

## Overview Of Gluten-Free Casein-Free Diet Application in Children With Autism Spectrum Disorder

**Risky Sandy A.K.<sup>1</sup>, Sari Eka Pratiwi<sup>2</sup>, Muhammad In'am Ilmiawan<sup>3</sup>**

### AFFILIATIONS

1. Medical Degree, Faculty of Medicine, Universitas Tanjungpura
2. Departement of Biology and Pathobiology, Faculty of Medicine, Universitas Tanjungpura
3. Departement of Biology and Pathobiology, Faculty of Medicine, Universitas Tanjungpura



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### ABSTRACT

*Background:* The theory that gluteomorphin and casomorphin can act as opiate-like peptides has an effect like opiates by binding to specific receptors in the central nervous system, which triggers the implementation of a casein-free gluten-free diet (GFCF). The binding of gluten and casein derivatives in these specific receptors leads to increased activity of the endogenous opioid system associated with symptoms of autism spectrum disorder. *Objectives:* To describe the application of a casein-free gluten-free diet in children with autism spectrum disorder (ASD). *Materials and Methods:* We conducted this research with cross-sectional design quantitative research using total sampling (38 respondents, all female, mother) in July-August 2021 with a food frequency questionnaire (FFQ). *Results:* The result revealed that the average age of ASD children is 10.47 years, weight 35.87 kilograms, height 141.45 centimeters, and mostly boys (68%). Most parents (86.8%) didn't adopt a GFCF diet. FFQ score mostly amounting to >150 (57.9%). *Conclusion:* ASD children in SLB Autis Kalbar are given foods with gluten and casein with diverse variations enough that children have an FFQ score >150, and their parents didn't implement GFCF diet.

### KEYWORDS:

autistic spectrum disorder; gluten-free casein-free; diet implementation.

### CORRESPONDING AUTHOR:

Risky Sandy A.K.  
riskysandyak99@student.untan.ac.id

### INTRODUCTION

Autistic spectrum disorder (ASD) is a mental development disorder characterized by an inability to behave in social, social communication, responsiveness, and maintaining social relationships. This disorder has no definite causes and is caused by various multifactorial genetic and environmental conditions. One factor that supports the occurrence of disturbances and the intensification of neurological disorders is a change in the digestive tract. Several studies have shown the possibility of digestive abnormalities of gluten and casein proteins leading to peptide formation with opioid properties in autistic children. (1–3).

The estimated prevalence of ASD in a recent study was estimated to be 1 in 68 children, of which 50% of children showed behavioral regression at about three years of age. The etiological factors are heterogeneous, including genetic, epigenetic, and environmental factors. However, the pathogenesis is still not clearly understood. However, the pathogenesis of ASD is thought to be related to the relationship between three elements: oxidative stress followed by sulfur metabolism deficiency, abnormal bacterial growth in the intestine, and increased intestinal permeability. Children with ASD generally experience protein indigestion due to the formation of amino acids in protein digestion.

Digestive tract disorders and a lack of digestive enzymes cause the failure of the body of ASD children to digest protein. Genetic diagnoses that may increase the risk of ASD include fragile X, tuberous sclerosis, Down syndrome, and Rett syndrome. However, this known genetic disorder accounts for a tiny proportion of all ASD cases. (4–7)

Treatment for ASD focuses on improving social, behavioral, and communication symptoms because there is no definitive treatment for ASD. The need for a comprehensive management approach according to the age and specific needs of each child with ASD is a general principle that a medical professional can do. The difficulty in determining the most effective intervention is a challenge because of the variation in the clinical picture of each individual. Until now, there has been no approved drug treatment for ASD symptom relief. However, risperidone and aripiprazole are drugs approved by the Food Drug Administration for associated irritability in children with ASD. What can be suggested to relieve gastrointestinal symptoms and behavioral disorders in children with ASD is a dietary intervention where this approach does not require clinical supervision. (7)

Dietary interventions are associated with food sensitivity in children with ASD. If the child is intolerant to certain foods, it will trigger a reaction from the immune system so that the body produces

inflammatory chemical compounds called cytokines. These cytokines can interfere with brain and respiratory tract activity and thus affect how a child feels physically and emotionally. (8) One known dietary intervention is the GFCF diet, which involves eliminating some proteins from the regular diet, such as gluten and casein. This diet was introduced in the 1980s, and it is known that consuming foods containing gluten and casein can change the brain's functioning, which causes autism symptoms. (9)

The opioid excess theory is the theory that sparked the gluten-free diet casein-free (GFCF). Gluten and casein derivatives can act as opiate-like peptides and have effects similar to opiates by binding to specific receptors in the central nervous system. The binding of opioid-like peptides to these particular receptors causes an increase in the activity of the endogenous opioid system, which is associated with ASD symptoms. (9,10)

This gluten-free, casein-free diet can eliminate opioid peptides from the body, aiding in reducing autistic symptoms. In children with autism who have leaky gut, there will be an increase in the permeability of undigested food, microorganisms, and contaminants to the portal circulation, reinforcing the concept of absorption of digested protein metabolism products, especially opiates in the blood, which leads to behavioral deficits in these children. Gluten and casein proteins cannot be adequately digested in children's intestines because

the emergence of the GFCF diet is a solution to facilitate the physical and mental growth of children with ASD. (11,12)

Based on the description above, the researcher is interested in conducting research that aims to describe the application of a casein-free gluten-free diet in children with autism spectrum disorder in West Kalimantan Autism Special School Pontianak.

**METHODS**

This research was conducted using a descriptive cross-sectional approach and quantitative analysis. Researchers conducted this research to describe the implementation of a gluten and casein-free diet by parents of children with ASD who attend the Autism Special School in West Kalimantan. The sampling technique used was non-probability sampling, namely a total sampling of 38 respondents whom are female and mother.

The respondents determined in this study were parents of West Kalimantan Autism SLB students who met the inclusion criteria, namely biological parents who had ASD children and attended the West Kalimantan Autis School (SLB). Meanwhile, the exclusion criteria set included parents not filling out the questionnaire completely and the child's parents having limited communication skills. Data collection took the form of filling out a questionnaire online via Google Forms and was guided by Google Meet. Primary data collection was carried out using a guided interview method, which began with an

explanation of the research and the filling out informed consent forms, a child and family characteristics questionnaire, and an FFQ questionnaire to measure the frequency of intake of foods containing gluten and casein. Descriptive questions to see the application of the GFCF diet to children with ASD.

This research has received approval from the Research Ethics Committee of the Faculty of Medicine, Tanjungpura University, through a Certificate of Ethical-Clearance number 1484/UN22.9/TA/2021.

**RESULT AND DISCUSSION**

**Table 1.** Subject Characteristics

Subject Characteristic	N
Age (year(s); <i>mean</i> [min-max])	10,47 [7-15]
Birth weight	
<2,5 kg (n) [%]	6 [16]
2,5-4 kg (n) [%]	32 [84]
Gender	
Male (n) [%]	26 [68]
Female (n) [%]	12 [32]
Are you given food other than breast milk before six months?	
Yes (n) [%]	22 [58]
No (n) [%]	16 [42]
Last age breastfed (month(s); <i>mean</i> [min-max])	11,45 [0-48]
0-6 (n) [%]	16 [42]
7-12 (n) [%]	12 [31]
13-18 (n) [%]	1 [3]
>18 (n) [%]	9 [24]
Current weight (kg; <i>mean</i> [min-max])	35,87 [20-60]
Current height (cm; <i>mean</i> [min-max])	141,45 [120-160]
Birth order	
Eldest	14 [37]
Middle	5 [13]
Youngest	12 [32]
Single	7 [18]
Diagnosed age (year(s))	
Less than one year	4 [10]
Around 1-2 years	11 [29]
More than two years	23 [61]

The distribution of research subjects based on age in this study shows that the youngest research subject is seven years old, and the oldest is 15 years old, with a mean of 10.47. The distribution of

research subjects based on gender in this study shows male gender as the most significant percentage, 68%, namely 26 people. These results are in line with Kurnia's (2018) research conducted at the AGCA Center Surabaya with 29 men (76.3%) and 9 women (23.7%). Various international studies have found that the average incidence of ASD in boys and girls has a ratio of 3:1. However, male dominance does not only apply to children with ASD but also to attention deficit hyperactivity disorder and other developmental conditions in boys compared to girls. (5,13)

Based on birth weight, the research results show that children born with a weight range of 2.5-4 kg are the most significant percentage, namely 84%, with a total of 32 people. Based on research by Satria (2020), there is no meaningful relationship between the incidence of LBW and ASD due to the high awareness of pregnant women in carrying out pregnancy control activities. However, LBW is still considered a marker of newborns with an increased risk of experiencing neurological, psychiatric, and neuropsychological problems and is an indicator of fetal growth problems associated with intrapartum complications and neonatal disorders. Low birth weight is associated with various kinds of obstacles in children, both from a cognitive and psychological perspective, such as language and speech problems, social problems, attention problems, hyperactivity, and comprehension/learning difficulties. (14)

Likewise, the distribution of research subjects based on giving food other than breast milk before six months in this study shows that children who were given food other than breast milk before six months were the most significant percentage, namely 58%, with a total of 22 people. Finally, the distribution of research subjects based on the age when they were last given breast milk in this study shows that the majority of children were last given breast milk in the age range 0-6 months, with the most significant percentage being 42%, with a total of 16 children. Various studies explain the relationship between breastfeeding and a decrease in the prevalence of ASD. The effect of breastfeeding on reducing the incidence of breastfeeding is mediated by increasing endogenous oxytocin in the baby's central nervous system. Scientific studies show the importance of breast milk and the increase in oxytocin in the baby's central nervous system. A mother who breastfed for a year or more was closely associated with a reduced prevalence of autism and identified short-term breastfeeding as a risk factor for ASD in genetically susceptible children. (15-17)

The division of research subjects based on birth order in this study showed that the eldest child had the highest number with a percentage of 37% with 14 people, while the lowest number was for middle children at 13% with 5 people. The distribution of research subjects based on diagnosed age in this study shows that the age of more than two years is

the most frequently diagnosed age with a percentage of 61% with a total of 23 people, followed by the least aged <1 year at 10%, with a total of 4 people. The research results were dominated by the age of diagnosis of more than 2 years, which could be triggered by clinical features such as delayed speech and more withdrawn behavior that some parents suspected in the first 12 months of a child's life, which was considered by doctors and health practitioners as nothing to worry about. Even so, doctors can recognize symptoms that make a diagnosis of ASD reliable, such as language difficulties, inability to interact socially, and not being able to look at someone at the age of 2 years. Apart from that, screening methods can be carried out early, before the age of 2 years, namely the Modified Checklist for Autism in Toddlers (MCHAT) and standard diagnosis using the Autism Diagnostic Interview. Early diagnosis of ASD in children will have a significant impact on the child's development in daily life, especially in terms of cognitive, language skills, and adaptation. (18–20).

The distribution of research subjects based on body weight in this study showed that the lowest body weight of research subjects was 20 kg, and the highest body weight was 60 kg, with a mean of 35.87. The distribution of research subjects based on height in this study showed that the lowest height of research subjects was 120 cm, and the highest was 165 cm, with a mean of 141.45. Based on

research conducted by Corbett (2021) in the Southern United States shows that there is no significant difference in terms of height and weight of children or adolescents with ASD compared to children or adolescents in general; it was even found that children with ASD tend to experience excess body weight due to behavioral, physical and psychosocial limitations. (21)

**Table 2.** Parent’s Subject Characteristics

Parent’s Subject Characteristics	Total	
	Father	Mother
Parents Age (year(s); <i>mean</i> [min-max])	43,82 [30-58]	39,37 [27-50]
Occupation		
Labor (n) [%]	17 [45]	-
Entrepreneurs (n) [%]	13 [34]	4 [10]
Civil/Army/Police (n) [%]	3 [8]	4 [10]
Housewife (n) [%]	-	28 [74]
Others (n) [%]	5 [13]	2 [6]
Education		
No school (n) [%]	-	1 [3]
Elementary School (n) [%]	4 [10]	6 [16]
Junior High School (n) [%]	9 [24]	7 [18]
Senior High School(n) [%]	16 [42]	19 [50]
College (n) [%]	9 [24]	5 [13]
Married age (years; mean [min-max])	28,53 [21-41]	24,05 [18-34]
Maternal age (years; mean [min-max])	-	28,53 [19-38]
Family Income (Rp)		
Low (<2 mio) (n) [%]	18 [48]	
Middle (2-4 mio) (n) [%]	7 [18]	
High (4-6 mio) (n) [%]	8 [21]	
Very High (>6 mio)(n) [%]	5 [13]	

The distribution of research subjects based on the father's age in this study showed that the youngest subject's father was 30, and the oldest was 58, with a mean of 43.82. The distribution of research subjects based on maternal age in this study showed that the youngest subject's mother was 27 years old; the oldest was 50, averaging 39.37.

Based on Table 2, it can be concluded that most fathers with ASD children work as laborers and have

a high school education, while mothers work as housewives and have a high school education with low family income. A qualitative study conducted by Camelia (2019) explains several things that can influence the adoption of a diet for children with ASD, namely limited diet food, parents who have limited time, and especially parents' purchasing power for diet food. However, this purchasing power is also influenced by the level of knowledge and skills in processing food. In his research, one respondent had an income of 10 million per month, had advanced knowledge and food processing skills, and could buy diet food from outside the city. Children with ASD require special attention regarding diet, for example, the GFCF diet, so as not to worsen the child's condition, such as the family's knowledge and economic support factors in fulfilling the diet. However, this factor does not stand alone; it is related to the attitude, motivation, and skills of parents or caregivers and surrounding support. (22)

namely 22 people (58%), and a score of 101-150, namely three people (8%). An FFQ score <50 indicates that the subject rarely consumes foods containing gluten and casein, with the frequency of consumption never or once a month. Subjects who have an FFQ score of 50-100 indicate a consumption frequency of less than 1-2 times per week, while scores of 101-150 and >150 have varying habits of consuming gluten and casein with a frequency of 1-2 times, 3 times a week to >1 time per day. The distribution of casein-free and gluten-free diets in this study shows that respondents who do not adopt a diet have the most significant percentage, namely 33 respondents (87%). Most parents do not adopt a gluten-free and casein-free diet because their children do not have problems consuming foods containing gluten and casein namely 19 respondents (50%). Five other respondents (13%) said this eating pattern played a role in reducing hyperactive behavior and tantrums in their children.

**Table 3.** FFQ Total Score, Diet implementation with reason

Characteristic	N
FFQ Score	
<50 (n) [%]	6 [16]
50-100 (n) [%]	7 [18]
101-150 (n) [%]	3 [8]
>150 (n) [%]	22 [58]
Diet Implementation	
Implemented (n) [%]	5 [13]
Not implemented (n) [%]	33 [87]
Reason	
No significant impact / less effective	8 [21]
No gluten and casein intolerance	19 [50]
Children become picky about food	6 [16]
Reduce hyperactivity and tantrums	5 [13]

The gluten-free, casein-free diet score in this study showed a total percentage of scores >150,

The Gluten-Free Casein-Free Diet (GFCF) is one of the many therapies that can be used for children with ASD. This diet is implemented by avoiding the intake of foods that contain gluten and casein. Gluten is a protein commonly found in several types of wheat, while casein is found in milk products and their derivatives. The benefits of implementing this eating pattern are reduced child hypersensitivity, more obedience and calmness, increased verbal and nonverbal communication, and better sleep

patterns. The latest research regarding a gluten-free, casein-free diet is still being researched further because of the pros and cons. A meta-analysis study by Quan (2021) found that the GFCF diet positively reduced stereotypic behavior and improved cognitive abilities in ASD children with a fairly good safety profile. This could be the reason why this eating pattern still exists today because the latest scientific research still supports the application of this eating pattern to improve the quality of life of children with ASD. (23)

Regarding implementing a gluten-free and casein-free diet determined based on FFQ scores, 33 children (87%) did not adopt a casein-free diet, while five other children (13%) applied a GFCF diet. A total of 19 parents (50%) who did not use this reasoned that they did not benefit significantly after implementing the diet. However, five parents (13%) said that this eating pattern had a good impact on their children, whether they only limited the frequency of eating or did not give them foods containing gluten and casein. Several things expressed by parents were caused by the limited alternative food available on the market. Based on research, parents' beliefs about the GFCF diet can provide different results. When parents implement this diet and see an increase in positive attitudes and resulting beliefs regarding the use of the GFCF diet in children with ASD, parents will continue it. This

shows that diet implementers have a higher perception of control and ability to use the GFCF diet.

On the other hand, parents who did not adopt a GFCF diet or discontinued its use believed they had more control over their children's symptoms and behavior. In contrast, increased personal control was associated with reduced diet and use of vitamin supplements. (24)

However, a scientific study from Keller (2021) regarding casein-free and gluten-free diets shows that adherence to the GFCF diet is not associated with an increase in ASD in children. These results explain that the GFCF diet may cause increased gastrointestinal side effects. Parents need to keep this in mind when choosing to implement a gluten and casein-free diet in their child, hoping to reduce or even eliminate ASD symptoms. Recent research has also revealed that individuals with ASD commonly exhibit selective eating patterns that may worsen when incorporated into a diet that then poses a risk for eating disorders and/or malnutrition. Gastrointestinal side effects include abdominal pain, bloating, constipation (less than two bowel movements/week), hard stools (normal stool frequency), diarrhea (watery stools three or more times a day), or loose stools (watery consistency). However, the frequency of defecation is normal), pain during defecation and large stools. In addition to gastrointestinal side effects, the risk of decreased appetite and weight loss should be considered in

addition to night waking when introducing a gluten and casein-free diet. Sleep disturbances are common in children with ASD, and additional dietary restrictions in children with ASD may worsen sleep difficulties.(25,26)

A cross-sectional study analyzed parent-report data collected using a 90-item online questionnaire from 387 parents or primary caregivers of children diagnosed with ASD regarding the effectiveness of

the GFCF diet. The results showed an effective diet in children whose parents reported GI symptoms, diagnosed food allergies and suspected food sensitivities, including remarkable improvements in ASD, physiological, and social behavior compared with children whose parents did not report symptoms, diagnosis, or sensitivity to certain foods. Although families with children with ASD often use the GFCF diet, there is little evidence to support this diet despite its popularity. (27,28)

**Table 4.** Gluten Consumption Distribution

Food	Frequency						Total
	Never	<1x/ week	1-2x/ week	3x/ week	1x/day	>1x/ day	
<b>Pure Gluten</b>							
Wheat	4 (10.5%)	6 (15.8%)	7 (18.4%)	15 (39.5%)	4 (10.5%)	2 (5.3%)	38 (100%)
Panir	20 (52.6%)	9 (23.7%)	7 (18.4%)	2 (5.3%)	0 (0%)	0 (0%)	38 (100%)
Oats	27 (71.1%)	6 (15.8%)	1 (2.6%)	3 (7.9%)	1 (2.6%)	0 (0%)	38 (100%)
Bread	6 (15.8%)	9 (23.7%)	10 (26.3%)	8 (21.1%)	4 (10.5%)	1 (2.6%)	38 (100%)
Noodles	7 (18.4%)	7 (18.4%)	8 (21.1%)	7 (18.4%)	6 (15.8%)	3 (7.9%)	38 (100%)
Biscuits	4 (10.5%)	12 (31.6%)	9 (23.7%)	7 (18.4%)	5 (13.2%)	1 (2.6%)	38 (100%)
Macaroni	26 (68.4%)	11 (28.9%)	1 (2.6%)	0 (0%)	0 (0%)	0 (0%)	38 (100%)
<b>Contain Gluten</b>							
Bakwan	20 (52.6%)	7 (18.4%)	7 (18.4%)	2 (5.3%)	1 (2.6%)	1 (2.6%)	38 (100%)
Cake	12 (31.6%)	14 (36.8%)	8 (21.1%)	2 (5.3%)	1 (2.6%)	1 (2.6%)	38 (100%)
Meatball	17 (44.7%)	11 (28.9%)	8 (21.1%)	2 (5.3%)	0 (0%)	0 (0%)	38 (100%)
Sausage	13 (34.2%)	10 (26.3%)	10 (26.3%)	3 (7.9%)	2 (5.3%)	0 (0%)	38 (100%)
Risoles	23 (60.5%)	4 (10.5%)	7 (18.4%)	2 (5.3%)	1 (2.6%)	1 (2.6%)	38 (100%)
Flour Seasoning	7 (18.4%)	6 (15.8%)	12 (31.6%)	8 (21.1%)	4 (10.5%)	1 (2.6%)	38 (100%)
Chicken	7 (18.4%)	6 (15.8%)	12 (31.6%)	8 (21.1%)	4 (10.5%)	1 (2.6%)	38 (100%)
Wet Cake	26 (68.4%)	11 (28.9%)	0 (0%)	0 (0%)	1 (2.6%)	0 (0%)	38 (100%)
Tempe mendoan	19 (50%)	7 (18.4%)	7 (18.4%)	3 (7.9%)	2 (5.3%)	0 (0%)	38 (100%)
Wafers	8 (21.1%)	7 (18.4%)	9 (23.7%)	9 (23.7%)	4 (10.5%)	1 (2.6%)	38 (100%)
Steamed Sponge	28 (73.7%)	8 (21.1%)	2 (5.3%)	0 (0%)	0 (0%)	0 (0%)	38 (100%)
Donut	13 (34.2%)	14 (36.8%)	6 (15.8%)	3 (7.9%)	1 (2.6%)	1 (2.6%)	38 (100%)
Deep fried tofu	22 (57.9%)	7 (18.4%)	7 (18.4%)	1 (2.6%)	0 (0%)	1 (2.6%)	38 (100%)

**Table 5.** Casein Consumption Distribution

Food	Frequency						Total
	Never	<1x/week	1-2x/week	3x/ week	1x/day	>1x/ day	
<b>Pure Casein</b>							
Cow's Milk	12 (31.6%)	5 (13.2%)	6 (15.8%)	8 (21.1%)	4 (10.5%)	3 (7.9%)	38 (100%)
Goat Milk	37 (97.4%)	0 (0%)	0 (0%)	0 (0%)	1 (2.6%)	0 (0%)	38 (100%)
Skimmed Milk	26 (68.4%)	4 (10.5%)	3 (7.9%)	4 (10.5%)	1 (2.6%)	0 (0%)	38 (100%)
Sweetened Condensed Milk	25 (65.8%)	7 (18.4%)	1 (2.6%)	3 (7.9%)	2 (5.3%)	0 (0%)	38 (100%)
Cheese	21 (55.3%)	13 (34.2%)	3 (7.9%)	1 (2.6%)	0 (0%)	0 (0%)	38 (100%)
<b>Contain Casein</b>							
Milk Pudding	27 (71.1%)	7 (18.4%)	2 (5.3%)	2 (5.3%)	0 (0%)	0 (0%)	38 (100%)
Milk Candy	17 (44.7%)	6 (15.8%)	10 (26.3%)	2 (5.3%)	3 (7.9%)	0 (0%)	38 (100%)
Ice cream	15 (39.5%)	5 (13.2%)	9 (23.7%)	7 (18.4%)	2 (5.3%)	0 (0%)	38 (100%)
Yogurt	26 (68.4%)	6 (15.8%)	4 (10.5%)	1 (2.6%)	1 (2.6%)	0 (0%)	38 (100%)
Butter	29 (76.3%)	4 (10.5%)	1 (2.6%)	3 (7.9%)	1 (2.6%)	0 (0%)	38 (100%)
Chocolate	13 (34.2%)	8 (21.1%)	5 (13.2%)	8 (21.1%)	2 (5.3%)	2 (5.3%)	38 (100%)
Fruit juice with milk	30 (78.9%)	5 (13.2%)	2 (5.3%)	1 (2.6%)	0 (0%)	0 (0%)	38 (100%)
Chocolate Candy	16 (42.1%)	6 (15.8%)	4 (10.5%)	9 (23.7%)	2 (5.3%)	1 (2.6%)	38 (100%)

The gluten-containing foods most commonly consumed are those made from flour, bread, noodles and biscuits. In line with research by Khoirunnisa (2018), processed gluten-source foods such as wafers, bread, noodles and seasoned chicken with a frequency of 1-2 times per week and 3 times per week are foods often consumed by children with ASD. (29)

The most widely consumed casein-containing drinks are cow's milk, chocolate, chocolate candy, and ice cream. This is also in line with research by Khoirunnisa (2018) which states that processed products such as cow's milk, ice cream and chocolate are the foods most consumed by ASD children, ranging from 1-2 times per week to 1 time per day. (29)

Our research has several limitations, one of which is that the sample size may differ from all ASD children in Pontianak City. Second, even though researchers supervised data collection via Google form, there is a possibility that respondents did not understand the contents of the questionnaire. Third, recall bias could occur due to limited parental memory regarding the last food consumption.

## CONCLUSION

Based on the results of research data analysis and discussion of the research conducted, it can be concluded that:

1. Most of the ASD children in the West Kalimantan Autism SLB are boys aged between 7-15 years,

diagnosed when they are more than 2 years old, have normal birth weight, and last breast milk 0-6 months with food other than breast milk given before six months.

2. Most of the mothers of ASD children in the West Kalimantan Autism SLB are housewives with a high school education, with most of the fathers of ASD children in the West Kalimantan Autism SLB being workers with a high school education and have low family incomes (less than 2 million).
3. Most ASD children in the West Kalimantan Autism Special School still consume foods containing gluten and casein.
4. Most parents do not apply the GFCF diet to their children and still provide food containing gluten and casein. Wheat, bread, noodles, and biscuits are widely given and consumed as gluten-containing foods. In contrast, cow's milk, chocolate, and ice cream are widely given and consumed as casein-containing foods.

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