, intolerances and allergic reactions.
- Five questions address GI issues, celiac disease, diet and weight changes.
- Two questions address the health history of the individual and of the family.
- One question addresses skin conditions.
- One question addresses the issue of celiac testing.

The Gastrointestinal Symptoms Survey was distributed to parents and caregivers of children and adults with intellectual and developmental disabilities in the United States, Canada and the United Kingdom. In the United States, the survey was distributed in New York to the caregivers at Pathfinder Village, in Edmeston. In addition, parents and caregivers of clients seen in the George A. Jervis Clinic at the NYS Institute for Basic Research in Developmental Disabilities, Staten Island, NY, were asked to participate in the survey. If parents or caregivers chose to participate, they had the option to return the survey by mail, or to complete it when they were at the clinic. In Canada, the survey was mailed to families in the registry of the Down Syndrome Research Foundation (DSRF) in Vancouver, British Columbia, and was available to attendees at the 2006 World Down Syndrome Congress (Patti & Gavin, 2006). A notice regarding the survey was also placed in the Down Syndrome Scotland Newsletter and the Down Syndrome Association magazine in the United Kingdom.

Data were taken from a larger survey sample that included children and adults diagnosed with various intellectual or developmental disabilities (e.g., autistic spectrum disorders, fragile X syndrome). Only responses taken from parents and caregivers of children and adults with DS are described in the present study. Approval from NYS Institute for Basic Research in Developmental Disabilities' Institutional Review Board (IRB) was obtained for the design and distribution of the survey.

Data Analysis

Ratings for each of the responses to the survey questions were coded, and descriptive analyses were conducted using computerized statistical software (SPSS, 2002). The data were summarized and converted into percentages. In order to test differences in responses among the DS sample, chi-square analyses were conducted. There were no significant differences between respondents by age, gender or country in which they reside (all p values > .08).

Results

A total of 350 surveys were received from parents (63%), other family members (5 %) and caregivers (32 %) of children and adults with DS. The survey sample was 57% male and 43% female. The mean age of the survey participants was 25.5 years, with an age range between 2 and 65 years. The breakdown by ethnic group was 316 (90%) white, 19 (5%) African-American, 4 (1%) Asian, 3 (0.9%), Hispanic, 6 (2%) other or combination, and 2 (0.6%) unknown.

Diet

In our survey sample, 66 % were reported to be on a regular diet, and 34 % were reported to be on a modified or special diet. High-fiber was the most common special diet (see Table 1), followed by gluten-free, then lactose-free and other types of diet, which included low- carbohydrates, high-carbohydrates, low-fat or casein-free (casein-free contains no milk protein, but may contain lactose).

Diet Type	*Frequency*	*(%)*
Regular	213	(66.4)
High-fiber	40	(12.5)
Gluten-free	16	(5.0)
Lactose-free	8	(2.5)
Other	39	(12.1)
Combination of above	5	(1.6)

Table 1. Description of type of diet reported by survey sample.

Note: Missing information from 29 surveys.

Food sensitivities, intolerances or allergies

In our survey, the data revealed that 22% of the participants had one or more food sensitivities, intolerances or allergies. Milk (9.2%), wheat (7.4%) and dairy products (7.4%) were the most frequently reported, followed by lactose (4.5%), barley (3.8%), oats (3.6%) and rye (3.2%) (See Figure 1).

Health History

In our survey sample, the participants' health history varied, but the most prevalent issue was thyroid disease (33.0%) by a seemingly large margin, followed by behavior problems (15.4%), anxiety (13.0%), depression (10.8%) and seizures (5.9%) (see Table 2).

Gastrointestinal issues

Irritable bowel syndrome was reported in 4.3%, H. pylori infection was reported in 2.2 %, and Crohn's disease was reported in 0.6 % of the survey participants. The prevalence rate of celiac disease, both diagnosed within the individual (5.6 %) and in the family's history (3.4 %), was low. It follows that the data revealed that only 3.4% of the sample had received genetic testing for celiac disease.

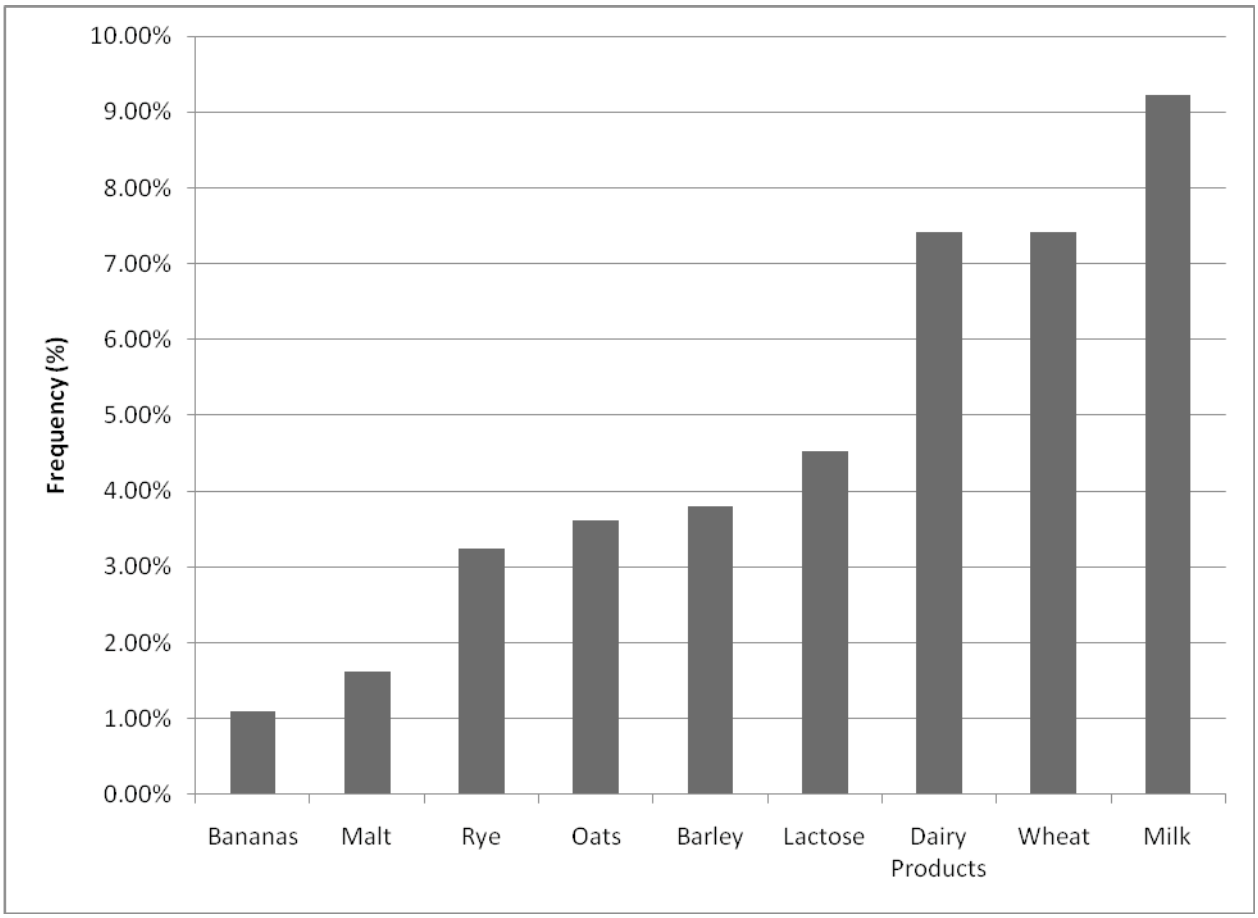

Figure 1. Frequency of food sensitivities, intolerances and allergies.

Note: Missing information from 26 surveys. Respondents may have reported more than one food sensitivity, intolerance or allergy per subject.

Condition	Frequency	(%)
Thyroid disease	107	(33)
Behavior issues	50	(15)
Anxiety	42	(13)
Depression	35	(11)
Seizures	19	(6)
Celiac disease	18	(6)
Irritable bowel syndrome	14	(4)
Alzheimer's disease	12	(4)
Anemia	11	(3)
Arthritis	9	(3)
Cancer	7	(2)
H. Pylori	7	(2)
Migraines	6	(2)
Osteoporosis	6	(2)
Psychosis	6	(2)
Diabetes	5	(2)
Crohn's disease	2	(1)
Other	58	(18)

Table 2. Health history of survey sample.

Note: Missing information from 26 surveys .Respondents may have reported more than one condition per subject.

Condition	Frequency	(%)
Irritable bowel syndrome	41	(12.7)
Colon cancer	20	(6.2)
Crohn's disease	15	(4.6)
Celiac disease	11	(3.4)
H. pylori infection	10	(3.1)
Other GI Issues	35	(10.8)
N/A or not known	242	(69.3)

Table 3. Family health history of survey sample

As Table 3 shows, the most common GI condition in the family history was irritable bowel syndrome followed by colon cancer, Crohn's disease, celiac disease and H. pylori infection.

Figure 2 shows the frequency with which our survey sample reported the presence of specific GI complaints. The most frequent GI complaint was constipation, followed by bloating, diarrhea, bowel incontinence and vomiting, and 14% of respondents experienced a weight loss of between 5 and 20 lbs.

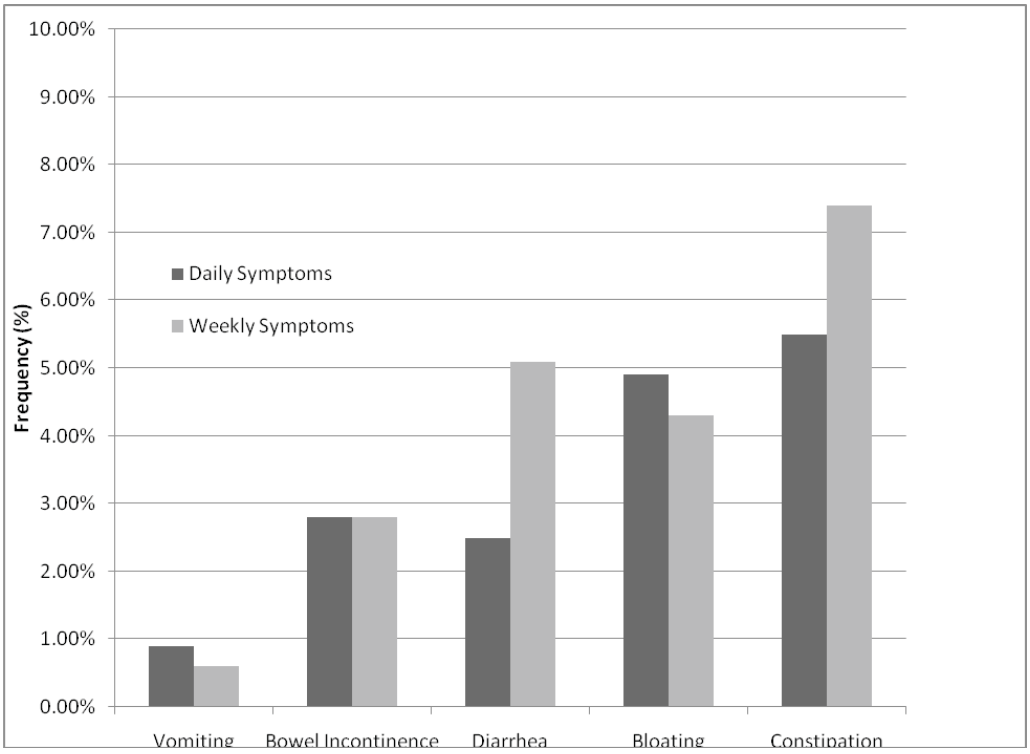

Figure 2.

Frequency of gastrointestinal complaints.

Note: Missing information from 26 surveys. Respondents may have reported more than one condition per subject.

Interpretation and Discussion

A total of 350 Gastrointestinal Symptoms Surveys were analyzed to assess the prevalence and frequency of GI problems and celiac disease in individuals with DS. The survey findings indicate that the most prevalent non-GI health issue in our sample of people with DS was thyroid disease, followed by behavior problems, anxiety, depression and seizures. According to the 1999 Healthcare Guidelines for Individuals with DS, (Cohen & the Down Syndrome Medical Interest Group, 1999) due to the high incidence of thyroid disease, thyroid function testing is recommended to start at 6 months of age and to be monitored yearly (Cohen et al., 1999). Changes in behavior, anxiety and depression were reported frequently and must be assessed in this population. Seizures were reported in 6% of our survey sample. Seizures tend to peak in infancy and again in the fourth and fifth decades (Cohen, 1999), and must be evaluated.

The survey data revealed that GI problems commonly occur in individuals with DS. Over 21% have one or more food sensitivities, intolerances or allergies. Milk, wheat and dairy products were the most common, followed by lactose, barley, rye and malt. People with food allergies, sensitivities and intolerances must be assessed further for the underlying causes of these conditions. Since celiac disease is defined as an intolerance to wheat, oats, barley and malt, people with these issues need to be tested for celiac disease.

It was found that constipation is the most frequent GI complaint, and it follows that a high-fiber diet is the most common special diet reported. The second most common diet reported was a lactose-free diet. There are two main causes of intolerance to lactose: primary lactose intolerance, which is caused by a genetic lack of lactase, and secondary lactose intolerance, which may develop from any disease that damages the villi (Green & Jones, 2006) such as celiac disease.

The most frequent GI complaints were constipation, followed by bloating, diarrhea, bowel incontinence and vomiting. These complaints must be investigated and treated. Non-medical treatment of constipation includes an increase in fluid intake, a high-fiber diet and an increase in physical activity. However, GI manifestations of celiac disease may include diarrhea, weight loss, failure to grow, vomiting, abdominal pain, bloating and distension, anorexia and constipation. Celiac disease that is left untreated may lead to vitamin and mineral deficiencies, osteoporosis and other extraintestinal problems (National Institutes of Health Consensus Development Conference Statement, 2004). Therefore, patients with DS should be tested for celiac disease.

In one study (Neuhausen, 2001), abdominal bloating was the only symptom experienced by some children with DS who were later diagnosed with celiac disease. Therefore, people with DS experiencing abdominal bloating should be tested for celiac disease.

Although the incidence of GI disease was low, the most commonly reported GI disease was celiac disease, followed by irritable bowel syndrome, H. pylori and Crohn's disease. These three conditions had low prevalence rates (see Table 2), which may be due to the sample being characteristically younger in age so that the disease has not yet manifested. H. pylori may also have a low prevalence rate due to the lack of symptoms associated with the disease. However, prevalence rates overall may be low because of some respondents' inability to report the symptoms (Wallace, 2002).

It is very common for celiac disease to present with extraintestinal manifestations, sometimes with few or no GI symptoms (National Institutes of Health Consensus Development Conference Statement, 2004). Dermatitis herpetiformis is one such skin condition, caused by an abnormal immune response to gluten that is seen in some people with celiac disease. In certain affected individuals, the chronic stimulation of the immune system by gluten produces IgA antibodies that bind to the skin (Green & Jones, 2006). This dermatological manifestation of celiac disease presents as clusters of small, itchy red bumps, raised red patches or small blisters. It is a symmetrical rash that occurs on both sides of the body. Dermatitis herpetiformis requires a physical examination and a skin biopsy to be diagnosed. In this survey, the researchers attempted to assess for this condition, by including two questions regarding skin conditions and rashes. Because these questions seemed to be too vague, researchers were unable to obtain any useful data from the responses. Some forms of eczema present similarly to dermatitis herpetiformis lesions (Green & Jones, 2006).

The prevalence rate of celiac disease in the sample reported within the individual and in the family's history was low. Consequently the data revealed that only 3.4% of the sample has had genetic testing for celiac disease. It was clear that some of the respondents did not understand what was meant by genetic testing.

Celiac disease, while the most reported GI disease in the survey sample, was still below the 9.1% expected rate in people with DS (Fasano et al., 2003). This may be due to several factors. Even with the presentation of symptoms, there is often a long delay in diagnosing celiac disease. Latent celiac disease is often seen in first-degree relatives of people with celiac disease or in persons with other autoimmune diseases. In latent celiac disease, a person who tested negative at one time may test positive upon retesting at a later date (Green & Jones, 2006). In a person who once tested negative, if the GI symptoms continue, retesting for celiac disease is recommended. In silent or asymptomatic celiac disease, there is a lack of symptoms, but villous atrophy is present. If individuals are unable to describe their symptoms, celiac testing/screening may be appropriate and should be offered (National Institutes of Health Consensus Development Conference Statement, 2004).

The treatment for celiac disease is a strict, lifelong gluten-free diet. It is a difficult diet to follow since there are many hidden sources of gluten in food. Therefore, it is crucial to enlist the assistance of a skilled dietician, establish a dietary plan, procure gluten-free foods and join a celiac disease support group. It is essential to educate family members and staff on the importance of maintaining a strict gluten-free diet. Individuals with DS must be given an array of

acceptable gluten-free foods to choose from. Resolution of GI symptoms while maintaining a gluten-free diet indicates that the treatment can improve the quality of life.

Recommendations

It is crucial to reinforce the importance of following the Healthcare Guidelines for Individuals with Down syndrome, 1999 revision (Cohen & the Down Syndrome Medical Interest Group, 1999). Children with DS between 2 and 3 years of age should be screened for celiac disease, provided the child has been on a regular gluten-containing diet. If the child is not ingesting gluten (i.e., is presently on a gluten-free diet), the intestinal villi may return to normal and will render a false negative test result (Green & Jones, 2006). According to the Celiac Disease Guideline Committee of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition 2005 (Hill et al., 2005), older people with DS have a higher prevalence of celiac disease than do children with DS, suggesting an increase in celiac disease prevalence with age. Even if there are no GI symptoms, screening for celiac disease for all people with DS is recommended (Zachor et al., 2000).

Celiac disease appears to be under-recognized and under-diagnosed in individuals with DS. Awareness of celiac disease must be raised and addressed in this population. In addition to following the recommendation of the Healthcare Guidelines for Individuals with Down Syndrome, 1999 revision (Cohen & the Down Syndrome Medical Interest Group, 1999), to screen children with DS between the ages of 2 and 3 years, we advise repeat testing for celiac disease if GI symptoms develop, and at regular intervals at later ages since celiac disease can develop at any age.

In the future, we plan to modify the Gastrointestinal Symptoms Survey to clarify the issue of genetic testing for celiac disease and to eliminate the questions on skin conditions, since it was difficult to interpret the answers to these questions without a physical examination. We will continue to distribute the survey to people with DS and to people with other disabilities, including autism spectrum disorder and fragile X syndrome.

A copy of the survey is available by contacting Maureen Gavin BSN RN-BC CDDN at:

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Obesity and the Metabolic Syndrome characteristics in children and adolescents with Down Syndrome

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Abstract

Objectives: To determine the prevalence of obesity and characteristics of the metabolic syndrome in children and adolescents with Trisomy 21.

Study design: Anthropometric measurements and calculated BMI% were obtained from 146 patients with Down Syndrome aged 5-20 y who were being followed at the National Down Syndrome Medical Unit in Israel. Blood pressure, fasting glucose and lipids were measured. The degree of physical activity as reported by parents was recorded.

Results: Of the patients evaluated, 52.1 % were found to be overweight and 26.4% met the criteria for obesity. Impaired fasting glucose levels (>100 mg/dl) were found in 13.9%. Dyslipidemia was also prevalent, with 48.0% patients having elevated serum LDL-cholesterol (>100 mg/dl) and 38.5% having low serum HDL-cholesterol (<40 mg/dl). None of the subjects studied had hypertension. In terms of physical activity, only 38.1% of the patients surveyed were engaged with sport activities beyond normal school hours.

Conclusions: Obesity, glucose intolerance, and dyslipidemia are common in children and adolescents with Down syndrome. Increased awareness of Down syndrome related disorders, systemic screening and surveillance, and early intervention in terms of increasing physical activity and weight reduction programs may improve the health and quality of life in this population.

Keywords: DS: Down syndrome, MS: metabolic syndrome, HDL: high density lipoprotein, LDL: low density lipoprotein

Introduction

The Metabolic Syndrome (MS) is characterized by obesity, dyslipidemia, insulin resistance and elevated blood pressure. The first three characteristics are also commonly found among individuals with Down syndrome (DS). Among the general population, MS is associated with the development of coronary heart disease, type 2 diabetes, stroke, peripheral vascular disease, and possibly Alzheimer's disease (Weiss et al., 2004; Bray & Bellanger, 2006; Amemiya et al., 2007; Zimmet et al., 2007). Stroke and coronary heart disease are rare in DS even though they have many of the manifestations of MS, but type 2 diabetes and Alzheimer's disease do occur more frequently in this special population and have a major impact on longevity and quality of life. Obesity, which is the key component of MS, may also contribute to physical disability, reduced physical activity, breathing difficulties and obstructive sleep apnea, all of which are known to be common in children and adults with DS (Al Husain, 2003; Allison et al., 1995; Sharav & Bowman, 1992; Prasher, 1995).

As the complications of MS overlap with the many of the known problems associated with DS, it would be important to determine the prevalence of MS manifestations among children with DS (Leonard, Bower, Petterson, & Leonard, 1999; American Academy of Pediatrics Committee on Genetics, 2001; Cohen, 1991; Roizen & Patterson, 2003). This is especially important with regard to obesity, as childhood obesity, both in the general and DS population, has significant implications for future health and function.

The purpose of this retrospective study was to evaluate a representative population of patients in a referral center for DS, and to determine the extent of MS manifestations in this population. The results of this study suggest that a significant proportion of children and adolescents with DS do have many of the characteristic manifestations associated with MS.

Methods

A retrospective study was performed at the National Down Center located at the Hadassah-Hebrew University Medical Center, Mount Scopus, Jerusalem, Israel. Data was obtained from the charts of 146 patients spanning the years 2005-2007. The study was approved by the Institutional Review Board of Hadassah University Medical Center.

As part of the routine visit, all patients had a complete physical examination.

Weight was measured with the patients attired in only light clothing and without shoes. Height was measured by a standard stadiometer. Blood pressure was determined

by an electronic sphygmomanometer (Datascope Accutorr Plus). BMI percentiles were calculated using an online BMI calculator provided by the CDC (http://apps.nccd.cdc.gov/dnpabmi/Calculator.aspx?CalculatorType=Metric). Calculations are based on height, weight, age, and gender. Laboratory investigations, when possible, were performed for the patients with DS and including fasting glucose, total cholesterol, HDL, LDL, triglycerides, TSH, and FT4.

Assessment of physical activity was performed by the Center's physiotherapist based on interviews with parents using a simple scale that was developed in the Center. This scale was based on the following criteria: Low active (no sports activity), moderately active (participation in sport activities only at school up to 2-3 times per week), high active (engagement in sport activities both at school and after school on a nearly-daily basis).

Results

The study included 146 patients with DS who were seen at the National Down Center. Mean age was 11.2 ± 4.5 y (range 5-20 y), male / female ratio 1.6. Patients were examined and anthropometric measurements taken.

Overweight / obesity

To determine the degree of weight abnormalities in the study population, BMI calculations were obtained for 144 patients. The mean BMI% was 75% (range 0-99%). There were 52.1% who met the criterion for being overweight (BMI% > 85%). In terms of obesity, 26.4% of the total group had a BMI% > 95. In contrast, only 20.1% of the patients had a BMI% < 50. At the extremes, there were 9 (6.2%) patients with a BMI% >99 and 4 (2.7%) with a BMI% <1.

Physical activity

Within this study population, 105 patients were assessed in terms of their level of physical activity. The largest group of patients (38.1%) was rated as high active. However, a significant proportion of patients were either low active (26.7%) or moderately active (35.2%).

Glucose

Fasting blood glucose levels were available for 36 patients. The mean blood glucose was 89.4 ± 17.5 mg/dl (range: 66.6 – 163 mg/dl). Within this group, 13.9% had abnormally high fasting blood glucose levels (>100 mg/dl).

Lipid profile

The lipid profiles of a subgroup of our patients (n=25) are shown in table 1. What is notable is that the total mean serum cholesterol was 157.3 ± 32.9 mg/dl which is well below the abnormal range, and only 9% had a serum cholesterol > 200 mg/dl. In contrast 48% had high LDL, and 38% had less than recommended values for HDL (table 1).

Blood pressure

Blood pressure measurements were normal for all patients in the study group.

Discussion

Our study reveals that the characteristic features of MS – especially obesity - are commonly found in DS. A high proportion of the patients in our study also had signs of dyslipidemia based on the proportion of children with LDL > 100 mg/dl and HDL < 40 mg/dl (Pueschel, Craig, & Haddow, 1992). What is interesting is that despite the high proportion of children with obesity, all of the children with DS had normal BP. This is consistent with previous studies that found that the average blood pressure in individuals with DS is normal and possibly lower than the general population for both males and females (Draheim, McCubbin, & Williams, 2002; van de Louw, Vorstenbosch, Vinck, Penning, & Evenhuis, 2009).

Previous studies have sought to find an association between coronary artery disease and dyslipidemia. Our findings showing the high incidence of dyslipidemia but normal blood pressure raises the possibility that individuals with DS, even those with both obesity and dyslipidemia, may be at lower risk for atherosclerotic disease because the hypertensive aspect of the MS is lacking (Pueschel et al., 1992).

There are many reasons why children and adolescents with DS may be predisposed to obesity as the phenotypic features of this syndrome include a lower basal metabolic rate, hypothyroidism, and a tendency towards developing insulin resistance. Delayed motor development and hypotonia may lead to reduced physical activity, aberrant feeding behaviors and eventually a suboptimal diet and excessive caloric intake (Ordonez, Rosety, & Rosety-Rodriguez, 2006).

Serum values (mg/dl)*	Patients*	% of patients with abnormal values	Reference values
Cholesterol	157.3 ± 32.9 (79.5-212)	9	<200
LDL-cholesterol	100.1 ± 20.5 (60-136)	48	<100
HDL-cholesterol	43.6 ± 10.9 (25-72)	38	>40
Triglycerides	98.9 ± 35.4 53-187	10	<150

Table 1. Lipid profile in a subgroup of our cohort

*mean ± SD, range in parentheses

Obesity and the other characteristic features of MS should not be considered as inherent components of DS. The wide range of BMI found in our study population is similar to that of the general population and indicates the important contribution of environmental and genetic variables that are not exclusive to Trisomy 21. Of note is that while the total cholesterol for our population was well within the normal range and only 9% of the patients had a cholesterol > 200 mg/dl, the distribution of lipoprotein fractions was abnormal with a near majority of patients having abnormally high LDL and low HDL. This is a pattern often seen with sedentary individuals and would indicate that children with DS are not sufficiently physically active. This is supported by our data showing significant proportions of our patient population were rated as low active or moderately active.

Similar to obesity and dyslipidemia in the general community, the manifestations of MS in DS can be reversed with appropriate life-style and pharmacologic interventions (Draheim et al., 2002). For example changing to a healthier lifestyle with more physical activity and a balanced and controlled diet can reduce obesity with an associated improvement in the lipid profile.

There are some limitations to the study. This was a retrospective study so the assessment of physical activity that was obtained by history may not be reliable. Similarly, we did not have laboratory values for all the subjects, as we did not receive authorizations from the patients' health maintenance organization to perform these tests.

Our study emphasizes the importance of continued follow-up of children and adolescents with DS. Obesity is prevalent at all ages, and early intervention can have a lasting impact on the health of an individual with DS. Increased surveillance of this population can facilitate early identification of feeding disorders and behavioral patterns likely to contribute to the development of MS manifestations. Cooperation between the individual with DS, family members, healthcare providers and educators is critical for reducing the manifestations of MS in this population.

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Hypercarotenaemia In Children With Down Syndrome

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Abstract
We present three children with Down syndrome who developed hypercarotenaemia, all were dependent upon food of a pureed texture and two of whom had concomitant hypothyroidism. The biochemical relationship between thyroxine and vitamin A has previously been described, as has the finding of hypercarotenaemia in those fed a pureed diet.

We suggest that in children with Down syndrome presenting with a yellow/orange skin colouration, investigations should include beta-carotene, vitamins A&E and thyroid function alongside liver function. Indeed, the evolution of an orange hue should prompt the clinician to check thyroid status and consider other pathologies as in one of our illustrative cases, fluctuation in skin colouration alerted clinicians to deteriorating thyroid control and a review of thyroxine prescription.

Keywords: Down syndrome, hypercarotenaemia, hypothyroidism, screening

Introduction
Children with DS are at increased risk of many medical conditions that occur in the general population (Roizen et al., 2003). Hypercarotenaemia is a benign condition causing an orange discolouration of the skin, sparing the sclera to distinguish it from jaundice. We suggest that children with Down syndrome may be predisposed to hypercarotenaemia. Whilst it appears that the preparation of food may be important, it has also been suggested that hypercarotenaemia shares a common pathway with the aetiology of hypothyroidism. We present three children with Down syndrome who presented with hypercarotenaemia. Two of these had concomitant hypothyroidism, the other had myelodysplasia and all were dependent upon a pureed diet.

Biochemistry
Carotenoids are lipid-soluble pigments found in photosynthetic plants, algae, fungi and bacteria. Fruits and vegetables contain carotenoids with many of those featuring in our case discussions being particularly rich (Mangels et al., 1993). Carotenoids are also important food colourants (Downham et al., 2000). There has been considerable interest in the specific health benefits of carotenoids however whilst these have been largely unsubstantiated (Etminan et al., 2005; Gallicchio et al., 2008), there does appear to be a significant protective relationship between serum carotenoid levels and many causes of mortality (Akbaraly et al., 2009; Agudo et al., 2007).

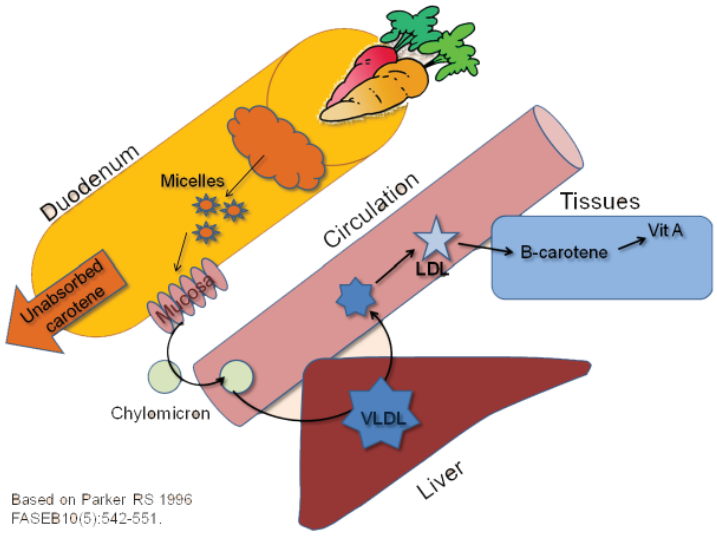

Figure 1: Intestinal absorption and metabolism of carotene to peripheral vitamin A deposition (Parker et al., 1996).

Carotene is a precursor of vitamin A with a complex series of transport mechanisms. Beta-carotene is absorbed and transported in micelles across the duodenal mucosa and via chylomicrons through the lymphatics and thereafter by lipoproteins in the circulation hereafter the conversion to vitamin A occurs in the peripheral tissue (Parker et al., 1996; Parker et al., 1989) (Figure 1).

Conversion of carotene to vitamin A is dependant on the particulate size of the food, amount of dietary fat, protein availability in the diet and the presence of intestinal disease (Parker et al., 1996; Barden et al., 1977; Patel et al., 1973; Sivaramakrishnan Venkatesh et al., 2006). There is also thought to be a genetic basis for variations of carotenoid metabolism (Mangels et al., 1993) and functional variability in the efficiency of beta-carotene15,15 deoxygenase enzyme (Barden et al., 1977).

Clinical presentation

Orange discoloration of the skin with a preferential distribution affecting the nasolabial folds, pinna, palms and soles of the feet and sparing the sclera is likely to represent hypercarotenaemia. This is a benign condition that has been previously reported in association with increased carotenoid ingestion, hypothyroidism, diabetes mellitus, eating disorders, liver disease and due to an inborn error of metabolism (Storm et al., 1990).

Others have documented case series of people with Down syndrome and carotenaemia. These studies were based on groups of patients in an institutionalised setting. In an attempt to determine the effect of Down syndrome upon nutritional status, a series of institutionalised adults with learning difficulties[1] due to Down syndrome were compared to those institutionalised with learning difficulties for other causes. With a universal diet, those with Down syndrome had higher levels of vitamin A compared to those institutionalised without Down syndrome, but similar values to non-institutionalised subjects. Carotene values were similar in the two institutionalised groups but significantly higher than those in the community (Storm et al., 1990).

Previously the belief was held that people with Down syndrome were at risk of vitamin A deficiency. There is some evidence for increased oxidative stress in Down syndrome and, as such, it follows that there should be extra demand for antioxidants such as beta-carotene (Ani et al., 2000). However many of these studies are of poor quality and contradictory, making firm conclusions difficult (Roizen et al., 2005).

The particulate size of the food ingested appears to be a significant factor determining the amount of carotenoid absorbed from the duodenum (Parker et al., 1996; Patel et al., 1973; Sivaramakrishnan Venkatesh et al., 2006) and heating also appears to increase bioavailability (Parker et al., 1999). This may be significant in the children in whom we observed high carotene levels. Each had a prolonged dependence upon pureed food as they were unable to tolerate other food textures. This is common in children with Down syndrome (Hopman et al., 1998) and would be a common factor, as observed in the studies of institutionalised people who were largely dependent on pureed tubers and legumes.

CASE SERIES

We present three children who presented with an orange discolouration to the skin and biochemical investigations proved this to be due to hypercarotenaemia.

Case 1

A twelve month old boy (47XY+21) was reviewed routinely. At the time of the review he was generally well although an orange discoloration to his skin had been noticed by his mother. She had searched the internet for possible causes and had come to the clinic questioning if her child had hypercarotenaemia. Clinical examination revealed a well child who was thriving. He was eating jarred baby food accompanied by some home pureed foods. Beta-carotene level was 2.8mg/l (reference range 0-0.8mg/l), vitamin A level 2.3mg/l (reference range - 0.2-0.6mg/l) and vitamin E level was 25.2 (reference range 5-20 mg/l). Routine thyroid function screening at the same time revealed subclinical hypothyroidism - TSH 11.4 pmol/l (reference range <6.0 pmol/l) and free T4 16.3µU/l (reference range 12-22µU/l). His carotenoid ingestion was reviewed and he was commenced on thyroxine supplementation. His thyroid function normalised and the orange discoloration of his skin resolved.

He continued to require food of a mushy consistency until the age of 2 years. Interestingly, a later recrudescence of orange discolouration coincided with deterioration in thyroid function and resolved upon correction of his thyroid status.

Case 2

A fifteen months old boy (47XY+21) attended for routine review and was noted to be well but had an orange/yellow discoloration to his skin, in particular to his nose, ears, palms of his hands and soles of his feet. His sclera were spared. Physical examination was otherwise unremarkable. Serum beta-carotene level was 2.3mg/l and an accompanying thyroid status review also demonstrated hypothyroidism (TSH 11pmol/l; T4 15.5ÂµU/l). At the time of presentation he was dependent upon pureed food (in particular carrot, new potatoes and sweet potato) and was regularly eating jarred baby food. After thyroxine supplementation and a dietary review his serum biochemistry resolved to the normal ranges.

Case 3

A 30 months old girl (47XX+21) was seen in clinic as her parents were concerned about a yellow discoloration to her skin and bruising. Examination revealed a happy child who was neither anaemic nor jaundiced. However, she had marked bruising. Carotenaemia was confirmed biochemically and additional concerns of a haematological malignancy were confirmed with her blood film initially demonstrating myelodysplasia. This progressed to acute myeloid leukaemia requiring chemotherapy. She made a good recovery and is now in remission. Dietary review at the time of presentation

1 The term learning difficulties in the UK refers to intellectual disabilities.

demonstrated a dependence upon pureed food, in particular orange coloured jarred baby food.

These cases share a commonality with the previously described literature in that each was dependent upon a pureed diet at the time of presentation. However, in our series each of these children also had significant co-morbid conditions – hypothyroidism and myelodysplasia.

The course of hypercarotenaemia in two of the children we have presented correlated closely with thyroid status. Successful management involved dietary modification and management of the hypothyroidism. It has been suggested that a common pathway involves thyroxine in vitamin A metabolism (Chanda et al., 1956). Animal studies have demonstrated that thyroxine is essential for the depletion of vitamin A from the liver (Nir et al., 1966) and that there is a linear inverse relationship between vitamin A and thyroid serum levels (Heimer et al., 1949). It is therefore credible that, in the hypothyroid state, hypercarotenaemia results. Details of the pathways involved remain elusive as does the mechanism behind the association of both hypothyroidism and carotenaemia in Down syndrome.

Recommendations for practice

It is difficult to recommend a change in practice based upon a small case series. However, we suggest that these cases highlight the importance of following published guidelines for the screening of co-morbid conditions in children with Down syndrome (Down Syndrome Medical Interest Group Guidelines).

While a larger cohort study would be required to confirm whether an association between hypercarotenaemia and hypothyroidism or haematological conditions exist, these complications of Down syndrome are well documented and we suggest that the new appearance of skin discoloration should prompt the clinician to be alert to the possibility of this heralding the onset of a co-morbid condition.

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DSQ will publish papers that advance the understanding of Down syndrome in all areas of science, education, health care and practice. Articles must be comprehensible to a broad audience, including researchers, practitioners, and families of children with Down syndrome.

Three categories will be considered for publication:

1. **Research**
   Articles reporting original clinical, educational, psychological, or basic science findings and contributing to the international literature in their respective disciplines. Manuscripts should contain a clearly written abstract, including background, methods, results and interpretation (summarized in tabular format where possible), and discussion concerning application of the findings as they apply to Down syndrome. Suggested length is 2500 words, excluding the abstract, figures, tables, and references.

2. **Practice**
   Articles directed at practicing clinicians and educators. These may include case reports on teachings, brief educational reviews of a focused problem, or short descriptions of innovative programs and preliminary findings. Suggested length is 2500 words.

3. **Review**
   a. Scholarly evidence-based reviews of topics relevant to practice. Systematic reviews should attempt to answer a focused question. Suggested length is 2500 words, excluding abstract, tables, figures and references.

   b. Narrative reviews provide readers with a synthesis of the existing literature in a particular field and are prepared by experts with a comprehensive understanding of the research area. Authors should discuss the application of existing evidence to practice. Suggested length is 3000 words, excluding abstracts, tables, figures and references.

Manuscripts should be prepared either according to the standards set out by the International Committee of Medical Journal Editors (ICMJE), found in the Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication, or according to the format specified in the Publication Manual of the American Psychological Association (APA) (5th Ed. 2001). All information regarding ethical considerations and manuscript preparation and submission can be found at the ICMJE website: http://www.icmje.org/ or at the APA website: http://www.apa.org/.

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