International Journal of Scientific Multidisciplinary Research (IJSMR)
Vol.3, No.2, 2025: 329-338

# Effectiveness of the Gluten-Free Casein-Free for Reducing Behavioral Symptoms in Autism

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A R T I C L E I N F O

*Keywords:* GFCF, Autism, Compliance of Parent, Autism Behavior

*Received : 19 December*
*Revised : 16 January*
*Accepted: 23 January*



A B S T R A C T

Autism is a neurological developmental disorder that affects an individual's ability to communicate, interact socially, as well as their behavior and interests. The symptoms typically begin to appear before the child reaches the age of three, and they can vary in severity and manifestation in each individual. One type of therapy that may help reduce autistic behaviors is the gluten-free, casein-free (GFCF) diet, which involves avoiding foods that contain both gluten and casein. This study aims to examine the relationship between the implementation of the GFCF diet and the behaviors of children with autism. A cross-sectional design approach was used for this research, conducted at the Child Development Clinic, Joglo. Sampling was performed using a total sampling technique, resulting in 31 respondents who were children on the autism spectrum who had been diagnosed by expert doctors. A modified Food Frequency Questionnaire (FFQ) was used to measure the GFCF diet compliance level variable. The ICHD-10 behavior sheet questionnaire was used to measure the autistic behavior score. Based on the results of the Spearman test, a p-value of 0.045 and a correlation coefficient of -0.363 were obtained, indicating a significant relationship between the Gluten-Free Casein-Free (GFCF) diet and the behaviors of autistic children. The implementation of the GFCF diet has had an able impact on the development of autistic children, particularly in reducing autistic behaviors

DOI: https://doi.org/10.55927/ijsmr.v3i2.75
ISSN-E: 2986-5042
https://journal.formosapublisher.org/index.php/ijsmr

## INTRODUCTION

Autism, or Autism Spectrum Disorder (ASD), is a neurobehavioral developmental disorder that shows up early in life. It is marked by problems with talking and body language, being hyperactive, having trouble controlling emotions, and not being able to make eye contact or show facial expressions. As a result, children with autism often have temper tantrums and have trouble interacting with others, their peers may even avoid them (Pahlevi, Utomo, & Zubaidah, 2021). Children with autism spectrum symptoms are seen before the child reaches the age of 3 years, with a greater ratio of males than females (Hangraeni, 2012). The frequency of occurrence is increasing, and often parents realize too late that their child has an autism disorder.

## LITERATURE REVIEW

The prevalence of autism worldwide continues to increase. Data from *the Centers for Disease Control and Prevention* (CDC) shows that 1 in 44 children in the world are diagnosed with autism spectrum disorder (ASD). Meanwhile, the WHO predicts that 1 in 160 children in the world suffer from ASD (CDC, 2019). According to the Ministry of Women's Empowerment and Child Protection. There are two new cases of ASC per 1,000 population in Indonesia, which is 237.5 million, with a growth rate of 1.14%. This estimate places the number of people with ASD at approximately 2.4 million, with an annual increase of about 500. (Insani & Sinaga, 2024).

Leaky gut syndrome is a common digestive issue in individuals with autism. This illness changes the normal digestive process by stopping the production of digestive enzymes. This makes it hard for complex proteins like gluten and casein to be broken down and turned into peptides. These peptides then enter the bloodstream and can act as false transmitters by interacting with opioid receptors to disrupt various brain functions, such as perception, cognition, emotion, and behavior, resulting in effects on the brain similar to those of morphine. (Yuwono, 2009; Dewanti & Machfud, 2014).

As the diagnosis of autism has evolved, various therapies have been introduced to help improve the ability of children on the autism spectrum to live closer to normal. People most commonly use the GFCF diet for children with autism spectrum disorders. This diet involves avoiding food and drink products containing gluten and casein, where cow's milk is the main source of casein protein and wheat flour contains gluten. Studies have shown that children on the autism spectrum make significant progress after being put on this diet, including social interaction skills and catching up with normal children (Sofia et al., 2017). Other research has also shown that a GFCF diet can help. For example, it has been shown to reduce stereotypical behaviors and boost cognitive skills in kids on the autism spectrum. (Quan et al., 2022).

Common behaviors exhibited by children with autism spectrum disorder include hyperactivity, difficulty focusing, inability to sit for long periods of time, tantrums, difficulty in following instructions, acting impulsively, and difficulty in controlling emotions. These behaviors tend to increase if the child consumes foods that contain wheat flour, milk, excessive sugar, or food additives, such as food coloring and flavoring (Abidin, 2023; Siron et al., 2020).

Previous studies have shown differences between children on the GFCF diet and those not on the diet. Children who followed the GFCF diet had lower scores in terms of behavioral disorders, social interaction, communication, and cognitive responses compared to children who did not follow the GFCF diet (Izzah, Fatmaningrum, & Irawan, 2020). Another study also revealed that samples with excessive gluten consumption had a 1,636 times greater risk of developing high behavioral disorder than samples who consumed low amounts of casein (Herawati, 2010).

The Child Development Clinic Joglo is a clinic in Jakarta that provides therapy for children with autism. Data obtained from the clinic from January to December 2023 revealed an increase in the number of children with autism treated there, 31 compared to 27 in 2022. According to preliminary clinic findings, many children with autism continue to experience tantrums, hyperactivity, and unfocused and uncontrolled emotions during therapy. Based on this, it is vital to investigate the pattern of GFCF diet implementation at the Children Development Clinic, Joglo, as well as its effectiveness for reducing behavioral symptoms in autism, such as emotional stability, hyperactivity, and the ability to focus attention in children with autistic spectrum disorders.

## METHODOLOGY

The study utilized an analytic observational design and a cross-sectional method. The sample for the study was drawn from the total sampling technique, which included all 31 children on the autism spectrum who received therapy at the Child Development Clinic, Joglo. The research was conducted in January 2024.

The study used a modified Food Frequency Questionnaire (FFQ). The children's conduct was observed utilizing the ICHD-10 behavior observation sheet. The child's behavior was observed over a three-month period using both the child development observation book at the therapy center and direct observation by the therapist. The Spearman correlation test was used to look at the data and see if there was a link between children on the autism spectrum eating a gluten-free and casein-free diet and their behavior. The results were analyzed using SPSS.

## RESULTS AND DISCUSSION

Tabel 1. Distribution of Respondent by Gender, Age, GFCF Diet Adherence, and Autism Behavior

| Characteristics | n | Presentation (%) |
|---|---|---|
| **1. Gender** | | |
| Male | 27 | 87.1 |
| Female | 4 | 12.9 |
| **2. Age** | | |
| 3 – 6 years | 15 | 48.4 |
| 7 – 9 years | 11 | 35.5 |
| 10 – 12 years | 4 | 12.9 |
| 13 – 15 years | 1 | 3.2 |
| **3. GFCF Diet Adherence** | | |
| Compliant | 20 | 64.5 |
| Less Compliant | 11 | 35.5 |
| **4. Autism Behavior** | | |
| Reduce | 23 | 74.2 |
| Remain/Increase in severity | 8 | 25.8 |

Table 1 explains that the majority of respondents with spectrum disorders were male, with 27 children (87.1%), while female respondents amounted to 4 children (12.9%). Previous studies have also revealed that the prevalence of autism is higher in boys than girls, with a ratio of about 4:1. The Center for Disease Control (CDC) report noted that the incidence of autism in boys is 4.5 times more than in girls, and this number continues to increase every year (CDC, 2019). Several theories explain this phenomenon, with one linking it to differences in testosterone and estrogen production. Both hormones change the way retinoic acid-related orphan receptor alpha (RORA) genes work, which controls how the brain works. It is known that testosterone can inhibit RORA activity, while estrogen increases it. Disruption of RORA function can lead to problems in the brain, given that it plays a role in neuroprotection against oxidative stress, which, according to another theory, also contributes to brain development (Werling & Geschwind, 2013).

The respondents' ages ranged from 3 to 15 years old, with 15 children (48.4%) in the 3 to 6 age group and one child (3.2%) in the 13 to 15 age group. Autism is a complex developmental disease that is typically diagnosed before a child reaches the age of three. The condition can make it difficult for children to communicate and express their desires, affecting their behavior and relationships with others (Arfiriana Pratiwi & Fithra Dieny, 2014).

Table 1 also shows that a majority of parents were compliant in giving their children the GFCF diet, as many as 20 respondents (64.5%), however, 11 of them were less compliant in applying the diet. According to the interview with the respondent's mother, several factors contribute to the difficulty of implementing the GFCF diet. The favorite food of a child is mostly derived from gluten and casein, so when not given their favorite food, children can throw a tantrum (shouting and hitting), making it difficult for parents to consistenly implement the diet. Furthermore, it is difficult to find food as an alternate substitute, and the children are difficult to control when there is a family that gives meals and drinks that contain gluten and casein.

Table 1 also explains that 23 children (74.2%) showed a decrease in autistic behavior. The reduction in autistic behavior manifests as a decrease in the severity of hyperactive behavior, as well as the children's capacity to follow therapist directions. Furthermore, children learned to heed directions and sit quietly throughout therapy sessions, albeit some children's calm intensity wore off quickly.

Table 2. Cross-Tabulation of the Correlation between the Level of Adherence to the GFCF Diets and Autism Behavior

| | | **Autism Behavior** | | **Total** | **P-Value** | **Correlation Coefficient** |
|---|---|---|---|---|---|---|
| | | **Reduce** | **Remain** | | | |
| **Level of Adherence GFCF Diet** | **Compliant** | 14 (45.16%) | 6 (19.35%) | 20 | 0.045 | -0.363 |
| | **Less Compliant** | 11 (35.48%) | 0 (0%) | 11 | | |
| | **Total** | 25 | 6 | 31 | | |

Table 2 shows that 20 out of all respondents adhered to the GFCF diet, with 14 children having a decrease in autistic behavior and 6 reporting no change. However, a reduction in autistic behavior was observed in up to 11 respondents who were less consistent with the GFCF diet. As a result, parents who adhere to the GFCF diet on a consistent basis are more likely to minimize their child's autistic behavior. However, it should be mentioned that respondents in this study did not only adhere to a gluten-free and casein-free diet but also a variety of therapies, such as occupational therapy, sensory integration, speech therapy, and ABA-VB, which were all effective in reducing their autistic behavior.

The Spearman correlation test showed a significant relationship between the level of GFCF diet compliance and the behavior of children with autism (correlation coefficient -0.363 and p-value 0.045, p-value < 0.05). The negative correlation coefficient of -0.0363 indicates that the relationship between GFCF diet compliance and autism-related behavior is adversely proportional. Based on these research results, it is possible to assume that the more consistent the GFCF diet, the less autism behavior in children. The results of this study agree with those of Rahmah, who found a connection between the GFCF diet and the

behavior of autistic children. The correlation coefficient was -0.453, and the significance level was 0.01 (Rahmah, Diani, & Rachmawati, 2015).

Selecting the type of food that children in the autism spectrum consume is an important component of their treatment. Gluten and casein, two common allergies in autistic children, can impair organ function, including brain function. As a result, dietary modifications are one of the therapeutic approaches that attempt to reduce or even avoid the symptoms. Some parents have used this diet in an effort to help the development of children with autism (Xu et al., 2018). The right diet can have a positive influence on a child's ability to adapt and develop at every stage of growth and development (Sinaga, Insani, & Renylda, 2022).

The GFCF diet involves avoiding all products that contain gluten and casein. Flour, wheat, barley, havermuth, and oats naturally contain gluten, while while dairy products contain casein. As a result, there is a need for alternative meals that can substitute gluten and casein while also addressing the nutritional demands of children with autism spectrum disorders.

Table 3. Gluten-Free Casein-Free Diet

| Diet | Food Not Privided | Substitutes Foods |
|---|---|---|
| Gluten Free | Biscuits, bread, noodles, snacks, cakes, and anything containing wheat flor or glutinous rice. | Rice flour, tapioca flour, yam, taro cassava, rice, vermicelli, and corn |
| Casein Free | Milk-based products such as mozzarella, cheese, butter, yogurt, snacks, ice cream, and confectionery | Soy milk, fresh milk, eggs, chichken, shellfish, shrimp, squid, red and green beans, and cashews |

Source: (Raziah et al., 2023)

Parents, especially mothers, have a crucial role in implementing the gluten-free casein-free (GFCF) diet in children on the autism spectrum. The involvement of parents in selecting, providing, and ensuring that the food provided is nutritionally suitable for autistic children has a significant impact on their diet. As the primary organizer of food consumption in the family, the mother has a significant deal of guilt for ensuring that the diet can be maintained regularly while also supporting the child's health and growth. Mothers who do not understand their child's condition or what is required to manage children on the autism spectrum are more likely to follow their child's wishes, including their meals.

The GFCF diet is a form of therapy that is applied internally to children with autism and is usually implemented in conjunction with other types of therapy, such as occupational therapy, behavioral therapy (ABA-VB), and speech therapy. This approach aims to support the holistic development of the child by addressing aspects related to behavior, social skills, and communication. Many children with autism spectrum disorders have experienced significant improvements in social and communication skills after undergoing GFCF diet

therapy. The implementation of the GFCF diet is individualized and cannot be homogenized for all children (Yuwono, 2009).

It is important that this diet be followed consistently, not just at home and at school but in any place. Parental compliance with the GFCF diet can be measured by the amount to which parents apply it, including their capacity to select and deliver food varieties, supervise food intake, and be consistent in doing so. The proper, consistent, and frequent application of the diet can positively impact the conduct of children, particularly those on the autism spectrum Following this diet consistently may help children focus better on everyday tasks, improve emotional stability, and lessen behavioral issues.

Parents' dedication to adherence to the GFCF diet greatly affects the behavior of children on the autistic spectrum. The behavior of children with autism decreases when parents adhere to this diet. This supports the theory that the GFCF diet is recommended for children on the autism spectrum disorder. Children with autism who adhere to the GFCF diet behave more subduedly, show more controlled emotions, and focus better. According to Saad's research, children on the autistic spectrum have made substantial ganis in their development, including behavior, when they avoid foods that contain gluten and casein. (Saad et al., 2024). In addition, the GFCF diet can improve the ability of autistic children to follow instructions given during therapy.

It was shown that the amount of hyperactivity in autistic children was reduced. This diet also has other benefits, including making children less susceptible to disease than they were before starting the GFCF diet (Izzah et al., 2020; Sofia et al., 2017). Children on the autism spectrum whose parents consistently followed the diet showed improvements in behavioral aspects, such as increased calmness, emotional stability, and ability to focus on activities. This indicates that the consumption of gluten and casein has a positive influence on the behavior of children with spectrum disorder. Various studies have also revealed that the majority of parents of autistic children feel that there is a positive impact of the implementation of the GFCF diet on their children's behavior (Hylman et al., 2016).

## CONCLUCION AND RECOMMENDATION

The results of this study showed that boys are more likely than girls to have autism. Furthermore, children aged three to six years were the most commonly diagnosed with autism. As expected, the Spearman correlation test showed a strong link between the GFCF diet and behavioral problems in autistic children (p-value = 0.045, correlation coefficient = -0.363). This suggests that implementing a GFCF diet can help reduce behavioral problems such as emotional stability, hyperactivity, and the ability to focus attention in children with autistic spectrum disorders.

To get the best outcomes, the gluten-free, casein-free (GFCF) diet must be implemented consistently, so it is important to socialize and provide more in-depth education to parents and individuals about the diet's application. To avoid mistakes in implementation, parents ought to take food allergy testing to understand and pay attention to the sorts of food that can or should be avoided for their children. To ensure consistent adherence to the GFCF diet, parents and stakeholders must collaborate. Kids with autism should have fewer behavior issues so they can interact with their peers and grow normally.

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