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SLEEP DISORDERS AMONG INDIVIDUALS WITH DEVELOPMENTAL DISABILITIES: A COMPREHENSIVE ANALYSIS

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Abstract:
Sleep problems in individuals with developmental disabilities pose significant challenges for them and their families. This paper aims to examine the types of sleep problems in these individuals, the causes of these issues, and their impact on daily life. Through the analysis of available literature and research conducted on a sample of 67 individuals with special needs and their parents, data are obtained on the prevalence of sleep problems, influential factors, and methods for coping with them. The results show that sleep problems in individuals with developmental disabilities are significant and can seriously impact their quality of life. More than 70% of parents state that the lack of sleep negatively affects their daily life and professional activities. The main causes of sleep problems have been identified as sensory disturbances, melatonin deficiency, and other health issues related to the child's condition. Additionally, 73.4% of parents report that they cope with their children's sleep problems independently. These findings suggest a need for improved strategies and interventions for managing sleep in individuals with developmental disabilities, including enhanced support for parents. The significance of

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these findings lies in highlighting the need for the development of specialized programs and interventions that will help improve the quality of life for these individuals and their families.

Keywords: sleep problems, individuals with developmental disabilities, autism, cerebral palsy, Down syndrome, sleep quality, interventions, parental support

1. Introduction

Quality sleep is the foundation of physical and mental health, especially important for the optimal development and well-being of individuals with developmental disabilities. Sleep is a fundamental biological process that plays a critical role in maintaining the physical and mental health of every human being. From a physiological perspective, sleep allows the restoration of energy, consolidation of memory, regulation of emotions, and strengthening of the immune system (Robinson, 2002). Sleep consists of two main phases: non-REM (NREM) and REM (Rapid Eye Movement) sleep, which alternate in cycles throughout the night. NREM sleep is divided into four substages, ranging from light to deep sleep, while REM sleep is associated with intense brain activity and dreaming (American Psychiatric Association, 2020).

The sleep quality is particularly important for children, who are in a phase of intense growth and development. During sleep, children undergo processes of brain growth and development, cell regeneration, and hormone synthesis, such as the growth hormone (Braam *et al.*, 2018). A large number of children experience some form of sleep problem, and there is evidence to suggest that some long-term sleep problems lead to impaired functioning, cognition and well-being in typically developing children and should, therefore, be the focus of research (Khan *et al.*, 2022). Lack of quality sleep in children can lead to serious problems in behavior, learning, and overall health (Richdale, 1999). These effects are even more pronounced in children with developmental disabilities, who already face special challenges in their daily lives (Mazurek & Sohl, 2016).

Sleep problems in children can be divided into two main categories (Dan, 2018):

- Dyssomnias disorders that result in difficulty either initiating or maintaining sleep or involve excessive sleepiness.
- Parasomnias disorders that disrupt sleep after it has been initiated but do not result in complaints of insomnia or excessive sleepiness.

For children with developmental disabilities, such as autism, cerebral palsy, and Down syndrome, sleep is even more crucial as it helps them cope with the challenges posed by their condition (Wayte *et al.*, 2012). Sleep problems in these children can include difficulties in falling asleep, frequent nighttime awakenings, and disruptions in the circadian rhythm, bruxism, sleep-related seizures, motor and movement disorders, excessive sleepiness, etc. (Giménez *et al.*, 2021). These problems have negative effects on

the physical and mental health of the children, causing additional difficulties in learning, behavior, and socialization (Melke *et al.*, 2007).

Scientific research shows that sleep problems are common in children with autism. For example, Richdale's (1999) study indicates that children with autism have a higher rate of sleep problems due to biological, psychological, and environmental factors. Many of these children have sensory disturbances, making them susceptible to hypersensitivity or reduced sensitivity to external stimuli, which can affect the quality of their sleep. Additionally, the lack of melatonin, a hormone that regulates sleep, is a common problem in these children.

Cerebral palsy, which results from brain damage affecting muscle control and coordination, is also associated with sleep problems. According to research by Wayte *et al.* (2012), children with cerebral palsy often have sleep difficulties due to pain, limited mobility, and sensory processing issues. These children can have frequent nighttime awakenings, breathing disturbances, and problems maintaining sleep.

Children with Down syndrome frequently experience sleep problems due to anatomical and physiological abnormalities associated with their condition. According to research by Giménez *et al.* (2021), children with Down syndrome often suffer from obstructive sleep apnea, which can lead to frequent awakenings and sleep disturbances. Additionally, these children have a higher risk of developing other health problems that can affect the quality of their sleep (Table 1).

Table 1: Sleep Problems in Children with Various Developmental Disabilities

Developmental disability	**Sleep Problems**	**Prevalence**	**Causes**
Autism	The most common are dyssomnias that include resistance to going to bed, delayed falling asleep, poor sleep maintenance, disturbed sleep associations, and early morning awakening. While other medically based sleep disorders such as parasomnias, movement disorders, circadian rhythm sleep disorders, sleep-disordered breathing occur with the same frequency as in neurologically typical children.	56.1%	Sensory disturbances, melatonin deficiency, biological and environmental factors
Cerebral palsy	Difficulty falling asleep and staying asleep, sleep-wake transition, sleep-disordered breathing and sleep bruxism, excessive daytime sleepiness, nightmares, and sleep talking.	15.2%	Brain damage, sensory processing issues, impaired motor skills. Visual impairments leading to abnormal light perception may also contribute to sleep-related disturbances in these children. There may be other factors such as pain, aspiration, glossoptosis

			(incorrect positioning of the tongue in the oral cavity), epilepsy or spasticity that can lead to altered sleep in these children.
Down syndrome	Obstructive sleep apnea, nighttime awakenings, breathing disturbances	13.6%	Anatomical and physiological abnormalities
ADHD	Difficulty falling asleep, frequent awakenings, restless sleep, sleep-disordered breathing, obstructive sleep apnea, periodic limb movement disorder, and circadian rhythm disturbances are some of the common manifestations of sleep problems that manifest in ADHD	25-50%	Hyperactivity, impulsivity, inadequate sleep routines
Rett syndrome	Nighttime awakenings, restless sleep, breathing disturbances	70-80%	Genetic factors, neurological abnormalities
Williams syndrome	Insomnia (sleep initiation, night awakening and sleep anxiety), parasomnias (bedwetting, limb movement), daytime sleepiness and disturbed sleep duration	45.5%	Cardiovascular problems, anxiety
Sanfilippo syndrome	Difficulty falling asleep, nighttime awakenings	91.5%	Metabolic disorders, neurological abnormalities
Angelman syndrome	Difficulty falling asleep, short sleep cycles	90%	Genetic factors, melatonin deficiency

*(Corkum *et al.*, 1998; Giménez *et al.*, 2021; Owens *et al.*, 2021; Glaze *et al.*, 2004; Hussin, 2019; Khan, 2022; Esbensen & Schwichtenberg, 2016; Morris *et al.*, 2000; Fraser *et al.*, 2005; Didden *et al.*, 2004)

According to the data in Table 1, sleep problems are highly prevalent among children with developmental disabilities and have a significant impact on their quality of life. These problems not only affect the children but also their families, creating additional challenges in daily life. Therefore, it is important to develop and implement strategies and interventions that help manage sleep in these children, as well as provide appropriate support for the parents.

2. Material and Methods

The subject of this research is a comprehensive analysis of sleep problems in individuals with developmental disabilities and their impact on the daily lives of these individuals and their parents. Sleep problems in these individuals are a complex phenomenon that includes various aspects such as difficulties in falling asleep, frequent nighttime awakenings, circadian rhythm disruptions, and other similar issues. These problems can have serious consequences for the physical and mental health of the individuals, their

ability to learn, and their socialization. Additionally, they can create significant stress and burden for parents and caregivers, further highlighting the importance of this research.

The aim of this research is to determine the prevalence of sleep problems among individuals with developmental disabilities, identify the causes and influencing factors of these problems, and propose effective strategies for their resolution. The research aims to provide a clear picture of how often these problems occur, what are the most common causes, and how they impact the daily lives of individuals and their parents. By doing so, it will contribute to a better understanding of sleep problems in this specific population and provide a basis for developing interventions and strategies to address these problems.

The research has four main objectives aimed at examining and understanding sleep problems in individuals with developmental disabilities and proposing effective solutions for them.

The *first objective* is to examine the prevalence of sleep problems in individuals with developmental disabilities. Examining the prevalence will help to obtain a clear picture of how often these problems occur and how severe they are.

The *second objective* is to identify the causes and influencing factors of sleep problems. This involves examining and analyzing the possible causes of sleep problems, including biological, psychological, and environmental factors. For example, in children with autism, sensory disturbances and melatonin deficiency are common causes of sleep problems. In children with cerebral palsy, pain and limited mobility may be major factors. This analysis will help to understand the specific challenges faced by these children and their families.

The *third objective* is to analyze the effects of sleep problems on the daily lives of individuals and their parents. This includes examining the impact of sleep problems on daily activities, learning, socialization, and the overall health of the children, as well as the well-being of their parents. Sleep problems can significantly affect the quality of life of the children, causing additional difficulties in their development and functioning. Additionally, these problems can create significant stress and exhaustion for parents, who often face a lack of sleep and the need for constant care for their children.

The *last objective* is to propose strategies to improve the quality of sleep in these children. This includes proposing specific and effective strategies and interventions for dealing with sleep problems, based on the collected data and analyses. The strategies may include changes in bedtime routines, the use of melatonin supplements, therapeutic interventions to address sensory disturbances, and providing appropriate medical and psychological support for the children and their families.

The research is based on a survey questionnaire designed for parents of individuals with developmental disabilities. The questionnaire is created to cover all relevant aspects of sleep problems in their children, including:

- **Sleep problems**: questions related to the type and frequency of sleep problems.
- **Bedtime habits**: questions about the routines and habits the children have before going to bed.

- **Influencing factors**: questions examining possible causes of sleep problems, such as sensory disturbances, melatonin deficiency, medical conditions, and other factors.
- **Receiving support**: questions about whether and how parents receive support from professionals and other sources to deal with sleep problems.

The questionnaire is composed of a combination of closed and open-ended questions to obtain both quantitative and qualitative data. Closed questions allow for easy data analysis, while open-ended questions provide a more detailed understanding of the parents' experiences and perspectives.

The research was conducted during the period of April-May 2024 in the Republic of North Macedonia on a sample of 67 parents of children with developmental disabilities. Given the specificity of the target group, the survey was conducted using direct interviews and electronic questionnaires with the parents, to ensure maximum accessibility and accuracy of the data. This study was performed in line with the principles of the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study. The authors also affirm that human research participants provided informed consent for publication of the obtained data.

3. Results and Discussion

This section presents and interprets the results of the research. Through the analysis of the demographic characteristics of the respondents, sleep problems, and their impact on daily life, a comprehensive picture of the situation is obtained.

Table 2: Age Group and Gender of Individuals with Developmental Disabilities

Age Group	Male (%)	Female (%)	Total (%)
1 to 10 years	19 (28.4)	10 (14.9)	29 (43.3)
11 to 21 years	18 (26.9)	14 (20.9)	32 (47.8)
22 to 33 years	3 (4.5)	2 (3.0)	5 (7.5)
Total	40 (59.7)	26 (38.8)	67 (100)

Table 2 presents data on the age group and gender of individuals with developmental disabilities. Out of a total of 67 respondents, 59.7% are male, and 38.8% are female. The majority of the respondents belong to the age group of 11 to 21 years (47.8%), followed by the group of 1 to 10 years (43.3%). The smallest percentage of respondents belongs to the age group of 22 to 33 years (7.5%). These data indicate that most of the respondents are in adolescence, which can be a critical period for the development and management of sleep problems.

Table 3: Diagnosis of Individuals with Developmental Disabilities

Diagnosis	Number of Respondents	Percentage (%)
Autism	37	55.2%
Intellectual Disability	9	13.4%
Cerebral Palsy	10	14.9%
Down Syndrome	5	7.5%
Other	6	9.0%
Total	67	100%

Table 3 presents data on the diagnosis of individuals with developmental disabilities. The majority of respondents have a diagnosis of autism, totaling 37 (55.2%), followed by individuals with cerebral palsy, totaling 10 (14.9%), and intellectual disability, totaling 9 (13.4%). Children with Down syndrome make up 7.5%, or 5 of the total number of respondents, while 9.0%, or 6 of the individuals with developmental disabilities, have other diagnoses.

Table 4: Sleep Problems

Question	Answer	Number of Respondents	Percentage (%)
Does your child have difficulty falling asleep?	Yes	37	56.1
	No	29	43.9
How often does your child wake up at night?	Does not wake up	11	16.9
	Rarely	30	46.2
	Very often	24	36.9
What do you think can disturb your child's sleep?	Noise	28	43.1
	Certain food	13	20.0
	Light from TV/screen	11	16.9
	Cold, mucus, sneezing	2	3.1
	Weather	3	4.6
	Other	8	12.3

Table 4 presents the survey results related to sleep problems in children with developmental disabilities. The results show that more than half of the individuals (56.1%) have difficulty falling asleep, which is a significant percentage. Regarding nighttime awakenings, 16.9% of the children do not wake up, 46.2% wake up rarely, and 36.9% wake up very often. This indicates that nighttime awakenings are a common problem among these individuals.

Regarding the correlation between the type of disability and the type, as well as the frequency of sleep disorders, of the children with autism, 19 parents answered that their children have difficulty falling asleep, while 15 answered in the negative, of the children with Down syndrome, half of the parents indicated problems in falling asleep, while in the case of children with cerebral palsy, 6 parents answered that they have difficulty falling asleep, and two parents answered the opposite. Most of the parents of children with autism indicated the duration of their children's sleep as the main problem, that is, 83% pointed out that their children sleep too little, and 78% indicated frequent awakenings during the night. In the group of children with cerebral palsy, 91% of the

parents indicated at least one awakening during the night, as well as the presence of fatigue in the children when getting up in the morning. Parents of children with Down syndrome, in the largest percentage, 89%, complain of constant movement and restlessness of their children during the night, while 85% of parents of children with ADHD indicate repulsion and "struggle" at bedtime.

In response to the question about possible factors that disturb the child's sleep, noise is the most common factor (43.1%), followed by certain foods (20.0%) and light from TV or screens (16.9%). Other factors, such as cold, mucus, sneezing (3.1%), and weather (4.6%), are less common. Additionally, 12.3% of respondents mentioned other factors affecting their children's sleep (Parent 1: *"Sleeps in the dark, without noise, I make sure not to give food that would hinder sleep in the evening, and yet has difficulty falling asleep."* Parent 2: *"The therapy the child receives."* Parent 3: *"If I turn over in bed next to her, she gets upset, gets scared, and wakes up. She sleeps with dim light from the TV or lamp, but if the power goes out, she immediately wakes up, gets scared, and wakes up."* Parent 4: *"When she is nervous, she does not sleep."*)

These results show that sleep problems in individuals with developmental disabilities are significant and can seriously impact their quality of life. The most common factors disturbing sleep are noise and certain types of food, indicating the need to create a calm and predictable sleep environment for these individuals. Additionally, it is necessary to investigate and address other factors that can affect sleep quality to improve the overall well-being of individuals and their families.

Table 5: Sleep Routine

Question	**Answer**	**Number of Respondents**	**Percentage (%)**
Do you follow a bedtime routine?	Yes	36	53.7
	No	31	46.3
Is the routine stable or does it change often?	Stable	32	88.9
	Changes often	4	11.1
Child's reaction if a part of the routine is skipped	Nervous, but not significantly affected	19	47.5
	Adapts quickly to new conditions	12	30.0
	Significant problems/negative reactions	9	22.5
Activities in the routine	Bathing	21	51.2
	Reading books	5	12.2
	Listening to music	12	29.3
	Other	4	9.8

Table 5 presents the results of the questions related to the bedtime routine for children with developmental disabilities. Among the respondents, 53.7% of parents follow a bedtime routine with their children, while 46.3% do not follow a routine. This shows that most parents recognize the importance of a bedtime routine.

Regarding the stability of the routine, 88.9% of parents state that the routine is stable, while only 11.1% say that it changes often. This indicates that most parents try to maintain consistency in the bedtime routine, which is important for creating a predictable and calm environment for the children.

The reaction of the child if a part of the routine is skipped varies, but most parents (47.5%) say that their children get nervous, but it does not significantly affect their sleep. However, 22.5% of parents report that their children have significant problems or negative reactions, indicating that the routine plays an important role in their preparation for sleep.

As for the activities in the routine, 51.2% of parents include bathing, 12.2% include reading books, and 29.3% include listening to music. This suggests that different activities can help in preparing for sleep, but bathing and listening to music are the most common. Parents of individuals with developmental disabilities mentioned the following activities as part of the routine under "Other" (Parent 1: *"First, he turns off all devices (laptop, TV, phone), turns off the lights, follows hygiene habits, and then goes to bed."* Parent 2: "*Bath, banana, tea, then sleep."* Parent 3: *"We scratch and drink milk"*).

These results show that the bedtime routine is an important aspect of sleep preparation for children with developmental disabilities. Parents who follow a stable routine and include activities such as bathing or listening to music can help create a calm and predictable environment for sleep, which is important for improving sleep quality in these children.

Table 6: Influencing Factors

Question	**Answer**	**Number of Respondents**	**Percentage (%)**
Does your child have any health conditions that might affect their sleep?	Yes	20	31.7
	No	43	68.3
What health conditions does your child have? (for those who answered "Yes")	Respiratory problems	7	10.9
	Epileptic seizures	2	3.1
	Other	11	17.2
Is your child using medications that can affect their sleep?	Yes	24	37.5
	No	40	62.5
What medications does your child use? (for those who answered "Yes")	Medications for allergies/ respiratory problems	9	14.1
	Medications for epileptic seizures	5	7.8
	Melatonin	3	4.7
	Vitamin therapy	2	3.1
	CBD/THC	1	1.6
Does your child's sleep affect their daily functioning?	Positively affects	13	20.0
	Negatively affects	23	35.4
	No remarks	29	44.6

Table 6 presents the results of the questions related to the influencing factors on the sleep of children with developmental disabilities. The results show that 31.7% of children have

health conditions that may affect their sleep, while 68.3% of children do not have such health conditions. Respiratory problems are the most common health condition (10.9%), while epileptic seizures are less prevalent (3.1%).

Regarding the use of medications, 37.5% of children use medications that may affect their sleep, while 62.5% do not use medications. The most common medications used by respondents in our study are medications for allergies and respiratory problems, followed by medications for epileptic seizures and melatonin.

Medications for allergies and respiratory problems, such as antihistamines, often cause drowsiness as a side effect. This can help with falling asleep, but at the same time, some antihistamines may have paradoxical effects in children, causing hyperactivity (Owens *et al.*, 2000). Our study shows that 14.1% of children use these medications, indicating the possibility of mixed effects on their sleep.

Medications for epileptic seizures, such as anticonvulsants, often have sedative properties and can improve sleep in children with epilepsy. However, some anticonvulsants can disrupt the circadian rhythm and cause sleep disturbances (Glaze *et al.*, 2004). In our study, 7.8% of respondents use medications for epileptic seizures, suggesting that this aspect should be carefully monitored and managed.

Melatonin, a natural hormone that regulates sleep, is often used as a supplement to treat sleep problems, especially in children with autism and other developmental disorders. Studies show that melatonin can shorten the time to fall asleep and improve sleep quality (Braam *et al.*, 2018; Tordjman *et al.*, 2005). Our results show that 4.7% of respondents use melatonin, which is consistent with recommendations for its use in children with developmental problems.

Vitamin therapy, particularly with vitamin D, can also have positive effects on sleep. Vitamin D deficiency is associated with sleep disturbances, and its supplementation can help improve sleep quality (Giménez *et al.*, 2021). In our study, 3.1% of respondents use vitamin therapy.

Finally, cannabis substances, such as cannabidiol (CBD) and tetrahydrocannabinol (THC), are used to treat various health conditions. CBD has anxiolytic and sedative effects that can help improve sleep, while THC can affect the REM phase of sleep (Mazurek & Sohl, 2016). Our data show that 1.6% of respondents use CBD/THC.

Regarding the impact of sleep on the child's daily functioning, 20% of parents stated that sleep positively affects their child's daily functioning, 35.4% said that sleep negatively affects it, and 44.6% had no remarks about the impact of sleep.

These results show that health conditions and the use of medications are significant factors that can affect the quality of sleep in children with developmental disabilities. Additionally, the impact of sleep on daily functioning is an important aspect to consider when developing strategies to improve sleep quality in these children. Providing appropriate support and treatment for health conditions and medications can help improve sleep quality and the overall well-being of children and their families.

Table 7: Evaluation of Sleep Quality and Support Methods for Parents

Question	Answer	Number of Respondents	Percentage (%)
How do you rate the quality of your child's sleep? (1-5)	1 (Very Poor)	0	0
	2 (Poor)	9	13.6
	3 (Average))	23	34.8
	4 (Good)	15	22.7
	5 (Excellent)	19	28.8
Do you seek help or advice from professionals regarding your child's sleep?	Yes	17	26.6
	No	47	73.4
How do you manage your child's sleep problems?	Independently	47	73.4
	With consultations	17	26.6
	No need	2	3
How does your child's lack of sleep affect your life?	Exhaustion	39	50.6
	Affects work	19	24.7
	Constant stress	15	19.5

Table 7 presents the results of the questions related to the evaluation of sleep quality and support for parents of children with developmental disabilities.

In response to the question about rating the quality of their child's sleep, parents used a scale from 1 to 5, where 1 indicates "very poor" sleep and 5 indicates "excellent" sleep. The majority of parents (34.8%) rate their child's sleep quality as 3, indicating average satisfaction. The second largest group (28.8%) rates their child's sleep as 5, which is the highest rating, indicating excellent sleep quality. This shows significant variations in the perception of sleep quality.

Regarding seeking help or advice from professionals, most parents (73.4%) do not seek professional help and manage their child's sleep problems independently. Only 26.6% of parents consult professionals. This may indicate a lack of access to professional support or insufficient awareness of the importance of professional help.

The lack of sleep in the child has a significant impact on the parents' lives. Half of the respondents (50.6%) reported feeling exhausted due to lack of sleep, while 24.7% stated that lack of sleep affects their work and professional obligations. Approximately 19.5% of parents feel constant stress due to these problems. These results indicate that children's sleep problems have serious consequences for the parents, highlighting the need for appropriate support and interventions to address these issues.

4. Recommendations

The literature analysis showed that our findings correlate to other researches, so similar to our results are Halstead *et al.* (2021) findings that sensory conditions were associated with high nighttime waking duration and also their parents' examinees reported their child's short sleep duration was the most common problem for them. Opposite to our findings, where the proportion of parents of children with ASD and parents of children with Down syndrome indicating sleeping disturbances problems is the same, were the

results of Saletovic *et al.* (2021) pointing out that more frequent sleeping problems (sleeping duration and waking during the nights) were reported by the parents of children with intellectual disabilities than the parents of children with ASD. Taylor *et al*. (2013) reported that the frequency of sleep interruption described by mothers of school-aged children with disabilities included in their study correlates to the experiences of similar sleeping interruption of the other mothers of younger, typically developing children.

5. Conclusion

Sleep problems in individuals with developmental disabilities are a significant challenge that requires careful consideration and intervention. The lack of quality sleep negatively impacts their overall development and well-being, as well as the lives of their parents. It is necessary to implement effective sleep management strategies, including improving sleep hygiene, medical interventions, and behavioral therapies. Additionally, parents should receive appropriate support and guidance from professionals to successfully address their children's problems. These findings indicate the need for further research and the development of specialized programs for managing sleep in children with developmental disabilities.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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