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## Sotos Syndrome: An assessment of stress levels of the patient and the family. The response to disability and developmental diversity

Dimitra Theodoropoulou<sup>1</sup>, Chrisi Vlachou<sup>2</sup>, Alexandros Argyriadis<sup>2</sup>,  
Agathi Argyriadi<sup>3</sup>

<sup>1</sup> Schimatari Health Center, Attica, Greece

<sup>2</sup> School of Health Sciences, Frederick University, Cyprus

<sup>3</sup> Department of Psychology, Frederick University, Cyprus

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**Corresponding author:** Dr Chrisi Vlachou, School of Health Sciences, Frederick University, Cyprus, Email: [chrisivlachou@yahoo.com](mailto:chrisivlachou@yahoo.com), [vlachouchrisi@gmail.com](mailto:vlachouchrisi@gmail.com), Tel: +306946264078

**S u m m a r y. Introduction:** Sotos syndrome is a rare genetic condition inherited in an autosomal dominant manner and caused by deletions or mutations of the NSD-1 gene located on chromosome 5q35. It is characterized by overgrowth in childhood, associated with mental delay and the predominant phenotypic feature is a facial deformity. The prevalence of births of children with Sotos syndrome is estimated to be 1 in 5,000.

**Aim:** This study aimed to evaluate the stress levels experienced by a patient with Sotos syndrome and his family. In addition, an attempt was made to study the evolution and experience of the feeling of stress over time, as well as the strategies used to deal with it.

**Method:** For this research, the case study method was used with a 18-year-old participant suffering from Sotos syndrome and his father. Information was collected by semi-structured interview, using an interview guide with open-ended questions. Participants were informed of the anonymity and confidentiality of their participation and a signed consent was obtained. The analysis of data was carried out using the thematic content analysis method.

**Results:** The patient had medical comorbidities and mental delay, that cause increased parental stress, which, however, decreases over time.

**Conclusions:** Several studies describe the psychosomatic characteristics of people with Sotos syndrome, but there are no studies to evaluate stress experienced by these people and their families. However, further research is recommended.

### INTRODUCTION

Sotos syndrome was first described by Sotos, Dodge, Muirhead, Crawford, and Talbot in 1964<sup>1</sup> and was originally called "cerebral gigantism".

Sotos syndrome is a disorder characterized by a particular facial appearance, overgrowth in childhood, and learning difficulties combined with delayed development of mental and motor skills.<sup>2</sup> Children affected by Sotos syndrome are usually taller than their peers and have unusually large heads.<sup>3</sup>

Sotos syndrome is reported to occur in 1 in 10,000 to 14,000 newborns. Because many of the features of Sotos syndrome can be attributed to other conditions, many cases of this disorder are likely to be misdiagnosed, so the true incidence may be closer to 1 in 5,000.<sup>4</sup>

About 95% of cases of Sotos syndrome occur in people with no family history of the disorder.<sup>5</sup> Most of these cases result from new (de novo) mutations involving the NSD1 gene, located on chromosome 5q35.<sup>6</sup> Sotos syndrome is inherited in an autosomal dominant manner. If neither parent of a relative has Sotos syndrome, the risk for the patient's siblings is low (<1%). The risk for the offspring of affected individuals is 50%.<sup>7</sup>

Sotos syndrome studies have focused primarily on observable clinical features and genetic causes.<sup>4</sup> However, there are a small number of case studies and cohort studies that have described some of the behavioral features seen within the syndrome, such as aggression,<sup>2</sup> behaviors that fall on the autism spectrum,<sup>8</sup> behaviors falling within the clinical category of Attention Deficit Hyperactivity Disorder (ADHD),<sup>4</sup> deviant social behaviors,<sup>9</sup> as well as behaviors related to communication difficulties.<sup>2</sup>

Children with Sotos syndrome present emotional and social problems. A child who looks older than his age but acts younger may have low self-esteem and elevated stress levels. This reflects on his school and family. So far, there is a great deal of ambiguity regarding the behavioral phenotype of Sotos syndrome, which needs to be studied in order to provide better quality of life and more appropriate psycho-social care and support to children and adults with this syndrome, and to their families.

## METHOD

The aim of the research was to investigate the stress levels of a patient with Sotos syndrome and his family. More specifically, we try to study how the respondents understand the syndrome, how they give value to what happened to the affected member, what expectations a parent might have for the child and to what extent they are realistic, how the feeling of stress develops over time, in which ways they experience it, but

also the strategies they use to deal with situations created by stress.

In this particular case study, we followed the qualitative research methodology, using semi-structured interviewing, as it was decided as the most appropriate method to gather information about the experiences of the participants, from which we will draw the data which can answer our research questions.<sup>10</sup> Individualized approach is best achieved through a qualitative approach and analysis of each case.<sup>11</sup> Qualitative research does not seek to identify an objective "truth". On the contrary, it attempts to construct reality based on the way in which the participants themselves perceive it.<sup>12,13</sup> Semi-structured interview was chosen for the flexibility it offers and because during a discussion other facets of the problem, that we might not have thought of, might be revealed.<sup>14</sup> The subjects of the study were a member of a family with a chronic disease (an 18-year-old boy with Sotos syndrome) and another family member (the father). Before the start of the interview, the participants were informed about the aim of the research, the preservation of their anonymity and the protection of their personal data, as well as the possibility of withdrawing from the research process anytime if they did not wish to participate any more. Participants signed a consent form, one copy of which was given to them, and a second copy was kept by the researchers. Discussions were recorded with the participant's consent and transcribed, stored securely until transcribed and then destroyed; then they were analyzed using the method of thematic analysis. Confidentiality was also strictly maintained throughout the research process.

The first step in the thematic data analysis was to familiarize the researchers with the data, where the interview transcripts were read and re-read. After discussing the data, the researchers asked themselves what stood out or what seemed to be part of the answer to the research questions. The researchers then followed the process of coding the data. In this step, the qualitative data was organized into groups with "codes", which reflect in a short phrase or word a meaning pattern that appears to be related to the research questions. The final step in the thematic analysis was the process of linking the various themes to develop a logical explanation (or theory) for the phenomenon under study and linking it to the existing literature.<sup>15</sup>

Based on the thematic content analysis that took place, six themes emerged with the following titles: "Medical Services", "Supportive Environment", "Psychophysical Effects", "Image

for the Child", "Sources of Stress" and "Defense Mechanisms".

## RESULTS

The case study concerns a family, member which suffers from a chronic illness. To protect personal data and maintain the anonymity of the child and family, the child will be referred to as "X".

This is a family of five, who live in a town one hour away from the capital of Greece. The 52-year-old father is a furniture dealer, and he works as a freelancer, but he is also involved in agricultural and livestock work and has a secondary educational level. The 45-year-old mother is a healthcare professional, working in the public sector, with a tertiary educational level. There is a 23-year-old university graduate brother and a 21-year-old student sister who lives in another city. The family's income is of a medium level and no member has any health problems, except for X.

X was born with the cesarean section method, due to disproportion, developed hypoglycemia, jaundice, and tremors, and was hospitalized in an incubator for twenty days. His height and head circumference were above the upper limit of normal, he was immediately diagnosed with the syndrome due to the phenotype and confirmed by molecular genetic testing. The parents underwent the same test, but it was not found that they are carriers of the syndrome, so it was a *de novo* mutation.

X was diagnosed at birth with a single kidney and bladder diverticulum. He was hospitalized when he was 2 years old for a urinary tract infection and for some time he was taking antibiotics for chemoprophylaxis. He is monitored annually by a nephrologist, and his blood pressure is measured frequently. It is noted that from the age of 7, when elementary school started, until the age of 14, the child presented nocturia.

X has camptodactyly and flat feet and walked for the first time after 18 months of birth with the help of a physiotherapist. His gait is characterized as peculiar and his bone age is advanced, while he exhibits a laxity in the joints. He has a long, prominent forehead, a long chin, an elongated skull, and hyperpigmentation of the skin.

He is monitored annually by a cardiologist, too. His heart function is normal, but he has a thickening at the apex of the heart.

Brain MRI showed dilatation in the lateral ventricles without increased intracranial pressure. He has poor dentition and is monitored by an orthodontist, while he has astigmatism, hypermetropia, and optic nerve damage and is

monitored twice a year by an ophthalmologist. X suffers from chronic ear infections. He has hearing loss, he was operated on to remove a cholesteatoma at the age of 16, while three more related surgeries are expected to be performed.

From the age of 2.5, X attended occupational therapy courses to improve gross and fine motor skills, and from the age of 3, speech therapy courses to manage speech delay and the correct articulation of words, which has been completed since last year. He is now being monitored weekly by a psychologist.

In terms of mental development, X is moderately mentally retarded, with an IQ of 42 and a total disability of 80%, while he has a very high emotional intelligence. He has a strong attachment to his mother because she is his main caregiver, while in the early years when he was hyperactive and aggressive, there were difficulties mainly in the relationship with his older brother and father, who could not accept his condition. Now relations have normalized. His relationship with his sister has always been good. According to the opinion of the Health Evaluation Committee, X should attend a special school after kindergarten, but the family, with the support of his therapists and the child psychiatrist who was attending him at the time, fought for him to attend a mainstream school, because they believed that he can succeed and just attended kindergarten for 3 years. In primary school, X was a fairly good student, but with difficulties especially in mathematics. But as the level of difficulty increased in Middle School and High School, his performance decreased. X is currently attending the 3rd grade of the General High School, with parallel support. He decided to continue his education at the General High School in order not to be separated from his friends.

X performs poorly in school, but he tries. His written language is poor, but he is fluent in spoken language. He has an excellent memory of locations, roads, and license plates. At times he is obsessed with various topics that he wants to talk about constantly. X is very sociable and accepted by his environment and receives positive reinforcement from everyone. He is generally a happy child. He loves basketball and dreams about his future.

Based on the thematic analysis carried out, a series of themes emerged, related to the stress levels experienced by the patient with Sotos syndrome and his father.

As far as medical visits are concerned, there is a different approach between the two participants. The child considers the doctors his friends and refers positively to them: *"I go to my friend P. who*

helps me to speak better...I tell him what worries me", "about the eyes, to my friend G.", "A month ago I went to a cardiologist, who helps me play basketball, I still go to my friend T. who tells me to wear the armband " and "I am pleased about going to the doctors because they treat me well". The father, on the other hand, has a negative attitude in his reports: "as far as we've run all this time, it's not the best" and "we run too often to different doctors".

The supportive environment, such as his coach, family, and school, plays an important role in the child's life: "my basketball coach, who encourages me to continue what I'm doing", "my principal, my teachers, my parents, my siblings, and my friends support me a lot". Regarding whether there are people with whom he can share his fears and worries, the father states that "this is a difficult part", "for the other person to understand you, he should live a similar situation", "the most important people are my own family". He doesn't think that a psychologist can help him, "I have visited a psychologist, but I don't think this really helps", while he acknowledges that he got strength from a geneticist at the Children's Hospital, "she guided us and gave us courage" and he considers the support of the church to be an important help, "the priest gave us extraordinary strength and helped us endure all that we go through from time to time with the child".

Regarding the psychosomatic effects, the child feels the urge to urinate when stressed, but treats it with humor "And you know what I'm suffering from? I feel like going to pee". The father shows symptoms of an anxiety disorder, as he mentions a lack of concentration, headaches, and fatigue "in the past I felt various things, headaches, fatigue, I was restless, I could not concentrate, I had difficulty sleeping because I was constantly thinking about the child", while he states "The sleep difficulty continues and maybe I have a little problem with concentration".

X's self-image is impressive because he does not consider himself to be essentially different from his peers. According to him, his difference lies in the following: "You know, one of my kidneys doesn't work", "I am taller, the others are shorter", and "my arms are longer than others", while he feels confident and he feels he's a cool kid "Yes, I'm handsome and I'm a multi-tool". The father also sees the child positively stating "he is in a mild form, because there are much worse forms, like the ones we met at the association in Athens, and this satisfies us, that is he suffers from a mild form" and also "But X is a smart kid".

Sources of stress for the child come from school tests, news about the coronavirus, his father and brother. Indicatively, he mentions that he feels anxious "when we are asked to write tests at school all the time", and "Yes, in the news for example, 800 people die every day", he refers to incidents of intense anxiety when his father calls him to do things he does not want to "What are we going to do to the sheep, get dirty?" and is bothered by his brother "my brother bothers me...he keeps teasing me". During the interview, he expressed his anxiety "Oh my God I'm worried", and "I'm a little scared", but he wanted to continue and said laughingly "No, I'm completely fine". The father mentions uncertainty and fears about the future sources of anxiety: "We knew the child would be born with something, but we didn't know what", "I used to think about how the child would develop", "The situation is difficult because of the uncertainty", "There must be a background behind, capable of helping him. At the moment this background exists, it's his family". He believes that the social environment does not treat disability positively "They don't have the culture and knowledge to do it. In fact, I have mainly faced contempt", while he points out that the state does not respond to the medical, psychosocial and emotional needs of the child, "There are too many problems, the governmental organization is poor", "The state can give money, but there are no people, neither in terms of humanity nor in terms of professional training, who use it properly", while he adds that "The state doesn't want the progress of those children, they constantly put up obstacles. This is all very depressing. We are constantly fighting, but we are already tired".

Finally, the defense mechanism used by both participants is the non-awareness of stress in everyday life. In addition, the child is in denial about the syndrome. When asked if he has heard about Sotos syndrome during medical visits or if he would like to know, the answer is a persistent denial. In his life he does not feel that he has been stressed "I am fine" and he has sources of pleasure, "It makes me happy when I go to the church and sing", and "When I am in a basketball team and play basketball". Although the father mentioned that he continues to have difficulties sleeping and concentrating, he claims "At the moment I am not worried about the child, because I know what I can give him in terms of health", "Now the stress levels are lower because we know what to wait for, while at first, when we didn't know, the anxiety was huge".

## DISCUSSION

The main conclusion that emerges after the interview with X and his father is that both of them are used to living their daily lives based on the Sotos syndrome. The analysis of the results confirms that both the patient and his family member experience stress.

From X's point of view, frequent visits to doctors are something that does not stress him, as he believes that everyone wants his best. He uses various strategies to manage negative emotional load, such as playing basketball. Physical activity is extremely important for his health promotion and disease prevention and for promoting positive mental health, including improvements in mood and self-esteem.<sup>16</sup> He also feels really good when he sings and is in church. Adaptation to chronic illness increases in direct relation to an increased level of mental well-being among people with chronic illnesses.<sup>17</sup> To promote psychological adjustment, patients must remain as active as possible and allowed to express their emotions and take control of their lives. And by using these strategies they have the best chance of successfully adjusting to the challenges posed by a chronic illness.<sup>18</sup> He also considers that his family is the one that supports him. The family is the core of society and provides not only material support but also spiritual and emotional support.<sup>19</sup> The only thing that stress him out are tests at school and his father's will to do things that he doesn't like. He generally lives an ordinary life and feels good about himself, but he refuses to know what the syndrome is that he often hears that he has. Young people living with chronic illnesses generally see themselves and their lives in the same way, like their healthy peers,<sup>20</sup> while at the same time find it difficult to accept an illness due to their unique developmental needs.<sup>21</sup>

From the father's point of view, there is a bit more stress and fatigue in terms of medical appointments combined with inconvenience and lack of organization from the state. There is also anxiety about the child's future as he realizes that he and his wife (the parents) will not be there for him forever. According to recent research, parents of children with mental retardation experience increased psychological distress and lower quality of life.<sup>22</sup> The severity of the disability is associated with higher levels of parental depressive symptoms, as increased severity can lead to a range of behavioral problems and demands on caregivers.<sup>23</sup> Furthermore, he considers that the only support he receives is from his own family and his faith in God. Positive

religious coping is suggested to have a positive impact on his mental health.<sup>24</sup> Parental stress decreases as the child grows and develops skills. Therefore, the main findings show greater levels of parental stress relative to child stress levels. However, there are no studies that have as their object the study of stress in families with children with Sotos syndrome and for this further research is suggested.

**Conflicts of Interest:** The author declares no conflicts of interest regarding the publication of this paper.

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