​ **Comprehension Text: Golden Rice**

**Golden Rice** is a type of genetically modified rice that has been developed to combat vitamin A deficiency. It contains beta-carotene, which the body can convert into vitamin A. This modification gives the rice a golden-yellow color, hence the name "Golden Rice." Vitamin A deficiency is a serious health issue in many developing countries, leading to blindness and even death, especially in children.

Golden Rice was developed by scientists Ingo Potrykus and Peter Beyer in the late 1990s. The goal was to create a rice variety that could provide a sustainable and affordable source of vitamin A for populations that rely heavily on rice as a staple food. Despite its potential benefits, Golden Rice has faced controversy and opposition from various groups concerned about the safety and environmental impact of genetically modified organisms (GMOs).

**Comprehension Questions:**

1. **What is Golden Rice, and why was it developed?**
   * Answer: Golden Rice is a type of genetically modified rice developed to combat vitamin A deficiency by containing beta-carotene, which the body converts into vitamin A.
2. **Who were the scientists behind the development of Golden Rice?**
   * Answer: Scientists Ingo Potrykus and Peter Beyer developed Golden Rice in the late 1990s.
3. **What health issue does Golden Rice aim to address, and why is it important?**
   * Answer: Golden Rice aims to address vitamin A deficiency, which is important because it can lead to blindness and death, particularly in children in developing countries.
4. **Why is Golden Rice named "Golden Rice"?**
   * Answer: Golden Rice is named "Golden Rice" because it has a golden-yellow color due to the presence of beta-carotene.
5. **What are some of the concerns and controversies surrounding Golden Rice?**
   * Answer: Concerns and controversies surrounding Golden Rice include its safety and environmental impact as a genetically modified organism (GMO).

**Discussion Questions:**

1. Do you think the benefits of Golden Rice outweigh the concerns? Why or why not?
2. How do you think Golden Rice could impact the lives of people in developing countries?
3. What are some other solutions that could address vitamin A deficiency?
4. How do you feel about the use of genetically modified organisms (GMOs) in agriculture?

**Activity Instructions:**

1. **Reading**: Distribute the comprehension text to the students and give them time to read it carefully.
2. **Comprehension Questions**: Hand out the comprehension questions and have students answer them individually or in pairs.
3. **Discussion**: Facilitate a class discussion using the discussion questions. Encourage students to share their thoughts and opinions.
4. **Reflection**: Ask students to write a short reflection on what they learned about Golden Rice and their views on GMOs.

Impact of sleep disorders on executive functions in autistic children: caregiver postulates

A qualitative research design was employed, involving semi-structured interviews with caregivers of children aged 5-17 years diagnosed with ASD. Participants were recruited through local autism support groups, special education schools, and public charter schools.

Interviews focused on the types, frequency, and severity of sleep disorders, their impact on the child's behavior, academic performance, social interactions, physical health, and family dynamics, as well as the strategies used to manage these issues. Thematic analysis was used to identify key themes and patterns from the data.

Sleep disorders in this study include insomnia, sleep apnea, and night terrors, varying in frequency and severity. Sleep disturbances were found to significantly impact daily functioning, leading to behavioral issues, academic challenges, social difficulties, and physical health problems. Caregivers employed a range of coping strategies, such as medical interventions, behavioral routines, environmental modifications, dietary adjustments, and alternative therapies, with varying degrees of success. Barriers to effective management included cost, accessibility, and lack of knowledge. The need for individualized, adaptive approaches to treatment was emphasized. Sleep disorders in children with ASD have profound effects on their daily functioning and overall quality of life. Addressing these issues requires a comprehensive, individualized approach that considers the unique needs of each child. Collaboration with caregivers and regular adjustments to intervention strategies are essential for effective management. Further research should focus on larger, more diverse samples and incorporate objective sleep measures to provide a more comprehensive understanding of these challenges Autism Spectrum Disorder (ASD) and have significant implications for their daily functioning and overall quality of life.

Recent research shows that as many as 80% of autistic children experience sleep disturbances, which can worsen their symptoms and lead to various behavioral and emotional challenges (Hollway et al., 2018). A general, widespread perception is that sleep plays a crucial role for children in cognitive development, emotional regulation, stress level, and overall health. For autistic children, adequate sleep is essential for managing core symptoms of ASD in addition to the common deficits associated with inadequate sleep. Some of the ASD traits that are remarkedly influenced by sleep include social communication difficulties and repetitive behaviors. In this population, sleep disturbances are common and May manifest as trouble falling asleep, frequent night awakenings, and waking up early in the morning (Güneş et al., 2019). These disturbances can cause a series of negative consequences, affecting not only the child's daily functioning but also the overall well-being of the entire family. Several factors contribute to the high prevalence of sleep disorders in children with ASD, including sensory sensitivities, anxiety, gastrointestinal issues, and neurochemical abnormalities (Ramanujam et al., 2020; Wang et al., 2015). Moreover, the interplay between sleep disturbances and behavioral problems is complex and bidirectional; poor sleep can exacerbate behavioral issues, which in turn can further disrupt sleep as a vicious cycle. This disruption underscores the need for effective interventions and support systems to help families manage sleep issues. Addressing sleep disturbances in children with ASD requires a multifaceted approach. Medical interventions, such as the use of melatonin, have shown promise in improving sleep onset and duration (Park & Park, 2020; Tse et al., 2018).

Behavioral strategies, including the establishment of consistent bedtime routines and the use of sleep hygiene practices, are also commonly recommended (Miner et al., 2023; Moore et al., 2017). Additionally, environmental modifications, such as reducing sensory stimuli in the bedroom, can help create a conducive sleep environment (Deliens & Peigneux, 2019; Nguyen, 2022). The impact of sleep disorders extends beyond the immediate effects on the child's behavior and health. Poor sleep can strain family dynamics, increase parental stress, and reduce overall family functioning (Lawson & Little, 2017; Liu et al., 2020).

Caregivers often report feelings of exhaustion and helplessness, which can affect their ability to effectively support their child (Haimovich et al., 2022). Understanding these broader impacts is crucial for developing comprehensive support systems that address the needs of both the child and the family. Recent research has begun to elucidate the neurobiological underpinnings of sleep disturbances in children with ASD. In animals, some have identified specific genetic and neural circuit disruptions that may contribute to fragmented sleep and associated cognitive deficit. These findings hold potential for the development of targeted treatments that address the root causes of sleep problems in this population.

Despite the growing body of research on sleep disturbances in children with ASD, significant gaps remain. Many studies have focused on quantitative measures, such as sleep duration and frequency of awakenings, without fully capturing the lived experiences of children and their families; this is where caregiver accounts come into play. Qualitative research offers valuable insights into the subjective impact of sleep disorders, such as their effects on daily routines, social interactions, and emotional well-being. This study aims to bridge this gap by using a qualitative approach to examine the impact of sleep disorders on the daily functioning of children with ASD. Through in-depth interviews with caregivers, this study seeks to gain a comprehensive understanding of the challenges and coping strategies related to sleep disturbances. This approach enables a detailed and nuanced examination of the experiences of families navigating the challenges of sleep issues within the context of ASD.

**Study design, methods, and participants**

This qualitative research aims to explore the impact of sleep disorders on daily functioning in children with Autism Spectrum Disorder (ASD). The study employs a phenomenological approach to gain an in-depth understanding of the lived experiences of children with ASD and their caregivers regarding sleep disorders and their effects on daily activities. Participants were selected through purposive sampling to ensure a diverse range of experiences related to sleep disorders in children with ASD. Aged 4-12 years and an ASD diagnosis are the criteria. Presence of reported sleep disorders, as indicated by caregivers. The sample size was determined based on the principle of theoretical saturation, where no new themes emerged from the data.

Interview data collection was conducted through interviews with the caregivers of children with ASD. An interview guide was developed to ensure consistency while allowing flexibility to explore relevant topics in-depth. The guide included open-ended questions about:

- The nature and severity of sleep disorders experienced by the child.

- The impact of sleep disorders on the child’s daily functioning, including behavior, learning, and social interactions. Coping strategies and interventions used by caregivers to manage sleep issues.

The perceived effectiveness of these interventions. Any additional challenges faced due to sleep disorders. Interviews were conducted in a quiet and comfortable setting, either in-person or via video call, depending on the participant’s preference. Each interview lasted approximately 60-90 minutes and was audio-recorded with the participant’s consent.

**Data Analysis**

Data analysis followed the principles of thematic analysis, as outlined by Braun and Clarke (2006). Transcriptions of the interviews were read multiple times to gain a deep understanding and interpretation of the data.

**Searching for Themes**

Codes were grouped into potential themes by identifying patterns and relationships among them. Reviewing Themes: Themes were reviewed and refined to ensure they accurately represented the data and were distinct from each other. Defining and Naming Themes: Each theme was defined clearly, and sub-themes were identified where necessary. Producing the Report: A coherent narrative was developed around the themes, supported by direct quotes from the interviews to illustrate key points.

To further support the findings of this study, the caretakers of the children were invited to review any of the information to ensure that their perceptions were accurately interpreted, and direct quotes were

**Member Convention**

Participants were invited to review the preliminary findings to confirm that their experiences were accurately represented. Peer Debriefing: The analysis process was discussed with peers and experts in the field to ensure the validity of the themes. Triangulation: Data were compared with existing literature on sleep disorders in children with ASD to enhance the robustness of the findings.

**Findings and Results**

The study included a total of 17 children, aged 5-18 years, with Autism Spectrum Disorder (ASD) who were experiencing sleep disorders. 28 caregivers (aged 33-60) participated (some children had more than one). 21 caregivers (75%) were the biological mother and the other 25% were biological fathers and grandparents. The participants were found in support groups, special education school, and public charter schools with pull-in/push-out services. 12 of the children were male and five were female.

Results of qualitative analysis

**Environmental Modifications**

Darkening the room, noise reduction, comfortable bedding.

**Dietary Adjustments**

Limiting caffeine, evening snacks, balanced diet

**Alternative Therapies**

Melatonin, aromatherapy, weighted blankets

**Professional Support**

Sleep specialists, therapists, support groups, parental self-care support networks, Stress management, education on sleep disorders

**Duration of Sleep Disturbances**

The duration of sleep issues included hours of wakefulness, multiple awakenings, and difficulty falling asleep. "He can be up for hours at night, but just as he starts to settle, he wakes up again," described one parent. Absolute sleep time was used (in hours) alongside relative sleep times.

**Nature and severity of sleep disorder**

Historically, it has been known that children with ASD experienced a range of sleep disorders, including insomnia, sleep apnea, and night terrors. These issues varied in frequency, duration, and severity, with factors such as sensory sensitivities, anxiety, and medications playing significant roles. This aligns with previous research, which also identified a high prevalence of sleep disturbances in children with ASD (Galli et al., 2022; Krakowiak et al., 2012).

The severity of sleep problems ranged from mild to severe. One caregiver explained, "there are nights when he falls asleep in 30 minutes, and there are nights when he gets no sleep at all." The severity of sleep levels was not formally quantified, as they were categorized as mild, moderate, and severe; quantification of this variable would be beneficial in addition to the qualification grouping.

Various factors influenced sleep, such as sensory sensitivities, anxiety, and medications. "His anxiety spikes at night, and the slightest noise can wake him up," said a caregiver.

**Impact on Daily Functioning Behavioral Changes**

Sleep disorders significantly affect daily functioning of children with ASD. Behavioral changes such as increased irritability and hyperactivity, academic challenges, social interaction difficulties, and physical health issues were common. These findings are consistent with existing literature that highlights Foster Psychological Research in Individuals with Exceptional Needs 2:3 (2024) 21-28 26 E-ISSN: 3060-6713 the broad impact of poor sleep on the emotional and behavioral regulation in children with ASD (May et al., 2013; Wang et al., 2021). Based on study results, sleep disorders have a strong correlation with increased irritability, aggression, and hyperactivity in children. One caretake has observed a clear pattern: "Lack of sleep makes him so irritable that he often lashes out at his siblings; he does not display this behavior when he gets enough sleep.”

**Academic Performance**

Children’s academic performance was negatively impacted by concentration issues, declining grades, and higher rates of absenteeism. One caretaker noted, "he misses a lot of school because he's too tired to get out of bed."

**Social Interactions**

Sleep issues impacted social interactions, causing withdrawal, difficulty with peer relationships, and social anxiety. "He avoids playing with other kids because he’s too tired and cranky," noted a caregiver.

**Physical Health**

Poor sleep affected physical health, leading to fatigue, headaches, and a weakened immune system. One parent observed, "He’s always tired and seems to catch every cold going around."

**Family Dynamics**

Sleep disorders disrupted family dynamics, increasing stress and disrupting routines, which also impacted siblings. "Our entire family is stressed and exhausted because his sleep issues affect everyone," explained a caregiver.

**Emotional Well-being**

The emotional well-being of children was impacted, with increased anxiety, mood swings, and depression. A parent shared, "His mood swings are so severe when he doesn’t sleep well, and it breaks my heart."

**Coping strategies and interventions**

Families have turned to prescription medications and over-the-counter supplements as an attempt to increase sleep. One caregiver mentioned, "melatonin occasionally helps, but we've also resorted to prescription sleep aids." Behavioral approaches included consistent bedtime routines, positive reinforcement, and relaxation methods. "We maintain a strict bedtime routine with calming activities, which sometimes aids in better sleep," a parent shared.

Alternative therapies such as melatonin, aromatherapy, and weighted blankets have been tried by caretakers. "A weighted blanket has been a game-changer for him; it really helps him feel secure," said one caregiver. Professional Support: Sleep specialists, therapists, and support groups were sought for professional guidance. "We’ve seen a sleep specialist, and the advice has been invaluable," shared a parent.

**Environmental Modifications**

Changes to the sleep environment included darkening the room, noise reduction, and comfortable bedding. "We made his room completely dark and quiet, and it seems to help a bit," mentioned a caregiver.

Adjustments included limiting caffeine, providing evening snacks, and maintaining a balanced diet. "We cut out all sugary snacks in the evening, which has made a noticeable difference," explained a parent.

**Successes and challenges of interventions**

Some families reported improved sleep quality, enhanced daily functioning, and reduced stress. "After trying various strategies, we finally found a routine that works for us," shared a relieved parent. Conversely, many families faced inconsistent results, resistance to change, and side effects from interventions. "Even with medication, some nights are still a struggle, and it’s hard to find a lasting solution," explained a caregiver.

**Barriers to Implementation**

Barriers such as cost, accessibility, and lack of knowledge hindered effective intervention. "The cost of some treatments is prohibitive, and it’s difficult to access specialized care," mentioned one parent. Adaptation over Time: Families described evolving strategies, long-term management, and changing needs over time. "What worked last year doesn’t work now, so we’re constantly adapting," noted a caregiver. Recommendations for Other Parents: Participants shared their experiences, practical advice, and encouragement for other parents. "Sharing our experiences with other parents has been incredibly helpful and reassuring," said a participant.

**Discussion and Conclusion**

This study aimed to explore the impact of sleep disorders on daily functioning in children with Autism Spectrum Disorder (ASD) through qualitative interviews with caregivers. The findings highlighted several key variables: nature and severity of sleep disorders, their impact on daily functioning, coping strategies and interventions, and the effectiveness and challenges of these interventions.

Coping Strategies and Interventions: Caregivers employed various strategies to manage sleep issues, including medical interventions (e.g., melatonin), behavioral strategies (e.g., bedtime routines), environmental modifications, dietary adjustments, and alternative therapies. Professional support from sleep specialists and therapists was also sought. These strategies reflect those commonly recommended in the literature for managing sleep problems in children with ASD (Moore et al., 2017; Park & Park, 2020).

Effectiveness and Challenges of Interventions: The effectiveness of interventions varied, with some families reporting significant improvements while others faced ongoing challenges. Barriers such as cost, accessibility, and lack of knowledge were common. The need for personalized and adaptive strategies was emphasized, mirroring findings from previous studies that highlight the complexity of treating sleep disorders in this population (Liu et al., 2020; Ramanujam et al., 2020). The prevalence and variety of sleep disorders in children with ASD can be attributed to multiple interacting factors. Sensory sensitivities and heightened anxiety levels, common in ASD, contribute significantly to sleep disturbances (Haimovich et al., 2022). These children often have difficulty calming down and maintaining a sleep routine due to their heightened arousal states, as supported by Arazi et al. (2019), who noted reduced sleep pressure in young children with autism (Arazi et al., 2019). The impact of sleep disorders on daily functioning is profound. Poor sleep exacerbates the core symptoms of ASD, such as irritability, aggression, and difficulty with social interactions, which can create a vicious cycle of behavioral problems and further sleep disturbances (Veatch et al., 2015; Wang et al., 2022). The link between sleep problems and academic performance is also well documented, with children experiencing sleep issues showing poorer concentration and increased absenteeism (Güneş et al., 2019; Kang et al., 2020). Coping strategies reported by caregivers align with the broader literature on managing sleep disorders in ASD. Medical interventions like melatonin are commonly used and have been shown to be effective in some cases (Park & Park, 2020; Tse et al., 2022; Tse et al., 2018).

Behavioral strategies and environmental modifications are also widely recommended, as they address some of the underlying causes of sleep disturbances, such as sensory sensitivities and anxiety (Deliens & Peigneux, 2019; Moore et al., 2017). The varying effectiveness of interventions highlights the need for individualized approaches. What works for one child may not work for another, underscoring the importance of tailored interventions based on each child’s specific needs and circumstances. This need for personalized treatment plans is echoed in the literature, which emphasizes the heterogeneity of ASD and the necessity for flexible, adaptive strategies (Miner et al., 2023; Ramanujam et al., 2020). Despite the valuable insights gained from this study, several limitations must be acknowledged. The qualitative nature of the research means that the findings are not generalizable to all children with ASD. The sample size, though sufficient for qualitative analysis, is relatively small and may not capture the full spectrum of experiences. Additionally, the reliance on caregiver reports introduces potential bias, as caregivers’ perceptions and experiences may not fully represent the children's actual sleep patterns and their impacts. Future studies could benefit from incorporating objective measures of sleep, such as actigraphy or polysomnography, to complement caregiver reports and provide a more comprehensive picture. Future research should aim to address these limitations by using larger, more diverse samples and incorporating objective sleep measures. Longitudinal studies could provide valuable insights into the long-term effects of sleep disturbances and the effectiveness of various interventions over time. Additionally, exploring the genetic and neurobiological underpinnings of sleep disorders in children with ASD could lead to more targeted and effective treatments. Studies that investigate the interplay between sleep disturbances and other comorbid conditions, such as ADHD and anxiety, would also be beneficial, as these conditions often coexist and interact in complex ways (Choi, 2023; Chung, 2024).

Another important area for future research is the impact of sleep interventions on the overall well-being of families with autistic children. Understanding how improving a child’s sleep can alleviate parental stress and improve family dynamics could highlight the broader benefits of effective sleep management strategies.

Finally, examining the role of cultural and socioeconomic factors in sleep disturbances and their management could provide a more holistic understanding of these issues and inform more inclusive and equitable intervention approaches. For practitioners working with children with ASD, this study underscores the importance of addressing sleep issues as a critical component of overall treatment plans. Practitioners should adopt a holistic, individualized approach to sleep management, considering the unique sensory, emotional, and environmental factors affecting each child. Collaboration with caregivers and ensure sustained improvements (Ramanujam et al., 2020; Souders et al., 2009). Practitioners should also advocate for policies and programs that increase access to sleep-related resources and support services, particularly for families from lower socioeconomic backgrounds who may face additional barriers to effective intervention (Koo et al., 2021; Liu et al., 2020). In conclusion, sleep disorders in children with ASD have far-reaching impacts on their daily functioning and overall quality of life. By adopting a comprehensive, individualized approach to sleep management, practitioners can help mitigate these effects and support children and their families in achieving better sleep and improved well-being. Authors’ Contributions Authors contributed equally to this article. Declaration In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT. Transparency Statement Data are available for research purposes upon reasonable request to the corresponding author. Acknowledgments We would like to express our gratitude to all individuals helped us to do the project. Declaration of Interest The authors report no conflict of interest. Funding According to the authors, this article has no financial support.

**Ethics Considerations**

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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