

**Translation, Adaptation, and Validation of the Brief Autism
Mealtime Behavior Inventory in Hindi (BAMBI-H)**

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Registration Number: P01II22S123023

This Dissertation is submitted as a part of fulfillment for the Degree of
Masters of Science (Speech-Language Pathology)

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JULY, 2024

CERTIFICATE

This is to certify that this dissertation entitled “**Translation, Adaptation, and Validation of the Brief Autism Mealtime Behavior Inventory in Hindi (BAMBI-H)**” is a bonafide work submitted in part fulfillment for the degree of Masters in Science (Speech-Language Pathology) of the student Registration Number P01II22S123023. This has been carried out under the guidance of the faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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This is to certify that the dissertation entitled “**Translation, Adaptation, and Validation of the Brief Autism Mealttime Behavior Inventory in Hindi (BAMBI-H)**” is the result of my own study under the guidance of Ms. Sindhusa Chandran, Assistant Professor of Speech Sciences, Department of Speech-Language Sciences, All India Institute of Speech & Hearing, Mysuru, has not been submitted earlier to any other University for another Diploma or Degree award.

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CHAPTER - I

INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impairment in social communication abilities and repetitive and restrictive behaviors (APA, 2013). Children with ASD may behave, communicate, and learn things differently than their peers, which means that they need help or assistance in their daily living (Darshan et al., 2023). Studies have indicated that children with ASD typically manifest characteristic features of the disorder before the age of 3 years and persist throughout their lifetime. However, there may be gradual improvements in symptoms as time progresses (Maenner, 2014).

An Indian study by Arora (2018) revealed that 125 children aged between 2 to 6 and 80 children aged between 6 to 9 across five states in northern and western parts of India were diagnosed with ASD. The study estimated that one in 89 children in India were diagnosed with ASD. These conditions not only contribute to diminish the quality of life but also give rise to comorbidities (Doreswamy et al., 2020). Children with ASD typically present with sensory differences and encounter feeding problems compared to typically developing children (Zobel-Lachiusa et al., 2015). Studies on the prevalence of feeding problems in this population is reported to be as high as 90% (Kodak & Piazza 2008), with approximately 70% of children described as selective eaters (Twachtman-Reilly et al., 2008). Mealtime difficulties affect 46-89% of children diagnosed with ASD (Ledford & Gast, 2006). According to Cornish (1998), 53% of individual with ASD may be deficient in some nutrients, and 60% of people may eat less than 20 different types of food. However, Nagai (1983) identified two groups of children with ASD: younger (ages two to six) and older (ages seven to nineteen) and also pointed out that eating problems persisted throughout adolescence.

Studies investigating feeding issues in this population included food selectivity and food refusal (Nadon et al., 2011, Martins et al., 2008). The term 'selective eating' or 'picky eating' is used to describe problems with appetite, which are defined as having a limited variety of food and not being able to taste new foods (Jacobi et al., 2003; Nicholls et al., 2001). The core causes of feeding issues in children with ASD has been determined by the aforementioned investigations to be their neophobia, impulsivity, perseverance, sensory deficiencies, social disobedience, and biological food intolerance. Because of their heightened sensitivity to food flavors, children with ASD may also struggle with emotional perception and eating disorders (Bilbay, 2015). Children with ASD exhibits sensory impairments and behavioral issues at mealtimes compared to typically developing children, (Zobel-Lachusua et al., 2015). Specifically, eating meals with different sensory stimuli can be a challenging experience for these individuals (Margai et al., 2020). Other factors, such as caregiver concerns, feeding practices that foster unhealthy eating patterns, and communication inadequacies, exacerbate these children's feeding difficulties (Cumine et al., 2000; Shaw et al., 2003).

Research on the dietary habits of children with ASD showed that, in contrast to neurotypical children, they ate fewer fruits and vegetables and chose high-calorie, high-fat foods (Mendive Dubourdieu & Guerendiain, 2022; Plaza-Diaz et al., 2021). According to Hyman et al. (2012), most children with ASD were found to lack fiber, choline, calcium, vitamin D or vitamin K. These unhealthy eating habits in children were seen to persist into adolescence and adulthood, leading to obesity and/or malnutrition, reducing the quality of life, and causing comorbidities (Doreswamy et al., 2020). It is acceptable to assume that individuals with ASD will display minimal nutritional diversity during mealtimes due to the disorder characteristics such as weak social connections, limited interests, and behaviors (Meral, 2015; Balikci & Çiyiltepe,

2017). They found to have sensitivity of the tactile or gustatory senses to moist, fibrous meal like fruits and vegetables, or sensitivity of the auditory senses when biting into crunchy foods (Reche-Olmedo et al., 2021). Nutritional difficulties may not only arise from motivational and environmental factors but also from neurological conditions or anatomical abnormalities (Burklow et al., 1998). Coordination issues during sucking, chewing, and swallowing due to motor impairments may later lead to aversion to specific food textures. These impaired feeding habits in childhood can persist into adolescence and adulthood if not identified and intervened, contributing to issues such as malnutrition. Therefore, the eating behaviors of children with ASD need to be early evaluated with assessment tools to find solutions for both children and caregivers.

Standardized assessment tools are crucial for establishing conclusive findings regarding the type and frequency of feeding issues and nutritional intake in children with ASD. These tools promote consistency across research and offer a productive way to gauge the feeding behavior. A range of self-reporting tools have been provided in the literature for assessing feeding difficulties including observations at mealtimes and questionnaires completed by parents or caregivers of the children to measure their feeding behavior (Matson & Fodstad, 2009). Various feeding questionnaires have been developed to determine problems in feeding and mealtime behaviors in children with neurodevelopmental disorders as mentioned in Table 1.

Table 1.1

List of feeding questionnaires available for children with ASD.

Feeding questionnaire	Developed by	Validated languages
1. Screening Tool for Feeding Problems (STEP)	Matson and Kuhn (2001)	English
2. Behavioural Pediatric Feeding Assessment Scale (BPFAS)	Crist and Napier (2001)	English, Greek, Korea, Turkish, Malay, Sinhala, German
3. The Swedish Eating Assessment (SWEAA)	Karlsson et al. (2013)	Swedish
4. Brief Autism Mealtime Behavior Inventory (BAMBI)	Lukens and Linscheid (2008)	Brazilian Portuguese, Vietnam, Malay, Thai, Oman, Chinese, Malayalam, Telugu
5. Aut-Eat Questionnaire (AEQ)	Gal et al. (2021)	Arabic, English, Spanish, Hebrew
6. Parent Mealtime Action Scale (PMAS-R)	Hendy et al., (2016)	English
7. Behavioral Pediatrics Feeding Assessment Scale (BPFAS)	Stephanie et al. (2015)	English, Korean, Turkish, Telugu

Among the above-mentioned tools, the Brief Autism Mealtime Behaviour Inventory (BAMBI) is a parental feeding questionnaire in English that has been developed in clinical and research settings for children with ASD. According to Seiverling et al. (2010), this tool holds promising psychometric assessment of feeding functions in children with ASD. The tool BAMBI was developed by Lukens and Linscheid (2008) to standardize data collection on feeding patterns specifically in ASD. This questionnaire addresses various problematic behaviors commonly observed in individuals with ASD and holds significant potential for clinical use, offering a quick

and accurate means of diagnosing feeding issues in children with ASD. Initially, the questionnaire featured twenty questions which was divided into three domains, as outlined by Lukens in 2002. However, the authors addressed its shortcomings and modified it after six years. The tool BAMBI is provided in Appendix A. The revision comprised of 18 items and rates the frequency of specific behaviors using a likert scale (1 = Never/Rarely to 5 = At Almost Every Meal). The scale yields a total score, and scores on three domains. Items 10, 11, 13, 14, 15, 16, 17, and 18 in the restricted variety factor measure the child's openness to experimenting with new foods and foods that differ in preparation, texture, and type. Five factors make up the food denial factor (items 1, 2, 4, 7, and 8), which describes the problematic behaviors that are shown when a child rejects food that has been offered to them. At last, the characteristic component of ASD (items 3, 5, 6, 9, and 12) includes elements that indicate behavioral traits of ASD, such as self-aggressive and stereotyped actions during meals. The questionnaire is self-administered by the parents/caregivers.

Need for the Study

There is a need to better understand the problems related to feeding in children with ASD, as well as more specific information on feeding obstacles from parents or caregivers. SLPs are involved in the diagnosis and management of both feeding and communication challenges in children with ASD because of their increased frequency of feeding problems. Research findings indicate that the tool BAMBI is a valuable measure for analyzing feeding-related issues in children with ASD. The BAMBI questionnaire was found to be sensitive enough to understand feeding-related problems. The translation and validation of BAMBI were conducted in multiple languages,

demonstrating its strong psychometric measures in recognizing feeding issues in children with ASD mentioned in Table 1.

Therefore, this proves that BAMBI questionnaire is preferred by SLPs for assessing feeding-related problems specifically in children with ASD. These questionnaires require active parental involvement and good observation of their child over time in a real-life context during meal times. Therefore, it is imperative that this questionnaire is in the parent's native language. Adapting a test to accommodate linguistic and cultural differences involves more than just translating the content into the target language; field testing is also required to determine validity and reliability.

There is currently an unavailability of a tool in Hindi, a north Indian language, to address feeding problems in native Hindi-speaking children with ASD. Tools available in foreign languages cannot be directly used in the Indian context. Thus, there is a requirement of culturally adapted, translated, and validated feeding tool in Hindi. A Malayalam version of BAMBI (BAMBI-M) was validated for clinical research use in native Malayalam-speaking children with ASD (Kripa & Sindhusa, in press).

Aim of the study

To adapt, translate, and validate the Hindi version of the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire language in children with ASD.

Objectives

The objectives of the study are as follows:

1. To translate and adapt the Brief Autism Mealtime Behaviour Inventory (BAMBI) questionnaire to Hindi, a North Indian language.

2. To validate the Hindi version of the Brief Autism Mealtime Behaviour Inventory (BAMBI-H) questionnaire.

CHAPTER - II

REVIEW OF LITERATURE

Feeding is a complex sensorimotor skill that is essential for human survival. Feeding encompasses the process of obtaining/gathering food, ingesting the food into the mouth, formation of bolus, and swallowing safely and efficiently. This physical process requires a series of coordinated steps from the voluntary process of oral management to the swallowing reflex and involuntary esophageal peristalsis. At the time of feeding, lips transport liquid or solid and hold the food in the oral cavity during chewing or mastication (Guyton, 1986; Lund, 1987). The lips and cheeks also help the tongue ensure the alternate movement of food between the teeth during chewing (Logemann, 1986). Once the food is masticated, the swallowing occurs to transport materials from the oral cavity to the stomach without allowing entry of food particles into the airway. Logemann (1998) defined feeding as the placement of the food in the mouth; the manipulation of the food in oral cavity before the initiation of the swallow including mastication, and the oral stage of swallowing when the bolus is propelled backward by the tongue. Normal swallowing can be illustrated in four phases: anticipatory, oral, pharyngeal and esophageal (Logemann, 1998).

Developmental Milestones Relevant to Normal Feeding

According to Pridham (1990), feeding skills are crucial for the development of an infant's capacity for self-regulation throughout the first year of life. The development of feeding and swallowing is the result of a complex interface between the developing nervous system, various physiological systems, and the environmental factors that begin in embryologic and fetal periods and continue through infancy and early childhood. The development of feeding is sustained by neurological maturation and

ongoing experiences of a child. It begins with hunger and satiety pattern at the age of 2-3 months. Till the age of 4-6 months, infants receive all the nourishment from breast/nipple feedings. As the child grows, the sucking and swallowing action is followed by biting, chewing, eating from a spoon, drinking from a cup and a straw which are more mature feeding behaviors. These developments occur as the higher cortical centers gain more control (Arvedson& Brodsky, 1993).

Table 2.1

Normal developmental milestones for self-feeding skills (source: Arvedson & Brodsky, 1993)

Age (months)	Level
0-5	Hand to mouth begins
2-4	Hand on bottle during feeding
4	Spoon feeding introduced
4-6	Cup drinking introduced
5-6	Both hands to hold the bottle
5-7	Semi solids from spoon
6	Cracker to mouth briefly
6	Lip closure around the spoon
6	Munching begins- vertical jaw action
7	Chewing begins- rotary jaw action
6-8	Liquid suck from cup
8-9	Assisting with spoon
9	Cracker to mouth- deliberately reaches for spoon
9-10	Drinks from the cup held by the caregiver
10-11	Pincer grasp for finger feeding
12	Self-feeding by grasping spoon with whole hands
12	Hold cup with 2 hands; 4-5 consecutive swallows
12	Hold and tips bottle by self
15-14	Skills refined for independent self-feeding

Factors Influencing the Development of Feeding

Oral feeding skills may vary in individuals since it is influenced by multiple anatomic, neurophysiologic, environmental, and cultural factors. It is influenced by the levels of alertness, stress, illness, and fatigue as well as actual motor coordination in the oral pharyngeal system. Also, the cultural pattern along with social factors within the family, have a very prominent effect on the feeding skills. The transitional feeding phase is the time, when the dietary pattern and preferences are acquired, and many of these preferences are carried over into adulthood (Arvedson & Brodsky, 1993). The aspects of anatomy, embryology, and physiology human embraces also influence the feeding development. In addition, it is influenced by behavioral and social factors (Miller, 1986).

Feeding is dependent on the neurological maturation of the child. Maturation of the central nervous system (CNS) plays an important role in the acquisition of normal swallowing or feeding skills. Both feeding and swallowing require intact functioning of the central and peripheral nervous systems and the intricate coordination of actions of multiple muscles of the oral cavity, pharynx and esophagus (Miller, 1982). A child's neurodevelopmental status determines the development of feeding and swallowing. Any abnormalities of developing brain determine the development of feeding and swallowing. Any abnormalities of developing brain or structural or functional deficits in the oral, pharyngeal or esophageal region can result in a spectrum of cognitive, communicative, behavioral and motor abnormalities that are often associated with feeding and swallowing disorders. Even a small injury to the developing brain can have a magnified negative effect on the rest of the sequence of the developing brain leading to congenital malformation and other related abnormalities (Lenn, 1991).

Feeding-related issues in children with ASD

A study by Danay et al. (2022) examined the eating patterns of preschool and school-aged children with ASD in Chile. The cross-sectional study involved 72 families with children diagnosed with ASD aged between 2 to 12 years old. The researchers found that 97.67% of the children presented food selectivity, corresponding to alterations in the frequency of consumption of specific food groups. Moreover, a significant percentage of children did not meet the daily recommendations for fruits (93.06%), fish (90.28%), water (80.56%) and vegetable (62.50%) consumption. The authors concluded that these findings should be considered when designing and carrying out feeding interventions in families with children with ASD for greater assertiveness and effectiveness in improving health.

Another study published in 2019 by Susan Mayes, found that atypical eating habits affected over 70% of all children with ASD. Sensory preferences, picky eating, and aversions are often a component of ASD such as preferring softer foods like yogurt while avoiding harder or crunchier foods. They frequently display strong positive or negative reactions toward particular flavors or scents, gravitating toward the comforting sensory experience of their preferred foods while avoiding others.

Leader et al. (2020) investigated the frequency of feeding problems, gastrointestinal (GI) symptoms, challenging behavior, sensory problems, and comorbid psychopathology in children and adolescents with ASD. The study used various questionnaires, including the screening tool for feeding problems for children, GI symptoms inventory (Autism Treatment Network 2005), Behavior Problems Inventory Short form (BPI-S; Rojahn et al. 2012), Short Sensory Profile (SSP; Dunn 1999) and Autism Spectrum Disorder Comorbidity Child (ASD-CC; Matson 2007). Findings showed that 84% of the participants had food selectivity, followed by food refusal

(78.7%), rapid eating (76.5%), chewing problems (60.3%), Food stealing (49.3%), and vomiting (19.1%). The study also revealed higher rates of GI symptoms, challenging behavior, and sensory issues in those who presented with rapid eating, food refusal, and food stealing compared to those without these problems. Additionally, comorbid psychopathology predicted rapid eating, food selectivity and food refusal were prevalent in this population. The findings suggested that these comorbid conditions are closely related and may have a significant impact on the quality of life and adaptive functioning of individuals with ASD.

Impact of their Feeding Difficulties on Caregivers

Gent, and Marshall (2021) explored the effects of feeding difficulties in children with ASD on their caregivers. The study findings provide an in-depth analysis of the various challenges and stresses the caregivers faced. In this study, caregivers of children (5-12 years) completed an online survey examining (a) demographic characteristics, (b) children's autism characteristics (Social Communication Questionnaire), (c) sensory profiles (Sensory Profile 2–short form), (d) feeding difficulties (Behavioral Pediatrics Feeding Assessment Scale, BPFAS) and (e) caregiver-reported impact of feeding difficulties (Feeding-Swallowing Impact Survey, FS-IS). Study participants included 78 caregivers of 80 children with ASD and they reported the following:

1. **Emotional Impact:** Caregivers often experienced significant levels of stress, anxiety, and emotional distress due to the ongoing struggle to manage their child's feeding issues. Many reported feeling overwhelmed and helpless, especially when conventional feeding strategies are ineffective.
2. **Physical and Psychological Burden:** The study highlights the physical toll on caregivers, including fatigue and sleep disturbances, as they devote considerable

time and effort to ensure their children are adequately fed. The psychological burden includes feelings of isolation and depression, resulting from the persistent nature of feeding challenges and the lack of social support.

3. **Impact on Family Dynamics:** Feeding difficulties can strain family relationships and dynamics. Siblings may feel neglected, and marital tensions can arise as parents navigate differing opinions on handling feeding issues. This additional stress can lead to a reduction in overall family cohesion and functioning.
4. **Need for Support and Resources:** The study emphasizes the importance of providing caregivers with adequate support and resources, including access to professional guidance, support groups, and practical tools to manage feeding difficulties. It suggests that interventions should not only target the child but also include support mechanisms for caregivers to enhance their coping strategies and reduce stress. Addressing the emotional, physical, and psychological burdens on caregivers can lead to more effective interventions and improve the overall well-being of families dealing with ASD-related feeding difficulties.

Importance of feeding tool for children with ASD

Feeding questionnaire tools are usually completed by parents or caregivers to evaluate the child's feeding issues. Researchers have utilized these parental self-administered questionnaires to enhance their understanding of the prevalence of feeding problems and the contributing factors that sustain them. Various questionnaires have been created as indirect methods of behavioral assessment to investigate the feeding issues of children with ASD. These questionnaires measure

children's feeding and lunchtime habits and are used to assess feeding problems in children. More recently, they have also been used to evaluate caregiver behaviors during mealtimes (Lukens & Linscheid, 2008).

Feeding difficulties are highly prevalent among children with ASD affecting up to 90% of this population (Nesreen et al. 2021). If not properly addressed, these challenges can lead to nutritional deficiencies, poor growth, and other health issues. Specialized feeding assessment tools are essential for identifying and managing feeding difficulties in children with ASD (Sowmya Nath 2014). The key reasons these tools are important include:

1. **Comprehensive Assessment:** Tools like the Montreal Children's Hospital Feeding Scale (MCH), Children's Eating Behavior Inventory (CEBI), Screening Tool of Feeding Problems (STEP), Parent Mealtime Action Scale (PMAS), The Swedish Eating Assessment (SWEAA), Behavioral Pediatrics Feeding Assessment Scale (BPFAS) and the Brief Assessment Scale for Mealtime Behavior in Children (BAMBI) allow for thorough evaluations of feeding behaviors, including sensory sensitivities, food selectivity, and oral-motor skills. This comprehensive assessment is crucial for developing effective intervention plans.
2. **Tracking Progress:** Standardized feeding tools enable caregivers and therapists to track changes in a child's feeding behaviors over time, allowing them to monitor the effectiveness of feeding interventions.
3. **Guiding Intervention:** Insights gained from feeding assessments directly inform the development of personalized nutrition and feeding therapy plans, tailored to address the unique needs of each child with ASD. This ensures children receive the specific support they require.

- 4. Early Identification:** Early identification and intervention for feeding problems in young children with ASD (ages 2-4) are crucial, as the brain's neuroplasticity is highest during this period. Feeding tools facilitate early detection and prompt treatment.

BAMBI as the preferable tool to assess feeding difficulties in children with ASD

Lukens and Linscheid (2008) developed the Brief Autism Mealtime Behavior Inventory (BAMBI), a standardized test designed to investigate mealtime issues in children with ASD aged 3 to 11. Currently, BAMBI is the only validated questionnaire specifically created for parents of children with ASD. This parent self-report questionnaire allows parents to rate their children's behavior during meals (DeMand et al., 2015). It uses a Likert scale where caregivers score behaviors from 1 (indicating never/rarely) to 5 (indicating always).

In clinical feeding assessments, BAMBI is a valuable tool for gathering data to clinically understand various aspects of a child's feeding issues, along with related information such as developmental disabilities or medical conditions that could affect feeding. This information aids clinicians in determining the need for further examinations and planning appropriate interventions. Direct evaluations, such as assessing bite size and texture as done by Sharp and Jaquess (2009), can also be beneficial for planning interventions, leading to more efficient and minimally invasive treatments. Children with ASD were found to consume less food than their typical peers and behaved more inappropriately during meals (Twachtman et al., 2008).

As described by Lukens and Linscheid (2008), BAMBI was developed to standardize the collection of data on nutrition and feeding habits tailored to children with ASD. This questionnaire evaluates various problematic behaviors commonly

found in this group that other assessments may overlook. Due to its comprehensive approach, BAMBI is widely employed in clinical settings to swiftly and accurately assess eating issues in children with ASD. The original BAMBI questionnaire, initially comprising 20 questions across three domains (Lukens, 2002), underwent revision and improvement six years later as highlighted by Lukens and Linscheid (2008). The updated version reduced the number of questions to 18 and introduced a Likert scale for rating the frequency of behaviors (ranging from 1 = Never to 5 = At Almost Every Meal).

BAMBI is the first instrument designed to evaluate feeding challenges in children with ASD. The tool highlighted the significance of feeding-related issues in the pediatric population. Literature has highlighted that the tool could distinguish between the feeding issues that people with ASD have and those that children with regular development present.

Thus, The Brief Autism Mealtime Behavior Inventory (BAMBI) is considered the most preferable tool for feeding assessment in children with ASD due to several key features:

1. **Specificity for ASD:** BAMBI was specifically developed to assess eating difficulties in children with ASD, making it more relevant and accurate for this population compared to tools designed for typically developing children.
2. **Three-Factor Structure:** The inventory consists of 18 items organized into three subscales: Food Refusal/Disruptive Behavior, Limited Variety, and Features of Autism. This structure allows for a comprehensive evaluation of various aspects of mealtime behavior specific to ASD.
3. **Reliability and Validity:** BAMBI has demonstrated high reliability and validity, with a Cronbach's alpha of 0.88 and strong construct validity,

particularly for the Limited Variety factor. It has also shown high test-retest reliability and inter-rater reliability.

4. **Observer-Reported Measure:** BAMBI is designed to be completed by parents or primary caregivers, providing an observer-reported measure that captures mealtime behaviors specific to children with ASD.
5. **Cross-Cultural Validation:** The tool has been translated and validated in multiple languages, including Portuguese-Brazilian, Turkish, and Vietnamese, enhancing its applicability across different cultural contexts.

Different Versions of BAMBI

Turkish version of BAMBI (Meral & Fidan - 2014)

The study was done by Meral and Fidan (2014) to determine the psychometric properties of the Turkish version of BAMBI for assessing mealtime behavior in children with ASD. The researchers ensured linguistic equivalence between the original English BAMBI and the Turkish translation. The inventory was then administered to 308 mothers of children with a 3-factor structure and the 5-point Likert scale was reduced to 14 items after validity and reliability analyses. Confirmatory factor analysis supported and acceptable goodness of fit for the Turkish BAMBI. The Turkish BAMBI demonstrated high internal consistency and split-half reliability. Item total correlation was acceptable and t-tests showed significant differences between the upper and lower 27% of scores. The findings indicate that Turkish BAMBI is a valid and reliable tool for assessing mealtime behaviors in Turkish children with ASD.

Chinese version of BAMBI (Gray, Heewon & Chiang, Hsu-Min - 2017).

This study investigated the mealtime behaviors of Chinese-American children with ASD by Gray, Heewon & Chiang, Hsu-Min. (2017). The findings suggest that thirty-one parents of Chinese-American children with ASD participated in the study and completed the BAMBI questionnaire. The top problematic mealtime behaviors reported by parents were: preferring “crunchy” foods (54%), not willing to try new foods (48%) and not remaining seated at the table until the meal is finished (46%). Compared to their white counterparts, Chinese-American children with ASD showed slightly lower scores on problematic mealtime behaviors. There was a significant association between food refusal and aggressive behaviors at mealtimes. This finding suggests that Chinese-American children with ASD exhibit unique mealtime behaviors compared to typical American children. The authors note that Chinese Americans often eat differently than typical Americans, with more emphasis on family-style dining and less on individual portions.

Brazilian Portuguese version of BAMBI (Castro et al; 2019)

The article “validation of the Brief Mealtime Behavior Inventory (BAMBI) Questionnaire” by Castro et al.(2019) describes the translation and validation of the BAMBI questionnaire into Brazilian Portuguese. The study aimed to provide a structured evaluation of feeding behaviors in the ASD population that can be integrated into clinical routines and help guide parent interventions. The final sample included 410 participants with a mean age of 9.58 ± 1.2 years and the majority were male (95%). The researchers investigated internal consistency using Cronbach’s alpha and test-retest reliability using the intraclass correlation coefficient (ICC) in a sample of children with ASD and TD. The Brazilian Portuguese version of the BAMBI showed good internal

consistency (None of the questions showed a score higher than 0.7, meaning that all questionnaire are reliable) and test-retest reliability (ASD groups different total scores $p=0.00$, Food refusal $p=0.021$, Feature of autism $p=0.00$ and limited variety $p=0.00$) indicating it can be used for clinical and research purposes. The validation of this questionnaire allows for the integration of a structured evaluation into the clinical routine and helps guide parent interventions regarding eating problems and potential consequences in the ASD population.

Thailand version of BAMBI (Chunsuwan, & Kulalert - 2021)

Preschool age children with ASD in Pathum Thani Province, Thailand have more eating problems than typically developing children, according to a case-control study conducted by Chunsuwan, & Kulalert (2021) from Thammasat University. The study compared eating behaviors in 30 children with ASD and 30 age and gender-matched children with TD. The BAMBI was used to assess mealtime behaviors. The mean total BAMBI score was significantly higher in children with ASD (45 ± 8.4) compared to children (40 ± 7.4). Of the three BAMBI domains food refusal was the only domain that differed significantly between the groups. Parents of children with ASD commonly reported problematic behavior such as expelling food that had been eaten and refusing to dislike foods. However, parents from both groups did not differ in their emotions and confidence during mealtime. The researchers concluded that eating problems should be addressed when caring for preschoolers with ASD, in addition to developmental stimulation. Limitations of the study included a small sample size, single-province location, and lack of a cut-off score for the newly developed questionnaire on caregiver attitude and strategies. This study was first in Thailand to compare eating problems between preschoolers with ASD and TD. The findings are

consistent with previous internal research showing that children with ASD have more feeding issues starting from preschool age.

Vietnam version of BAMBI (Minh Huong et al. – 2021)

Validation of the BAMBI questionnaire in Vietnam in 2021 describes a cross-sectional study that aimed to validate the BAMBI questionnaire in Vietnamese population of children with ASD. The researchers translated the BAMBI questionnaire into Vietnamese and tested it on 194 children aged 3-11 years with a diagnosis of ASD. The study found that the Vietnamese version of BAMBI demonstrated good internal consistency and test retest reliability, indicating that it is a valid and accurate tool for assessing mealtime and feeding difficulties in children with ASD in Vietnam. The validation of BAMBI questionnaire in various languages contribute to the growing body of research on the clinical assessment and management of feeding difficulties in children with ASD across different cultures and contexts. It highlights the need for culturally appropriate and psychometrically sound tools to accurately identify and address the unique challenges faced by children with ASD and their families during mealtimes.

Italian version of BAMBI (Lamboglia et al; 2023)

The article “Development and validation of inventory to assess mealtime behavior problems in children with ASD” by Lukens and Linscheid described the development and validation of the brief autism mealtime behavior inventory (BAMBI), to measure mealtime behavior problems in children with ASD. The BAMBI was designed to assess aggressive, disruptive, and destructive behaviors exhibited by children with ASD during mealtimes. The initial 20-items scale was tested on 40

typically developing children and 68 children with ASD. The final 18-item BAMBI demonstrated good internal consistency, high test-retest reliability, and strong construct and correlation-related validity. The BAMBI was found to effectively differentiate mealtime behavior problems between the ASD and typically developing groups. It also showed significant correlations with other measures of autism severity and feeding problems. The development and validation of the BAMBI provided a standardized tool to assess mealtime behaviors in children with ASD, which can help guide appropriate intervention and support for these families.

Malayalam version of BAMBI (Kripa & Sindhusa, in press)

There is a dearth of feeding tool that is culturally appropriate for Indian contexts considering its multilingual and multicultural diversity. A Malayalam version of BAMBI (BAMBI-M) was validated for clinical research use in native Malayalam-speaking 30 children with ASD (Kripa & Sindhusa, in press). BAMBI-M is found to be a very sensitive tool for identifying feeding-related issues in children with ASD. The test-retest reliability, was assessed using Spearman's rho correlation coefficient, yielded a high value of 0.956. The test also demonstrated high sensitivity and specificity, with a cut-off value of 31. Higher cut-off values correlated with increased frequency of problem behaviors. Internal consistency analysis indicated good reliability among items for children with ASD, achieving a Cronbach's Alpha of 0.710.

Telugu version of BAMBI (Vandana & Swapna, in press-2024)

A Telugu version of BAMBI (BAMBI-T) was validated for clinical research use in native Telugu-speaking 60 children with ASD (Vandana & Swapna, in press). The spearman-rho (ρ) value obtained was found to be 0.9 indicating positive

correlation. sensitivity and specificity was found to be one at the cut-off score of 32.5, indicating that the test is very sensitive in identifying feeding problems specific to children with ASD. The finding was significant as the Cronbach's alpha value obtained was 0.44 shows significant positive relationship and indicating that all items were reliable.

There is currently an unavailability of a tool in Hindi, a north Indian language, to address feeding problems in native Hindi-speaking children with ASD. Tools available in foreign languages cannot be directly used in the Indian context. Thus, there is a need of cultural adaptation, translation, and validation of Hindi version of BAMBI.

CHAPTER - III

METHOD

Ethical consideration: This study was conducted at the AIISH in Mysuru, following approval of “Ethical guideline for BioBehavioral Research including Human Subjects” (Basavaraj & Venkatesh, 2009). Caregivers of the participants received detailed explanations about the study procedures and utmost care was taken to guarantee the safety and confidentiality of participant details.

Participants:

A total of 60 participants in the age range of 3-11 years were enrolled into two groups. Group 1 consisted of 30 primary caregivers of children diagnosed with ASD, while Group 2 consisted of 30 primary caregivers of age-matched neurotypical children. Participants were recruited through convenience sampling. Parents of children undergoing speech-language and/or occupational therapy services at the Department of Clinical Services and Preschool Education at AIISH, Mysuru as well as in other clinical settings were enrolled for the study. They were further subdivided into three categories: 3.0-5.11 years, 6.0-8.11 years, and 9.0-11.11 years.

Table 3.1

Gender distribution across children with ASD and TD

Gender	Group-1 (Children with ASD) (n=30) (Mean=7.12, SD= 2.41)	Group-2 (Neurotypical children) (n=30) (Mean= 7.08, SD=2.43)
Male	25	15
Female	5	15

Inclusion criteria

- Hindi as the native language of the primary caregiver.
- All the children were diagnosed as having ASD by an RCI certified SLP.
- The parent or caretaker who spend quality time during the child's mealtime was enrolled.
- Parent with a minimum educational qualification of tenth grade was enrolled.

Exclusion criteria

- The research did not enroll parents of children with any other additional issues, such as seizure disorder, or motor or intellectual deficits.
- The children who had previously attended feeding therapy were excluded.

Procedure:

The study was conducted in two phases: Stage 1 involved translating and culturally adapting the original BAMBI questionnaire, and Stage 2 involved validating the tool. The widely accepted American Association of Orthopedic Surgeons (AAOS) rules, which include the forward-backward translation approach, were used to translate and adapt the BAMBI questionnaire. Permission from the authors of the BAMBI questionnaire (Lukens & Linscheid, 2018) was acquired by email on October 5, 2023.

Stage 1: Translation and Adaptation of the BAMBI questionnaire.

The following five AAOS recommended steps will be used in the translation and adaptation process.

1. Forward translation
2. Synthesizing common translation

3. Backward translation
4. Expert committee review
5. Pre- final testing

1. Forward translation

The English-adapted version of the BAMBI questionnaire underwent translation into Hindi by two Hindi-English bilingual individuals: one of them was a professional translator (Teacher in Hindi, Higher senior secondary school, Indore), while the other was an SLP with expertise in feeding-related issues (Clinical Speech Language Pathologist at the AIISH, Mysore). They had Hindi as their first language and English as their second language. The BAMBI questionnaire (Appendix I) consists of 18 statements, all of which except for four statements (statements 3, 9, 10 & 15) were problem statements. The four statements were converted to problem statements to maintain uniformity across all the statements. For example, Statement 3 "My child remains seated at the table until the meal is finished" was converted to "My child does not remain seated at the table until the meal is finished". The translators then produced individual translations (F1 and F2), aiming for logical translations rather than literal ones. They considered the definition of the original term, without translating it 'word to word'. The focus was on ensuring comprehensibility for ordinary layman respondents rather than catering to professional audiences. The translation process also took into account cultural variations in mealtime behavior.

2. Synthesizing common translation

A third member of the independent team (a clinical SLP) provided a single consolidated translation once the differences between the independent translations had

been resolved. The version that was simpler, clearer, and more colloquial was selected out of the two translations since every translator had a different language preference and word choice. The common synthesis process was summed up in a written report. An attempt was made to come to a consensus on subjects. Every issue was thoroughly examined, along with potential solutions.

3. Backward translation

Within a month span, two Hindi-English bilingual adults from a non-medical background (Hindi postgraduate students, Maghad University, Bihar state, Hindi) individually translated the common synthesized translation back into English (B1 and B2). Similar to the forward translations, the primary objective was to achieve a translation with the same linguistic sophistication as the source. However, rather than strict language equivalence, the objective of maintaining intellectual and cultural parity was more important in this backward translation.

4. Expert committee review

The team comprised two proficient SLPs (Assistant professors in SLP) and were skilled in both forward and backward translation. All members of the panel were bilingual Hindi-English bilinguals. The expert committee thoroughly reviewed all translations, identified any errors, and subsequently drafted a report detailing the steps to be taken to ensure equivalency. They rated the items on a four-point Likert scale (1-4) (Helen-2016) where each point had a description in terms of ambiguity, cultural appropriateness, clarity, and representativeness. They provided appropriate suggestions regarding the questions.

Table 3.2*Parameters considered for content validation and their corresponding ratings*

	1	2	3	4
Ambiguity	Ambiguity of the item is high	Item needs some revision	No doubt, but Item needs some minor revision	Meaning is clear
Cultural Appropriateness	Inappropriate	Item needs some revision	Appropriate but needs some minor revision	Highly appropriate
Clarity	Not clear	Item needs some revision	Clear but needs some minor revision	Item clarity is good
Representativeness	Not a representative of the desired content	Item needs some revision	Representative but needs some revision	Highly representative

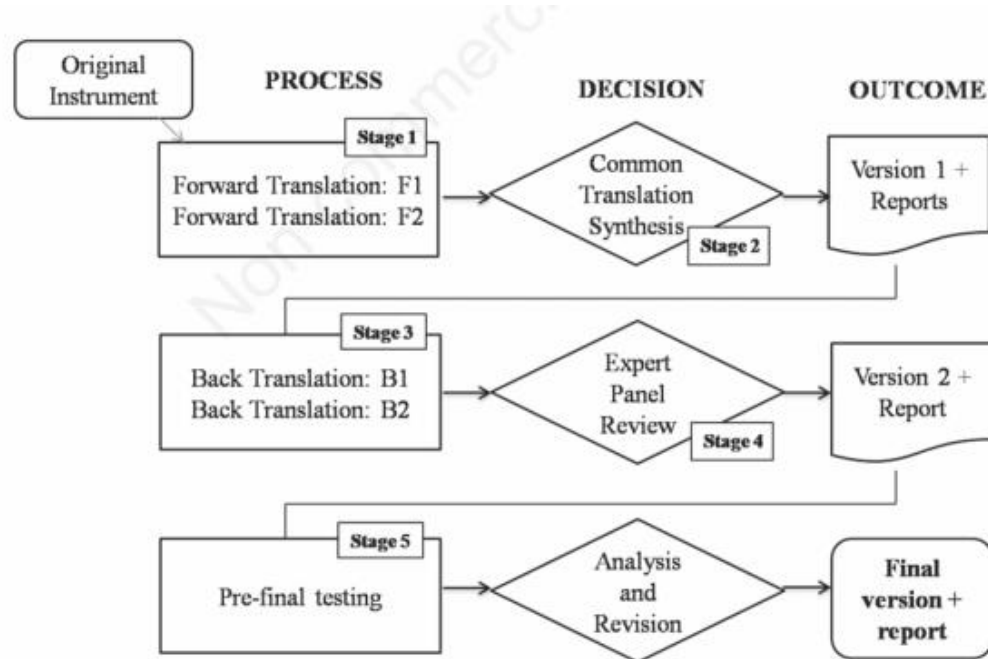
5. Field testing of pre-final version

This prefinal version of the questionnaire was administered to 15 primary caregivers of children with ASD. This step preceded the finalization of the translated questionnaire's ultimate form. Based on the initial questionnaire, participants were selected for interviews. In addition to providing answers, participants were asked to share their perspectives on how they interpreted each question. Additionally, they were asked if any of the questions or things bothered them or appeared unimportant and if there were any other issues related to feeding behavior apart from the 18 statements. The opinions and responses were reviewed to ensure that the translation was accurate, and any modifications that were required were made before the questionnaire was ready. All the revisions mentioned above led to the final BAMBI version of the Hindi questionnaire. The AAOS translation-adaptation process adapted from Thimmaiah et

al. (2016) is summarized in the flowchart below.

Figure 3.1:

Flowchart depicting translation process in Stage 1 (in accordance to the principle of the American Association of Orthopedic Surgeons, AAOS, adapted by Thammaiah et al., 2016, picture taken with permission)



Stage 2: Validation of translated questionnaires

This stage validated the translated and adapted BAMBI-H on children with feeding problems secondary to ASD.

Administration of BAMBI-H

The BAMBI-H was administered to caregivers who are native Hindi speakers and proficient in reading and writing Hindi. This group comprised caregivers of both children with ASD and typically developing children within the age range of 3 to 11

years. Caregivers received a concern report as well. Following the BAMBI-H assessment, they were requested to complete the Feeding Handicap Index. In the BAMBI-H, caregivers were presented with 18 statements, each requiring a response ranging from 1 to 5, where 1 denoted "never" and 5 denoted "always." Additionally, they were requested to indicate whether each statement posed a problem for them or not. The count was determined based on the number they selected in their response. The Feeding Handicap Index (FHI) comprises 38 questions across three domains: physical, emotional, and functional. Each question employs a rating scale of 0 to 2, where 0 signifies "never" and 2 signifies "always." Following the completion of these questions, caregivers are asked to assess the severity of the child's condition on a 7-point rating scale, ranging from normal to severe.

Statistical analysis

1. Descriptive statistics: Mean, standard deviation and median scores of BAMBI-H questionnaire was calculated for each group. Non parametric test was carried out for further analysis. Mann-Whitney test was used to compare the scores between the groups.
2. Test-Retest Reliability (Stability): The BAMBI-H tool was re-administered on 10% of the both participants group one week after their initial response and Spermans-Rho correlation was utilized to compare the obtained results.
3. Internal Consistency: Consistency of statements of BAMBI-H was assessed among children with ASD and typical children using Cronbachs alpha test.
4. Concurrent validity: Feeding Handicap Index (FHI) was used as a gold standard tool to check the concurrent validity.

5. Discriminate validity: Pearson's correlation coefficients was employed among the statements in BAMBI-H to assess discriminant validity.
6. Cut off score: The Receiver Operating Curve (ROC) was employed to determine the optimal clinical cut-off score to differentiate between the two groups and to graphically display the trade-off between sensitivity and specificity.

CHAPTER- IV

RESULTS

The study aimed to translate, adapt, and validate the English version of the Brief Autism Mealtime Behavioral Inventory (BAMBI) questionnaire into Indian language Hindi. The primary objective was to translate and adapt the questionnaire to Hindi. The secondary objective was to validate the Hindi version of BAMBI (BAMBI-H). These two objectives of the study were carried out in two phases. Phase I included translation and adaptation of the English version of the BAMBI questionnaire to Hindi and Phase II involved administration of the developed BAMBI-H in 30 children with ASD in the age range of 3-11 years. In Appendix B final BAMBI-H version is provided.

Phase I: Translation and Adaptation of the English version of the BAMBI questionnaire in Hindi

The BAMBI questionnaire was translated and cross-culturally adapted into Hindi following the guidelines of the American Association of Orthopedic Surgeons (AAOS) principles adapted from Thimmaiah et al. (2016). The translation-adaptation process was carried out in five stages.

4.1.1 Forward translation

The original English BAMBI questionnaire underwent translation into Hindi by two Hindi-English bilingual individuals: a professional translator (Teacher in Hindi, Higher senior secondary school, Indore), and an SLP with expertise in feeding-related issues (Clinical Speech Language Pathologist at the AIISH, Mysore). The BAMBI questionnaire consisted of 18 statements, all except for four statements (statements 3, 9, 10 & 15) were problem statements. The four statements were converted into problem

statements to maintain uniformity across all the statements. Only for statement 3 “My child remains seated at the table until the meal is finished” the word ‘table’ was removed because of cultural adaptation and statement made was “My child remains seated until the meal is finished”.

Table 4.1.

BAMBI-H statements and their F1 and F2 Translated Version (in IPA)

S.N	BAMBI statements	Conversion into problem statement	F1 (forward translation 1)	F2 (forward translation 2)
1	My child cries or screams during mealtimes.	Not change required. The statement was retained.	'me:ra 'k ^h a:ɬe 'ro:ɬa: 'ja: 'tʃil:a:ɬa: hə	'bətʃ:a 'səmaɪ 'b ^h o:ɔ̃ɰ ke: sə'məj 'ro:ɬa: jə 'tʃil:a:ɬa: fiɛ
2	My child turns his/her face or body away from food.	Same	'me:ra 'k ^h a:ne ki 'de:k ^h ne 'əpna: 'p ^h e:r 'le:ɬa: hə	'bətʃ:a 'tʃi:ze 'paɪ 'ʃəri:r 'k ^h a:ne: se: 'du:r kəɪ le:ɬa: fiɛ:
3	My child remains seated until the meal is finished.	My child does not remain seated until the meal is finished	'me:ra 'k ^h a:na 'ho:ne se 'hi: 'oʰ 'dʒa:ɬa: hə	'bətʃ:a 'k ^h a:na: 'pəfile 'nəfi:n 'bəiʰɬa: fiɛ:
4	My child expels (spits out) food that he/she has eaten.	Same	'me:ra 'k ^h a:ne ko 'de:ɬa: hə	'bətʃ:a 'tʃu:ŋk 'k ^h a:ne: ko: 'moŋfi se: 'nikəl jə 'tʃu:ŋk de:ɬa: fiɛ:
5	My child is aggressive during mealtimes (hitting, kicking, scratching others).	Same	'me:ra 'k ^h a:ne ke 'gɔs:a ('ma:rna:, 'ləɬ 'ma:rna:, 'na:k ^h u:n 'ma:rna:)	'bətʃ:a 'səmaɪ 'k ^h a:ne: ko: 'səməj 'bahuɬ 'a:kra:mək fiɛ: ('ma:rna:, 'la:ɬ 'ma:rna:, 'na:k ^h u:n 'ma:rna:)
6	My child displays self-injurious behavior during	Same	'me:ra 'k ^h a:ne ke 'əpne 'a:p 'pəfiɔʰɬa: hə	'bətʃ:a 'səmaɪ 'ko 'ʃri:ɬ 'swəjəm ko: 'nəkəsa:n

	mealtimes (hitting self, biting self).		'ko 'ma:rna:, 'd̪a:n̪t̪ 'ka:t̪əna:)	'pəhʊntʃa:t̪a: fi: ('kʰʊd̪ ko: 'ma:rna:, 'd̪a:n̪t̪ 'ka:t̪əna:)
7	My child is disruptive during mealtimes (pushing/throwing utensils, food).	Same	'me:ra 'bətʃ:a 'kʰa:ne ke 'səmaɪ 'st̪ʰiɾ 'nəhi:n 'rəh̪t̪a: ('d̪ʰək:a: 'ma:rna:, 'bart̪ən 'pʰe:kəna:, 'kʰa:na: 'pʰe:kəna:)	'me:ra 'bətʃ:a 'kʰa:ne ke 'səmaɪ 'st̪ʰiɾ 'nəhi:n 'rəh̪t̪a: ('d̪ʰək:a: 'ma:rna:, 'bart̪ən 'pʰe:kəna:, 'kʰa:na: 'pʰe:kəna:)
8	My child closes his/her mouth tightly when food is presented	Same	'me:ra 'bətʃ:a 'kʰa:ne ke 'səmaɪ 'd̪ʒo:r se 'mʊŋfi 'bənd̪ 'ka:r 'le:t̪a: hɛ	'me:ra: 'bətʃ:a 'kʰa:na: 'd̪i:e: 'd̪ʒa:ne: pər 'mʊŋfi kəŋs kər 'bənd̪ kər le:t̪a: fi: hɛ
9	My child is flexible about mealtime routines (e.g., times for meals, seating arrangements, place settings).	My child is not flexible about mealtime routines (e.g., times for meals, seating arrangements, place settings).	'me:ra 'bətʃ:a 'kʰa:ne ke 'səmaɪ 'me:n 'bəd̪la:v 'ho:ne 'pər 'ənʊkʊl 'vʲəvə 'fi:a:r 'nəhi:n 'kərət̪a: hɛ ('səmaɪ 'əʊr 'd̪ʒəgə 'ka: 'bəd̪ləna:)	'me:ra: 'bətʃ:a 'kʰa:ne: ki: 'ro:d̪ʒ ki: 'd̪ɪnt̪ʃəɾja: ke: 'ba:re:me: 'lət̪ʃi:la: 'nəhi:n fi: ('kʰa:na: 'kʰa:ne: ke: 'səməj 'aur 'd̪ʒəgəh ka: 'bəd̪ləna:)
10	My child is willing to try new foods	My child is not willing to try new foods.	'me:ra 'bətʃ:a 'ne 'nəe 'kʰa:d̪jə 'pəda:r̪h̪o: ko 't̪raɪ 'karne 'me:n 'səh̪jə:g 'nəhi:n 'kərət̪a: hɛ	'me:ra: 'bətʃ:a: 'nəje: 'kʰa:ne: ko: 'a:d̪ʒma:ne: ka: 'ɪt̪ʃʊk 'nəhi:n fi: 'səh̪jə:g 'nəhi:n 'kərət̪a: hɛ
11	My child dislikes certain foods and won't eat them.	Same	'me:re 'bətʃ:e ko 'kʊt̪ʃ 'kʰa:d̪jə 'pəda:r̪h̪ 'nə'pəsənd̪ 'hɛ 'ər 'vəh 'onhe: 'nəhi:n 'kʰət̪a: hɛ	'me:re: 'bətʃ:e: ko: 'kʊt̪ʃ 'kʰa:ne: ki: 't̪ʃi:zə 'nəhi:n 'pəsənd̪ 'd̪ʒi:se: 'vo: 'kəbʰi: 'nəhi:n 'kʰət̪a: 'kʰət̪a: hɛ
12	My child refuses to eat foods that require a lot of chewing (e.g., eats only soft or pureed foods).	Same	'ese: 'kʰa:d̪jə 'pəda:r̪h̪ 'd̪ʒinhe: 'ka:fi: 't̪ʃəba:ne ki 'd̪ʒərʊət 'hɛ, 'onhe: 'me:ra 'bətʃ:a 'əsvi:ka:r	'me:ra: 'bətʃ:a: 'd̪ʒje:d̪a: 't̪ʃəba:ne: 'va:li: 't̪ʃi:zjo: ko: 'nəhi:n 'kʰət̪a: ('sɪrf 'mola:jem 'kʰa:d̪jə

			'kərəʈa: hɛ ('sɪrʃ 'mɒlɑ:ʤem 'kʰa:ʤjə 'pəʈɑ:rʈʰ, 'tərəl 'pəʈɑ:rʈʰ) 'pəʈɑ:rʈʰ)	'pəʈɑ:rʈʰ, 'tərəl 'pəʈɑ:rʈʰ)
13	My child prefers the same foods at each meal.	Same	'me:ra 'bətʃ:a 'hər 'ba:r 'e:k 'səma:n 'ke: 'kʰa:ʤjə 'pəʈɑ:rʈʰ ko 'kʰa:na: 'pəsəŋd 'kərəʈa: hɛ	'me:ra: 'bətʃ:a: 'fiər 'ba:r 'e:k 'hi: 'tərəh 'ka: 'bʰo:ʤɪŋ 'kʰa:na: 'pəsəŋd 'kərəʈa: fiɛ:
14	My child prefers “crunchy” foods (e.g., snacks, crackers).	Same	'me:ra 'bətʃ:a 'kurkure 'kʰa:ʤjə 'pəʈɑ:rʈʰ 'kʰa:na: 'pəsəŋd 'kərəʈa: hɛ	'me:ra: 'bətʃ:a: me: 'kurkuri: 'kʰa:ʤjə 'pəʈɑ:rʈʰ 'kʰa:na: 'pəsəŋd 'kərəʈa: fiɛ: ('tʃəps, 'bʰu:ʤi:ʤa: ɪtʃɑ:ʤi:)
15	My child accepts or prefer a variety of foods.	My child does not accept or prefer a variety of foods.	'me:ra 'bətʃ:a 'vɪbʰɪŋŋ 'prəka:r 'ke: 'kʰa:ʤjə 'pəʈɑ:rʈʰ 'kʰa:na: 'pəsəŋd 'nəfi:n 'kərəʈa:	'me:ra: 'bətʃ:a: 'tərəh ki: 'tʃi:zə 'kʰa:na: 'pəsəŋd 'nəfi:n 'kərəʈa:
16	My child prefers to have food served in a particular way.	Same	'me:ra 'bətʃ:a 'kʰa:ne ko 'vɪʃɪʃt 'təri:ke se 'paro:se 'dʒa:ne 'par 'hi: 'pəsəŋd 'kərəʈa: hɛ	'me:ra: 'bətʃ:a: 'vɪʃe:ʃ 'təri:ke: se: 'paro:sa: 'gəjə 'hu:ə 'kʰa:na: hi: 'pəsəŋd 'kərəʈa: fiɛ:
17	My child prefers only sweet foods (e.g., candy, sugary cereals).	Same	'me:ra 'bətʃ:a 'sɪrʃ 'mi:tʰi: 'tʃi:ze 'kʰa:na: 'pəsəŋd 'kərəʈa: hɛ	'me:ra: 'bətʃ:a: 'ke:vəl 'mi:tʰa: 'kʰa:na: 'pəsəŋd 'kərəʈa: fiɛ: ('dʒe:se: ('kəē:ʤi:, 'mi:tʰe: 'əna:ʤɪ ki: 'mi:tʰa:i: ʤə 'tʃə:klət)
18	My child prefers food prepared in a particular way (e.g., eats mostly fried foods, cold cereals, raw vegetables).	Same	'me:ra 'bətʃ:a 'vɪʃɪʃt 'vɪdʰi: se 'bəna: 'fiʊə 'kʰa:na: 'hi: 'pəsəŋd 'kərəʈa: hɛ ('tɑ:la: 'huə, 'kətʃi:i: 'səbʤi:ʤa)	'me:ra: 'bətʃ:a: 'e:k 'vɪʃe:ʃ 'təri:ke: se: 'bəna:ʤa: 'hu:ə 'kʰa:na: hi: 'pəsəŋd 'kərəʈa: fiɛ: ('təla: 'hu:ə, 'kətʃi: 'səbʤi:ʤa, 'tʰəŋʤa:)

4.1.2 Synthesizing common translation

A third member of the independent team (a clinical SLP at the facility) consolidated both translations. The version that was simpler, clearer, and more colloquial was selected out of the two translations. The common synthesis process was summed up in a written report (Table 4.2).

Table 4.2.

BAMBI-H statements after synthesizing common translation (in IPA)

S. N	BAMBI statements	Statements from consolidated version (Step-2)
1	My child cries or screams during mealtimes.	'me:ra 'bətʃtʃa 'xa:te 'səməj 'ro:ʈa: 'ja: 'tʃil:a:ʈa: fiə
2	My child turns his/her face or body away from food.	'me:ra 'bətʃtʃa 'xa:ne 'ko: 'de:k ^h ne 'par 'əpəna 'ʃəri:r 'ja: 'mun ^h 'xa:ne 'se: 'mo:ʈ 'le:ʈa: fiə:
3	My child does not remain seated until the meal is finished.	'me:ra 'bətʃtʃa 'xa:na 'pu:ra: 'xa:je: 'bimə fi: 'oʈ ^h 'dʒa:ʈa: fiə:
4	My child expels (spits out) food that he/she has eaten.	'me:ra 'bətʃtʃa 'xa:ne 'ko: 'mun ^h 'se: 'nikəl 'ja: 'tʃu:ŋk 'de:ʈa: fiə:
5	My child is aggressive during mealtimes (hitting, kicking, scratching others).	'me:ra 'bətʃtʃa 'xa:ne 'ko: 'səməj 'bahut ^h 'gɔs:a 'kərəʈa: fiə: ('ma:rəna:, 'laʈ 'ma:rəna:, 'na:k ^h u:n 'ma:rəna:)
6	My child displays self-injurious behavior during mealtimes (hitting self, biting self).	'me:ra 'bətʃtʃa 'xa:ne 'ko: 'səməj 'k ^h oʈ 'ko: 'nɔkəsa:n 'pəfiʊntʃa:ʈa: fiə: ('k ^h oʈ 'ko: 'ma:rəna:, 'd̪a:nʈ 'ka:ʈəna:)
7	My child is disruptive during mealtimes (pushing/throwing utensils, food).	'me:ra 'bətʃtʃa 'xa:na: 'xa:ne 'ko: 'səməj 'st ^h ir 'nəhi: 'rəfiəʈa: ('dʒe:se: 'b ^h o:dʒa: 'ja: 'bartən 'ko: 'p ^h e:kəna: 'ja: 'd̪ ^h əke:ləna:)
8	My child closes his/her mouth tightly when food is presented	'me:ra 'bətʃtʃa 'xa:na: 'xiləʈe 'səməj 'əpəna: 'dʒo:r 'se: 'mun ^h 'bənd̪ 'ka:r 'le:ʈa: fiə:

9	My child is not flexible about mealtime routines (e.g., times for meals, seating arrangements, place settings).	'me:ra 'bətʃtʃa 'xa:ne: 'ki: 'ro:dʒ 'ki: 'a:dəʊ:ŋ 'me: 'kɪsi: 'bʰi: 't̪ərəʃi 'ke: 'bəðələ:v 'ko: 'pəsəŋd̪ 'nəʃi: 'kərəʃa: ('xa:ne: 'xa:ne 'ke: 'səməj 'o:r 'dʒəgəh 'ka: 'bəðələna:)
10	My child is not willing to try new foods.	'me:ra 'bətʃtʃa 'ko:i: 'na:ji: 'xa:ne: 'ki: 'tʃi:z 'xa:na: 'nəʃi: 'tʃa:ʃəʃa:
11	My child dislikes certain foods and won't eat them.	'me:re: 'bətʃtʃa 'kʊtʃ 'nə 'pəsəŋd̪ 'tʃi:ŋdʒo: 'ko: 'kəbʰi: 'nəʃi: 'kʰəʃa:
12	My child refuses to eat foods that require a lot of chewing (e.g., eats only soft or pureed foods).	'me:ra 'bətʃtʃa 'dʒje:ða: 'tʃəba:ne: 'va:li: 'tʃi:zə 'ko: 'nəʃi: 'kʰəʃa: ('sɪf 'mʊlə:jem 'xa:dʒə 'pədə:r̪ʰ, 't̪ərəl 'pədə:r̪ʰ)
13	My child prefers the same foods at each meal.	'me:ra 'bətʃtʃa 'ʃər 'ba:r 'e:k 'hi: 'tʃi: 'tərəh 'ka: 'bʰo:dʒən 'xa:na: 'tʃa:ʃəʃa: ʃe:
14	My child prefers “crunchy” foods (e.g., snacks, crackers).	'me:ra 'bətʃtʃa 'xa:ne: 'me: 'kʊrkʊri: 'tʃi:ze: 'xa:na: 'pəsəŋd̪ 'kərəʃa: ʃe: ('tʃəps, 'bʰu:dʒija: 'ɪtʃa:di:)
15	My child does not accept or prefer a variety of foods.	'me:ra 'bətʃtʃa 'ələg 'ələg 'tərəh 'ki: 'tʃi:ze: 'xa:na: 'pəsəŋd̪ 'nəʃi: 'kərəʃa:
16	My child prefers to have food served in a particular way.	'me:ra 'bətʃtʃa 'ke:vəl 'vɪʃe:f 'təri:ke: 'se: 'pəro:se: 'ʃʊe: 'xa:ne: 'ko: 'hi: 'pəsəŋd̪ 'kərəʃa: ʃe:
17	My child prefers only sweet foods (e.g. candy, sugary cereals).	'me:ra 'bətʃtʃa 'ke:vəl 'mi:tʰa: 'xa:na: 'pəsəŋd̪ 'kərəʃa: ʃe: ('dʒe:se: 'ki: 'mi:tʰa:ɪ: 'ja: 'tʃə:kəle:t̪)
18	My child prefers food prepared in a particular way (e.g., eats mostly fried foods, cold cereals, raw vegetables).	'me:ra 'bətʃtʃa 'vɪʃe:f 'təri:ke: 'se: 'bəna:ja: 'hu:ə 'xa:na: 'hi: 'pəsəŋd̪ 'kərəʃa: ʃe: ('t̪ələ: 'hu:ə, 'kətʃi: 'səbdʒi:ja:, 't̪ʰəŋd̪a:)

4.1.3 Backward translation

Within a month span, two Hindi-English bilingual adults from a non-medical background (Hindi postgraduate students, Maghad University, Bihar state; native Hindi speakers from Delhi) individually translated the common synthesized translation back into English (B1 and B2). Similar to the forward translations, the translation with the same linguistic sophistication as the source was achieved. However, rather than strict

language equivalence, the objective of maintaining intellectual and cultural parity was prioritized in this backward translation.

4.1.4 Expert Committee Review

The expert committee thoroughly reviewed all translations, and drafted a report detailing the steps to be taken to ensure equivalency.

In the translated BAMBI-H statement, statements 2, 4, 11, 12 ranked 3 in clarity. Hence, they were revised to enhance clarity and the statements as “मेरा बच्चा खाने को देखने पर अपना शरीर या मुँह खाने से मोड़ लेता है।” (Statement 2), “मेरा बच्चा खाने को मुँह से निकाल या थूक देता है।” (Statement 4), “मेरा बच्चा कुछ न पसंद चीजों को कभी नहीं खाता।” (Statement 11), “मेरा बच्चा ज्यादा चबाने वाली चीजों को नहीं खाता (सिर्फ मुलायम या तरल चीजे)।” (Statement 12) were modified accordingly to “मेरा बच्चा खाने को देखते ही अपना शरीर या मुँह मोड़ लेता है।”, “मेरा बच्चा खाना खाते समय खाना मुँह से निकाल (थूक) देता है।”, “मेरा बच्चा जो ना पसंद है, वो चीजे कभी नहीं खाता।”, “मेरा बच्चा जो चीजे ज्यादा चबानी पड़े वह नहीं खाता। (सिर्फ मुलायम या तरल चीजे खाता है।)” respectively.

Table 4.3

Modification suggested by the expert panel committee in Stage 4 for the synthesized final consolidated version of Step 2

S.N	BAMBI statements	Statements from consolidated version (Step-2)	Modification suggested by the expert Committee (Step-4)
1	My child cries or screams during mealtimes.	'me:ra 'bətʃtʃa 'xa:te 'səməj 'ro:ʈa: 'ja: 'tʃil:a:ʈa: fiə	'me:ra: 'bətʃtʃa: 'xa:ne: ke: 'səmaɪ 'ro:ʈa: 'ja: 'tʃil:a:ʈa: fiɛ:

- 2 My child turns his/her face or body away from food. 'me:ra 'bətʃtʃa 'xa:ne 'ko: 'me:ra: 'bətʃtʃa: 'xa:ne: 'de:kʰne 'par 'əpəna 'ʃəri:r ko: 'de:kʰtʃe: fi: 'əpna: 'ja: 'munʰ 'xa:ne 'se: 'mo:ʃ 'ʃəri:r 'ja: 'munʰi 'mo:ʃ 'le:tʃa: fi: | 'le:tʃa: fi: |
- 3 My child does not remain seated until the meal is finished. 'me:ra 'bətʃtʃa 'xa:na 'pu:ra: 'me:ra: 'bətʃtʃa: 'xa:na: 'xa:je: 'bɪnə fi: 'uʰh 'dʒa:tʃa: 'pu:ra: 'xa:je: 'bɪna: fi: fi: 'uʰh 'dʒa:tʃa: fi: | 'uʰh 'dʒa:tʃa: fi: |
- 4 My child expels (spits out) food that he/she has eaten. 'me:ra 'bətʃtʃa 'xa:ne 'ko: 'me:ra: 'bətʃtʃa: 'xa:ne: 'munʰ 'se: 'nikəl 'ja: 'tʰu:ŋk 'ko: 'de:kʰtʃe: 'səmaɪ 'de:tʃa: fi: 'xa:ne: 'munʰi 'se: 'nika:l ('tʰu:ŋk) 'de:tʃa: fi: | ('tʰu:ŋk) 'de:tʃa: fi: |
- 5 My child is aggressive during mealtimes (hitting, kicking, scratching others). 'me:ra 'bətʃtʃa 'xa:ne 'ko: 'me:ra: 'bətʃtʃa: 'xa:ne: 'səməj 'baɦuʃt 'gʊs:a 'kərəʃa: ke: 'səmaɪ 'baɦuʃt 'gʊs.sa: fi: ('ma:rəna:, 'laʃt 'ma:rəna:, 'kərəʃa: fi: | ('la:tʃ 'na:kʰu:n 'ma:rəna:) 'ma:rəna:, 'na:kʰu:n 'ma:rəna:)
- 6 My child displays self-injurious behavior during mealtimes (hitting self, biting self). 'me:ra 'bətʃtʃa 'xa:ne 'ko: 'me:ra: 'bətʃtʃa: 'xa:ne: 'səməj 'kʰuʃd 'ko: 'nʊkəsa:n ke: 'səmaɪ 'xuʃd 'ko: 'pəɦuʃtʃa:tʃa: fi: ('kʰuʃd 'ko: 'nʊksa:n 'pəɦuʃtʃa:tʃa: fi: | ('xuʃd 'ko: 'ma:rəna:, 'ma:rəna:, 'dʒa:nʃt 'ka:təna:) ('dʒa:nʃt 'ka:təna:) 'dʒa:nʃto: 'se: 'xuʃd 'ko: 'ka:təna:)
- 7 My child is disruptive during mealtimes (pushing/throwing utensils, food). 'me:ra 'bətʃtʃa 'xa:na: 'xa:ne 'me:ra: 'bətʃtʃa: 'xa:ne: 'ko: 'səməj 'stʰi:r 'nəɦi: 'xa:ne: ke: 'səmaɪ 'stʰi:r 'rəɦəʃa: ('dʒe:se: 'bʰo:dʒa: 'nəɦi: 'bəɦtʃa: | ('bʰo:dʒn 'ja: 'baʃtən 'ko: 'pʰe:kəna: 'ja: 'bəʃtən 'ko: 'pʰe:ŋkəna: 'ja: 'dʰəkələna:) 'dʰəkələna:)
- 8 My child closes his/her mouth tightly when food is presented 'me:ra 'bətʃtʃa 'xa:na: 'xɪləʃe 'me:ra: 'bətʃtʃa: 'xa:ne: 'səməj 'əpəna: 'dʒo:r 'se: 'xi:ləʃe: 'səmaɪ 'əpna: 'munʰ 'bəndd 'ka:r 'le:tʃa: fi: 'munʰi 'dʒo:r 'se: 'bənd 'kər 'le:tʃa: fi: | 'kər 'le:tʃa: fi: |
- 9 My child is not flexible about mealtime routines (e.g., times for meals, seating arrangements, place settings). 'me:ra 'bətʃtʃa 'xa:ne: 'ki: 'me:ra: 'bətʃtʃa: 'xa:ne: 'ro:dʒ 'ki: 'a:dəʃto:ŋ 'me: ki: 'ro:dʒ 'ki: 'a:dəʃto:ŋ 'kɪsi: 'bʰi: 'tərəɦi 'ke: 'me:ŋ 'kɪsi: 'bʰi: 'tərəɦ 'bədʒlə:v 'ko: 'pəsəndd 'nəɦi: 'ke: 'bədʒlə:v 'ko: 'pəsəndd 'kərəʃa: ('xa:ne: 'xa:ne 'ke: 'nəɦi:ŋ 'kərəʃa: | ('xa:ne: 'səməj 'o:r 'dʒəgəɦ 'ka: 'xa:ne: ke: 'səmaɪ 'ja: 'bədʒləna:) 'dʒəgəɦ 'ka: 'bədʒləna:)
- 10 My child is not willing to try new foods. 'me:ra 'bətʃtʃa 'ko:i: 'na:ji: 'me:ra: 'bətʃtʃa: 'ko:i: 'xa:ne: 'ki: 'tʃi:z 'xa:na: 'nəɦi: 'tʃa:ɦəʃa: 'nəɦi: 'xa:ne: ki: 'tʃi:z 'xa:na: 'nəɦi:ŋ 'tʃa:ɦəʃa: | 'xa:na: 'nəɦi:ŋ 'tʃa:ɦəʃa: |

11	My child dislikes certain foods and won't eat them.	'me:re: 'bətʃtʃa 'kʊtʃ 'nə 'pəsəŋd 'tʃi:ŋdʒo: 'ko: 'kəbʰi: 'nəhi: 'kʰəʃa:	'me:ra: 'bətʃtʃa: 'dʒo: 'na: 'pəsəŋd 'fi:, 'ʊo: 'tʃi:ze: 'kəbʰi: 'nəhi:ŋ 'xa:ʃa:
12	My child refuses to eat foods that require a lot of chewing (e.g., eats only soft or pureed foods).	'me:ra 'bətʃtʃa 'dʒje:ða: 'tʃəba:ne: 'va:li: 'tʃi:zə 'ko: 'nəhi: 'kʰəʃa: ('sɪf 'mʊla:jem 'xa:dʒə 'pəda:rʃʰ, 'tʃərəl 'pəda:rʃʰ)	'me:ra: 'bətʃtʃa: 'dʒo: 'tʃi:ze: 'dʒəja:ða: 'tʃəba:ni: 'pəʃe: 'ʊəf 'nəhi:ŋ 'xa:ʃa: ('sɪf 'mʊla:jəm 'ja: 'tʃərəl 'tʃi:ze: 'xa:ʃa: fi:)
13	My child prefers the same foods at each meal.	'me:ra 'bətʃtʃa 'fiər 'ba:r 'e:k 'hi: 'tʃi: 'tərəh 'ka: 'bʰo:dʒən 'xa:na: 'tʃa:fi:ʃa: fi:	'me:ra: 'bətʃtʃa: 'fiər 'səmaɪ 'e:k 'hi: 'tərəh 'ka: 'bʰo:dʒn 'xa:na: 'tʃa:fi:ʃa: fi:
14	My child prefers “crunchy” foods (e.g., snacks, crackers).	'me:ra 'bətʃtʃa 'xa:ne: 'me: 'kʊrkʊri: 'tʃi:ze: 'xa:na: 'pəsəŋd 'kərəʃa: fi: ('tʃəps, 'bʰu:dʒija: 'iʃja:di:)	'me:ra: 'bətʃtʃa: 'xa:ne: 'me:ŋ 'kʊrkʊri: 'tʃi:ze: 'pəsəŋd 'kərəʃa: fi: ('tʃɪps, 'bʰʊdʒija:)
15	My child does not accept or prefers a variety of foods.	'me:ra 'bətʃtʃa 'ələg 'ələg 'tərəh 'ki: 'tʃi:ze: 'xa:na: 'pəsəŋd 'nəhi: 'kərəʃa:	'me:ra: 'bətʃtʃa: 'ələg 'ələg 'tərəh 'ki: 'tʃi:ze: 'xa:na: 'pəsəŋd 'nəhi:ŋ 'kərəʃa:
16	My child prefers to have food served in a particular way.	'me:ra 'bətʃtʃa 'ke:vəl 'vi:ʃe:f 'təri:ke: 'se: 'pa:ro:se: 'fi:ʊe: 'xa:ne: 'ko: 'hi: 'pəsəŋd 'kərəʃa: fi:	'me:ra: 'bətʃtʃa: 'ke:vəl 'vi:ʃe:f 'təri:ke: 'se: 'pa:ro:se:ŋ 'fi:ʊe: 'xa:ne: ko: 'hi: 'pəsəŋd 'kərəʃa: fi:
17	My child prefers only sweet foods (e.g. candy, sugary cereals).	'me:ra 'bətʃtʃa 'ke:vəl 'mi:tʃa: 'xa:na: 'pəsəŋd 'kərəʃa: fi: ('dʒe:se: 'ki: 'mi:tʃa:i: 'ja: 'tʃo:kəle:tʃ)	'me:ra: 'bətʃtʃa: 'ke:vəl 'mi:tʃa: 'xa:na: 'pəsəŋd 'kərəʃa: fi: ('mi:tʃa:i: 'ja: 'tʃʊk:le:tʃ)
18	My child prefers food prepared in a particular way (e.g., eats mostly fried foods, cold cereals, raw vegetables).	'me:ra 'bətʃtʃa 'vi:ʃe:f 'təri:ke: 'se: 'bəna:ja: 'hu:ə 'xa:na: 'hi: 'pəsəŋd 'kərəʃa: fi: ('tʃəla: 'hu:ə, 'kətʃi: 'səbdʒi:ja:, 'tʃʰəŋdʌ:)	'me:ra: 'bətʃtʃa: 'vi:ʃe:f 'təri:ke: 'se: 'bəna:ja: 'fi:ʊə 'xa:na: 'pəsəŋd 'kərəʃa: fi: ('tʃəla: 'fi:ʊə, 'kətʃi: 'səbzi:ja:)

4.1.5 Field testing of pre-final version

This prefinal version of the questionnaire was administered to 15 primary caregivers of children with ASD who had feeding issues. All 18 statements were reviewed by parents as accurate and culturally appropriate.

Phase I (translation and adaptation of BAMBI questionnaire completed with the final version of BAMBI-H (Appendix-I) under 3 domains as shown in table 4.4.

Table 4.4

BAMBI-H under 3 domains

Domain	Statement number	Total
Limited Variety Factor (LVF)	10, 11, 13, 14, 15, 16, 17, 18	8
Food Refusal Factor (FRD)	1, 2, 4, 7, 8	5
ASD characteristic (CF)	3, 5, 6, 9, 12	5

Phase 2: Validation of BAMBI-H

4.2.1 Test-retest reliability of BAMBI-H

Test-retest reliability was assessed by readministering BAMBI-H questionnaire on 10% of total population within a time interval of 1 week. The spearman's rank correlation coefficient was used to assess the consistency or stability of BAMBI-H over time. The spearman-rho (ρ) value obtained was found to be 0.65 indicating moderate positive correlation. The findings indicated that BAMBI-H tool is a reliable tool to assess feeding skills in children with ASD.

4.2.2 Internal consistency of BAMBI-H

The internal consistency of items was assessed among children with ASD using Cronbach's coefficient alpha. The finding was significant as the Cronbach's alpha value obtained was 0.894 indicating that all items were highly reliable and measured

the feeding trait with high degree of reliability. However, the Cronbach's coefficient alpha was found to be 0.254 for typically developing children. This could be because the problem statements were uniformly rated as never or rarely in typically developing peers as compared to children with ASD. This could have reduced the variance needed for a higher Cronbach's alpha.

4.2.3 Concurrent Validity

Concurrent validity of BAMBI-H was established by administering the Feeding Handicap Index (FHI, Srushti & Swapna; 2014). The FHI is a gold standard tool used to assess feeding problems comprehensively in the physical, functional, and emotional domains. The FHI was developed by synthesizing information from the literature and feedback from parents of children with communication disorders regarding feeding issues. The inventory comprises 38 items, categorized into three domains: physical (21 items), functional (10 items), and emotional (5 items). Its 3-point rating scale (0-never, 1-sometimes, 3-always). Using Spearman's rho correlation, it is found that BAMBI-H has a strong positive relationship ($r = 0.848$, $p < 0.05$) (Al-Hameed, 2022) suggesting that BAMBI-H is strongly associated with FHI.

Table 4.5

Correlation between BAMBI-H and FHI in children with ASD

S.No	Variable	FHI	Total
		score	
1	BAMBI-H	total	Spearman's rho
	score		p-value
			0.848
			< 0.01

4.2.4 Cut off scoring using ROC curve

A Receiver Operating Characteristic (ROC) curve was created by plotting true positive rate i.e., sensitivity and specificity for BAMBI-H scores between group 1 and 2 at various threshold setting as shown in figure 4.1 showing its coordinates and sensitivity of specificity according to specific domain was shown in table.

Figure 4.1

ROC curve of the total BAMBI-H score and its domains

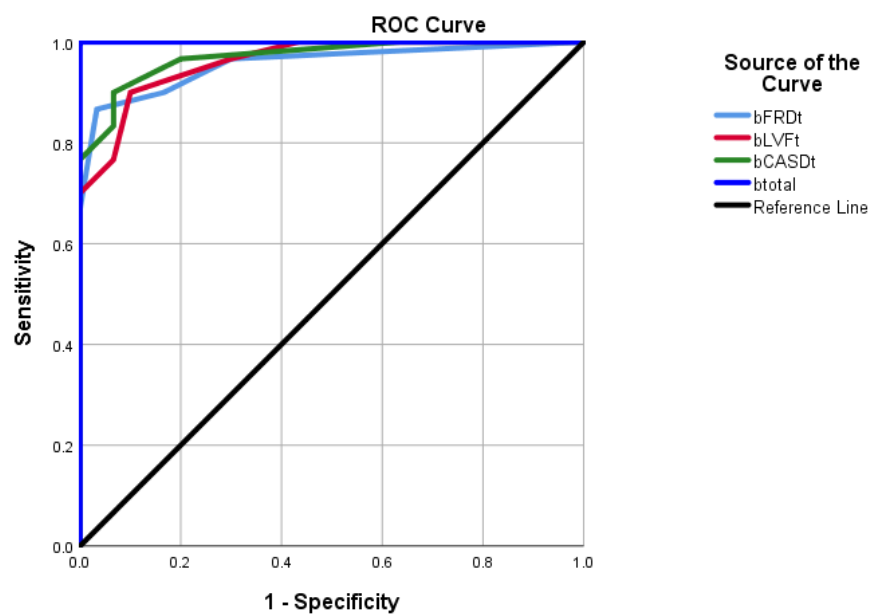


Table 4.6

Domain specific Sensitivity, specificity, cutoff score and Area under the curve

Domain	Sensitivity	Specificity	Cutt-off score	AUC
FRD	90%	84%	6.5	0.956
LVF	90%	90%	12.5	0.961
CASD	90%	94%	7.5	0.971
Total	100%	100%	27	1.000

Note: FRD- Food Refusal Domain; LVF- Limited Variety Factor; CASD- Characteristics of ASD

As seen in the figure, the ideal ROC curve with AUC closer to 1 is seen in the upper left corner of the chart. The sensitivity and specificity were found to be one (dark blue) at the cut-off score of 27, indicating that the test is very sensitive in identifying feeding problems specific to children with ASD. The domain food refusal factor cut-off score was 6.5, for limited variety factor cut off score was 12.5 and for children with ASD cut-off score was 7.5. All the 3 domains has higher AUC (1.000) indicating good accuracy of the tool. According to ROC curve, the BAMBI-H score 27 is considered to be overall cut-off score. A score equal to or above 27 indicated children with feeding problems. The area under the curve (AUC-ROC) obtained was 1 indicating very high discriminatory power.

4.2.5 BAMBI-H scores across children with ASD and Neurotypical children

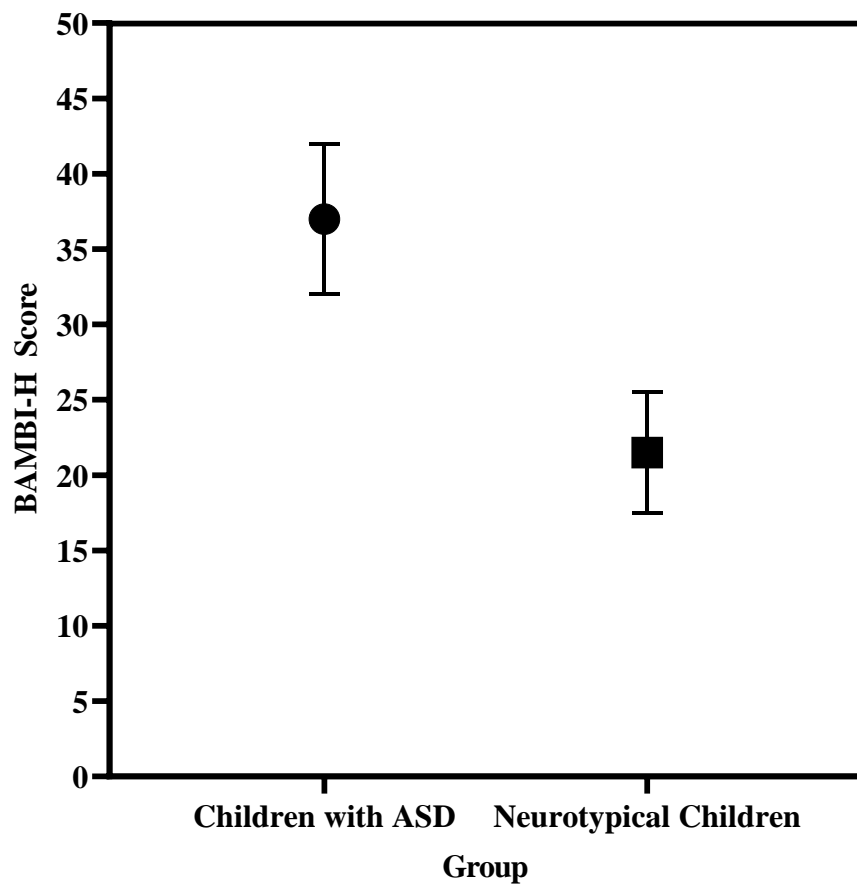
The 18 statements of BAMBI-H were filled by a total of 60 parents. Table depicts the demographic distribution and overall scores of group 1 (children with ASD) and group 2 (neurotypical children). A clear-cut distinction in the BAMBI-H scores between the two groups was found. Scores of Participants in group 1 (children with ASD) were higher compared to group 2 (neurotypical children). Among 30 participants, the highest and lowest score in the group 1 obtained was 47 and 32 respectively. The highest and lowest score in the group 2 obtained was 26 and 18 respectively. There was no overlap between the ranges of scores of both groups indicating a very clear distinction in the feeding issues. The BAMBI-H scores in group 1 was found to be wider in range and higher compared to group 2. The overall scores and demographic distribution of group 1 and 2 are given in the table.

Table 4.7*Overall scores and demographic distribution of two groups*

Overall score	BAMBI-M	Group 1 (Children with ASD) (n=30)	Group 2 (Neurotypical children) (n=30)
Mean		37.83	21.90
SD		4.62	2.41
Minimum score		32	18
Maximum score		47	26
Minimum age		3.00	3.00
Maximum age		11.11	11.11
Mean age		7.12	7.08
SD		2.41	2.43
Males		25	15
Females		5	15

Figure 4.2

Figure depicting the median BAMBI-H scores across children with ASD and Neurotypical children



Note. The Median score BAMBI-H score obtained across ASD children is 37 and for neurotypical children is 21.5.

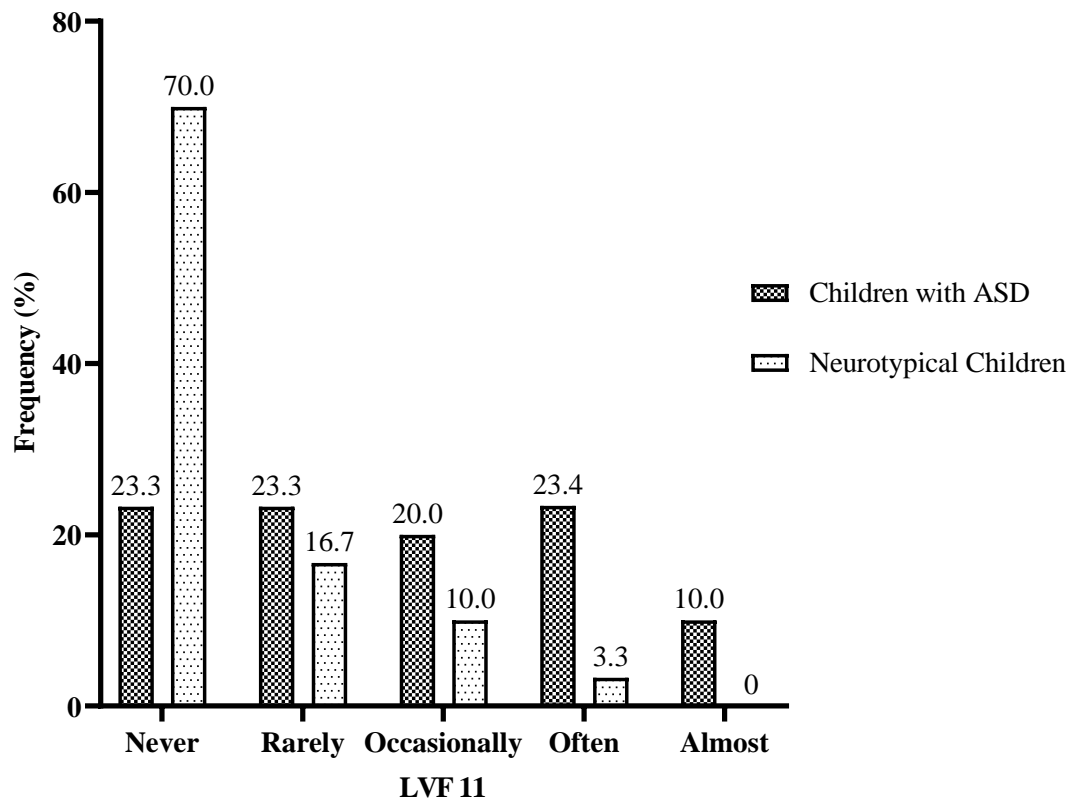
4.2.6 Most frequently rated item across the domains

4.2.5.1 Across Limited Variety Factor Domain. Of all the (total no. of LVF statements are 8) items in the limited variety factor (LVF), statement 11 “My child dislikes certain items and won’t eat them.” was found to be the most frequently scored item in group 1. More than 53.4% of parents of children with ASD rated it as falling under occasionally, often and almost. Item 11 assess the aversion towards certain foods

by the child or eating only narrower range of food, measuring the food selectivity, but while analysing item 11 in neurotypical population, 86.7% of the responses were falling in never and rarely category as seen in figure (4.3).

Figure 4.3

Frequency of occurrence of LVF 11 statement among ASD and Neurotypical Children

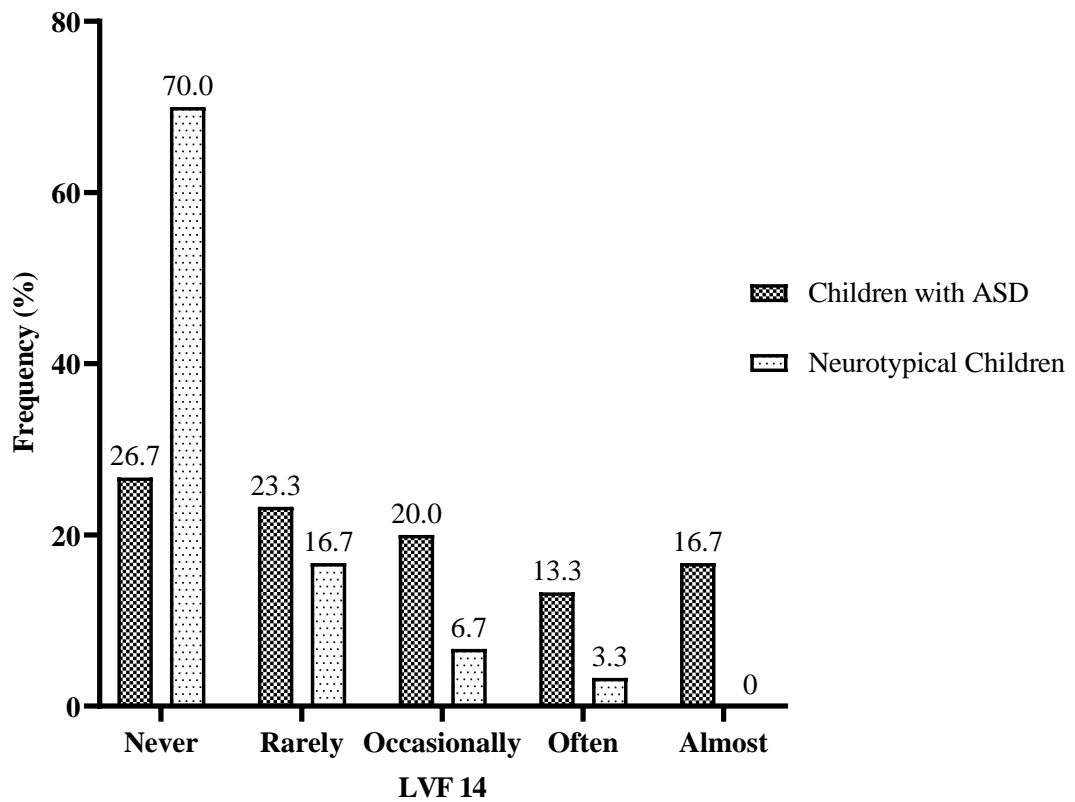


In decreasing order of frequency after statement 11, the most frequently occurring problematic issues were statements 14,10,13,15,17,18,16.

Statement 14 is about the preference of children for crunchy foods. More than 50% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 90% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 14 among children with ASD and Neurotypical children is depicted in figure 4.4.

Figure 4.4

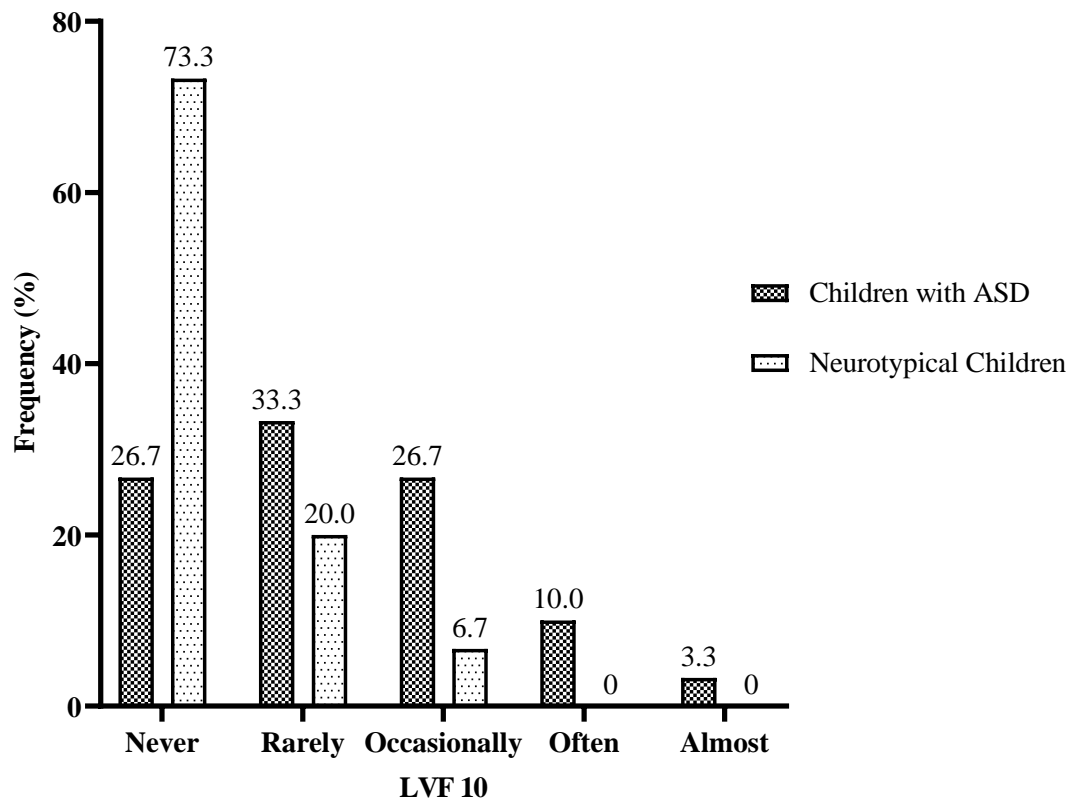
Frequency of Occurrence of LVF 14 Statement Among ASD and Neurotypical Children



Statement 10th is about the preference of children towards willing to try new foods. Around 40% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 93.3% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 10 among children with ASD and Neurotypical children is depicted in figure 4.5.

Figure 4.5

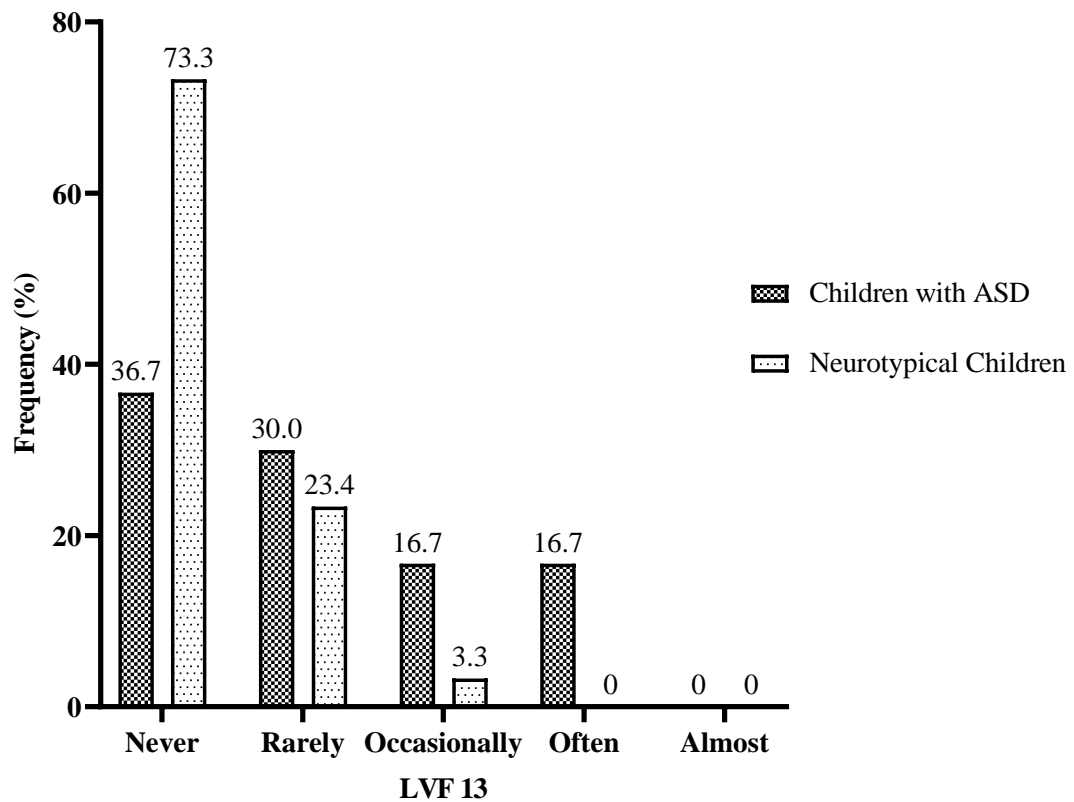
Frequency of Occurrence of LVF 10 Statement Among ASD and Neurotypical Children



Statement 13th is about the preference of children towards same food at each meal. Around 33.3% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 96.7% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 13 among children with ASD and Neurotypical children is depicted in figure 4.6.

Figure 4.6

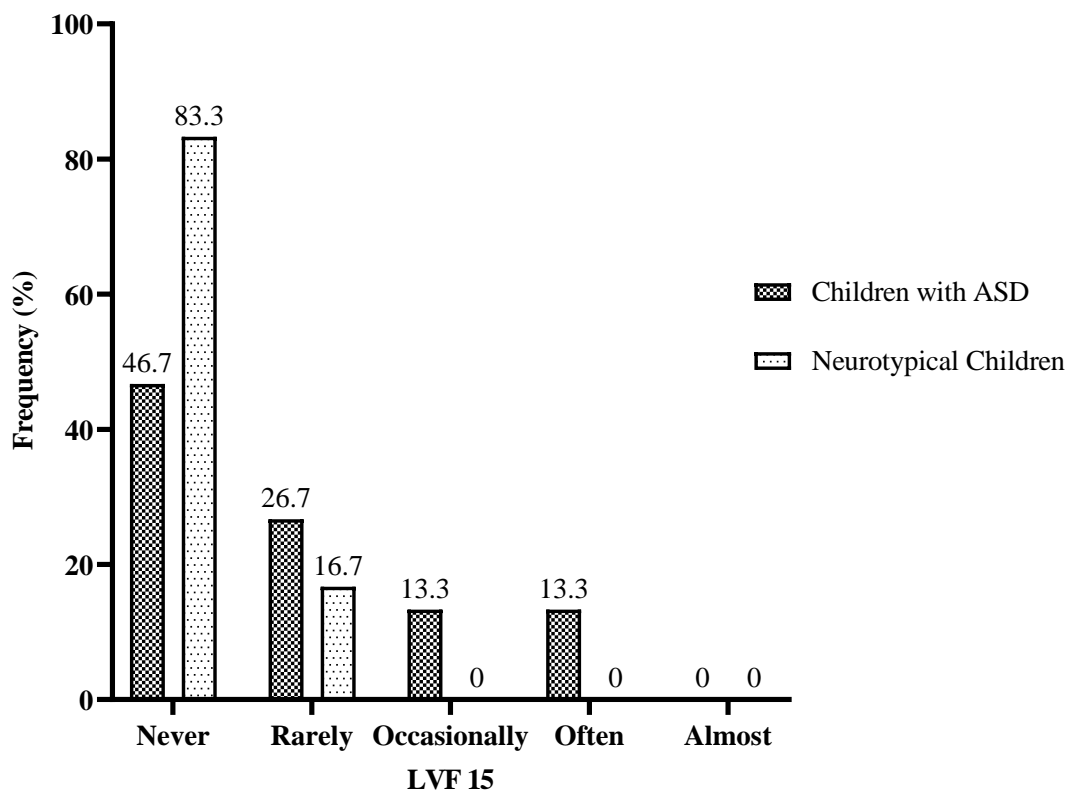
Frequency of Occurrence of LVF 13 Statement Among ASD and Neurotypical Children



Statement 15th is about the acceptance and preference of children towards a variety of foods. Around 26.6% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 100% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 15 among children with ASD and Neurotypical children is depicted in figure 4.7.

Figure 4.7

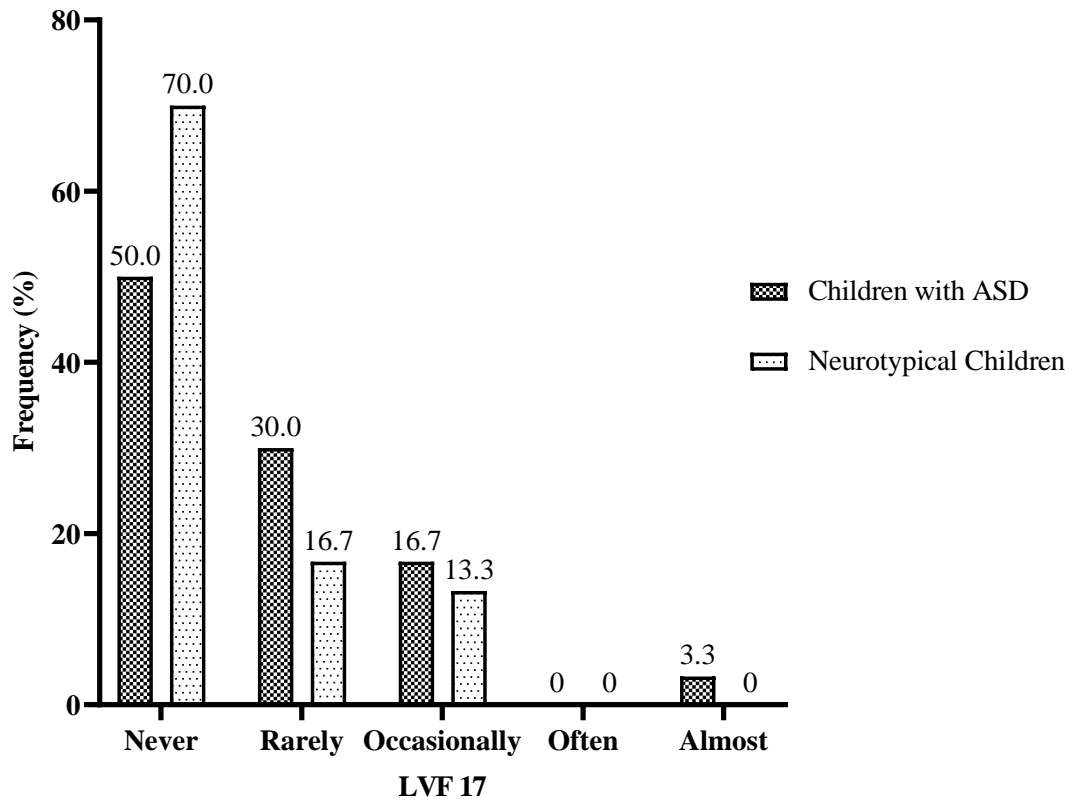
Frequency of Occurrence of LVF 15 Statement Among ASD and Neurotypical Children



Statement 17th is about the acceptance and preference of only sweet foods. Around 20% of parents of children with ASD rated it as falling under occasionally and almost, but in neurotypical population, 86.7% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 17 among children with ASD and Neurotypical children is depicted in figure 4.8.

Figure 4.8

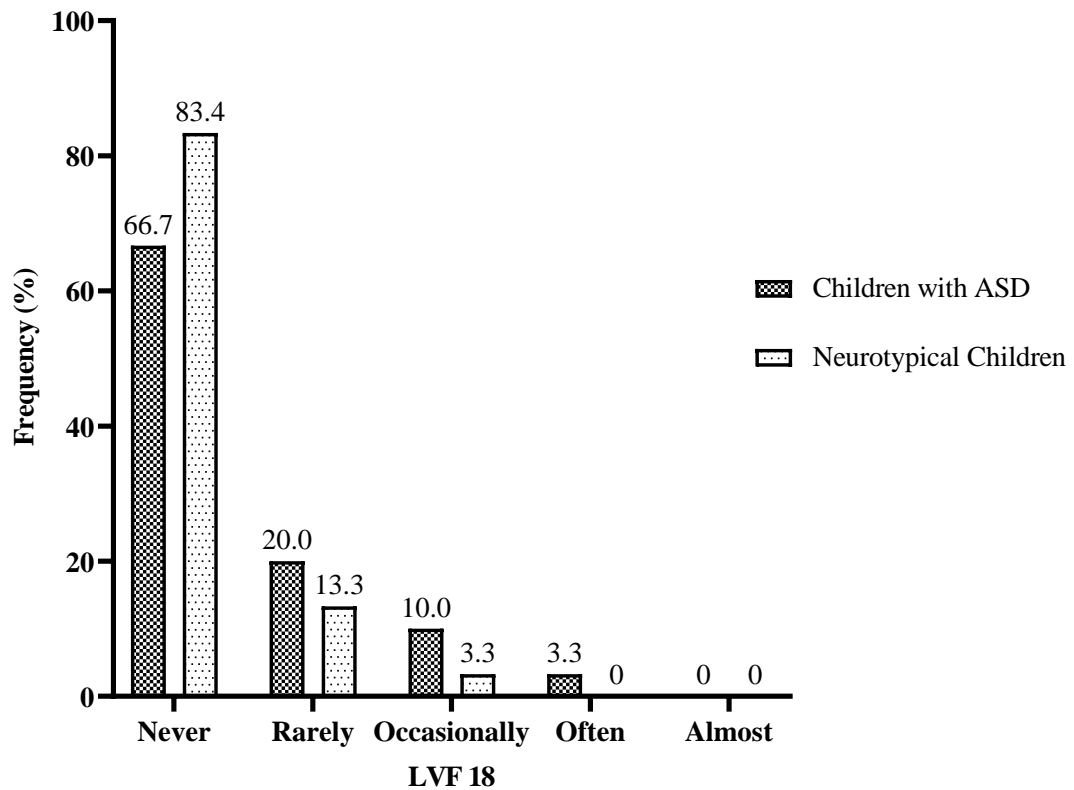
Frequency of Occurrence of LVF 17 Statement Among ASD and Neurotypical Children



Statement 18th is about the acceptance and preference of food prepared in a particular way. 13.3% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 96.7% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 18 among children with ASD and Neurotypical children is depicted in figure 4.9.

Figure 4.9

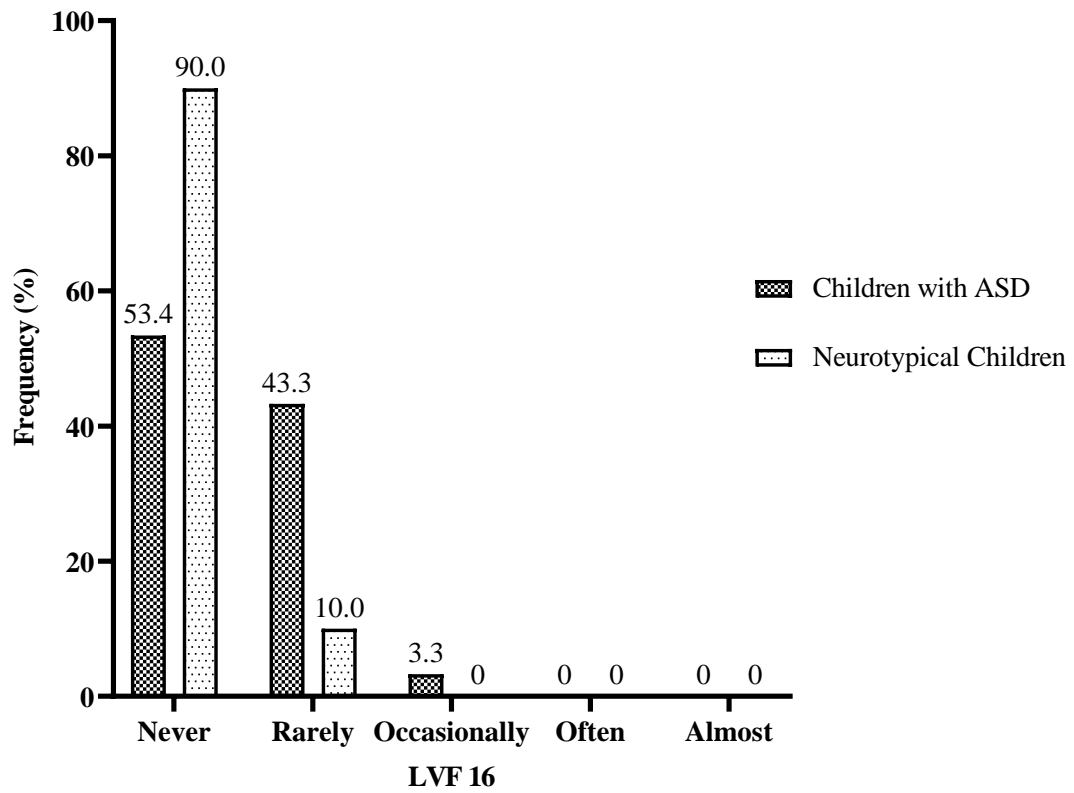
Frequency of Occurrence of LVF 18 Statement Among ASD and Neurotypical Children



Statement 16th is about the acceptance and preference of food served in particular way. Only 3.3% of parents of children with ASD rated it as falling under often, but in neurotypical population, 100% of the responses were falling in never and rarely category. The frequency of occurrence of LVF 16 among children with ASD and Neurotypical children is depicted in figure 4.10.

Figure 4.10

Frequency of Occurrence of LVF 16 Statement Among ASD and Neurotypical Children



Figures 4.11 and 4.12 illustrate the distribution of all LVF statements within the "never" to "almost" categories among children with ASD and neurotypical children.

Figure 4.11

Graph Indicating distribution of LVF among ASD children.

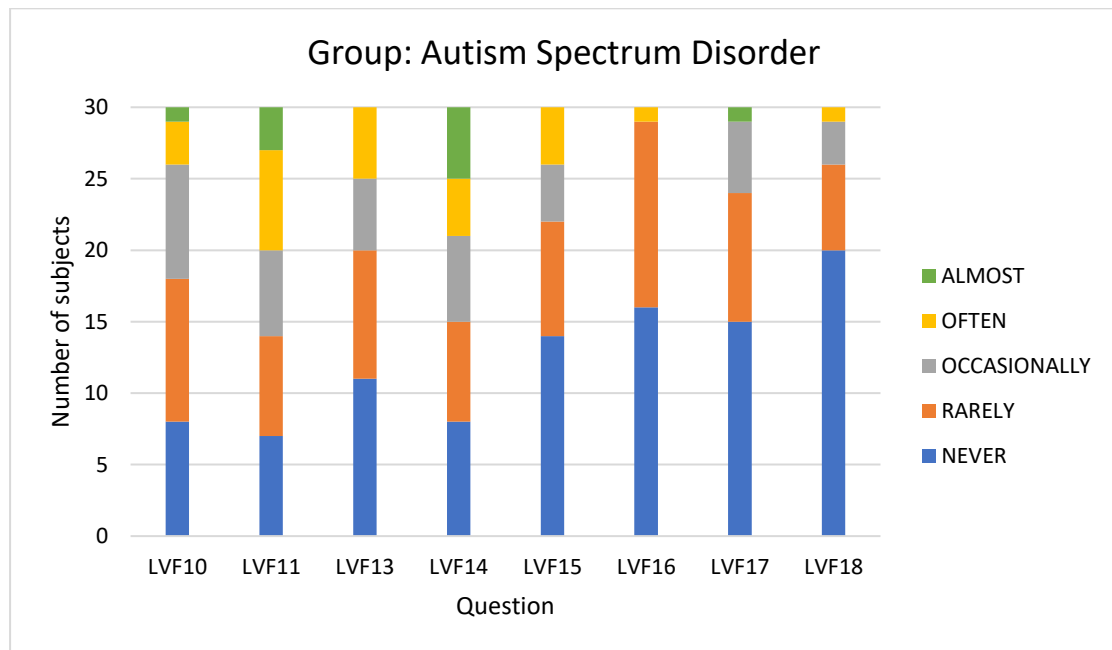
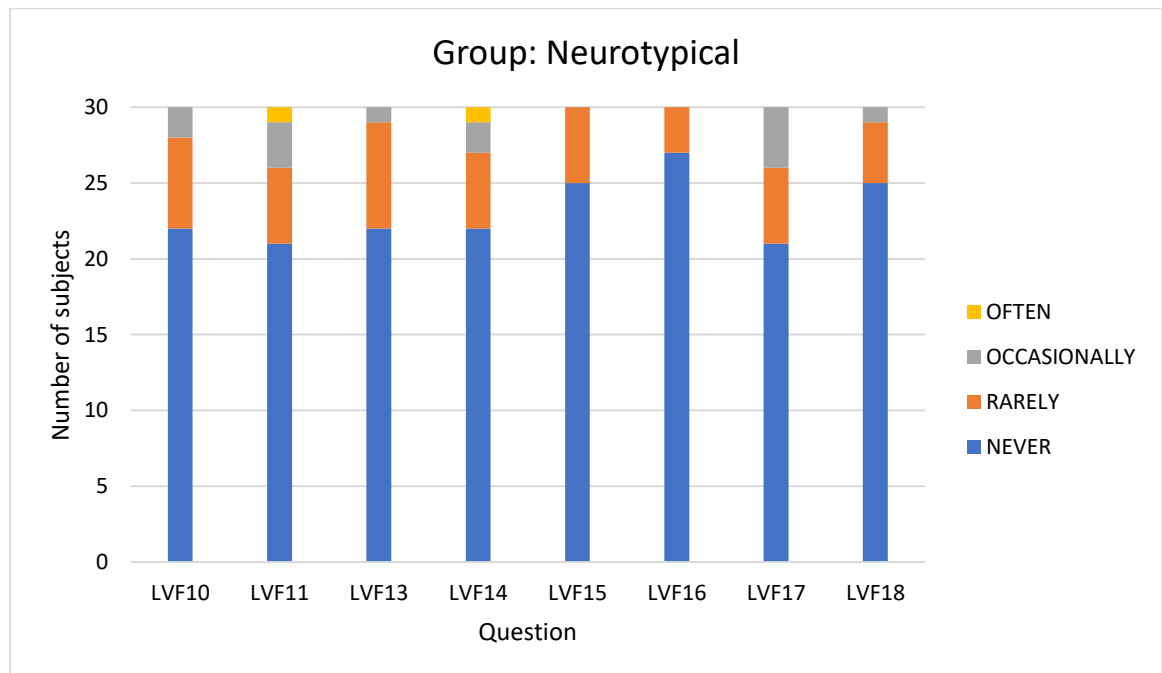


Figure 4.12

Graph Indicating distribution of LVF among Neurotypical children



4.2.5.2 Across Food Refusal Domain. While critically evaluating the food refusal domain (FRD), statements 7 and 8 were found to be most frequently occurring as depicted in Figures 4.14 and 4.13. However, the frequency of these behaviour exhibited is less when compared to the LVF domain. “My child is disruptive during mealtimes (pushing/throwing utensils, food)” and “My child closes his/her mouth tightly when food is presented” are item number 7 and 8 respectively of the BAMBI-H questionnaire. For item 7; 43.4% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 100% of the responses were falling in never and rarely category. For item 8; 43.3% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 100% of the responses were falling in never category.

Also, as Figure 4.14 and 4.13 indicate the frequency of problematic issues towards these statements (Item number 7 and 8) and other items under this category is much less among Neurotypical children. More than 90% of responses fall under the never or rarely category.

Figure 4.13

Frequency of Occurrence of FRD 8 Statement Among ASD and Neurotypical Children

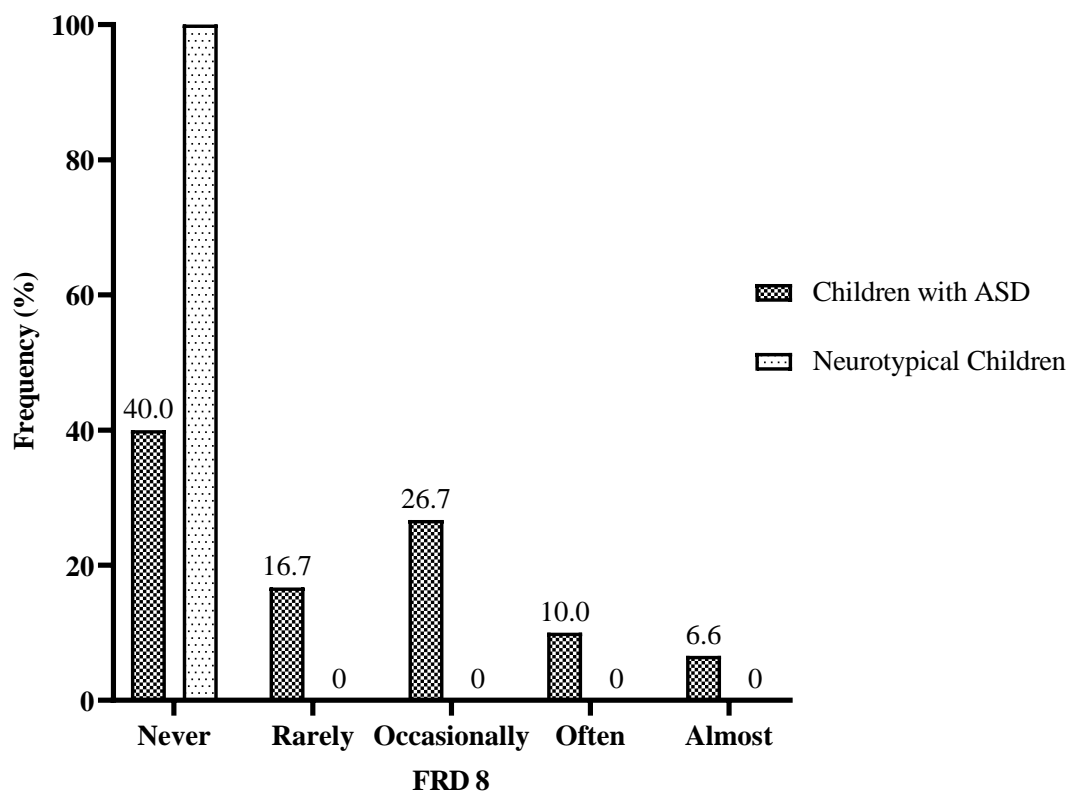
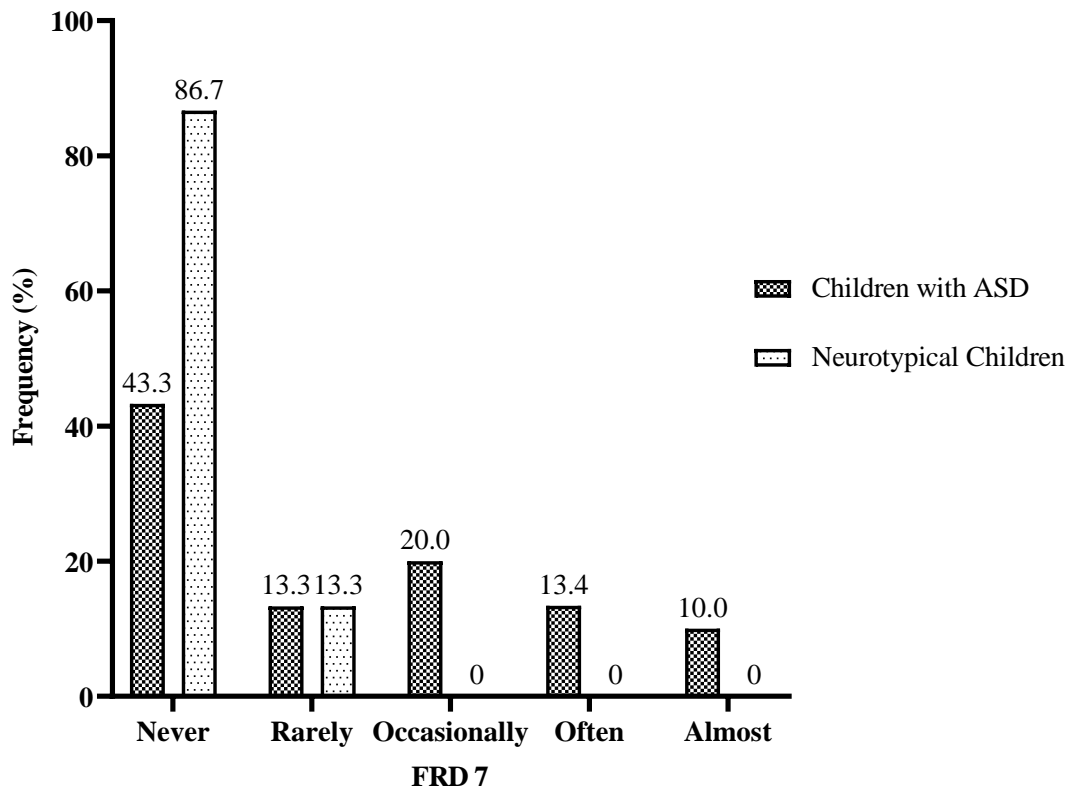


Figure 4.14

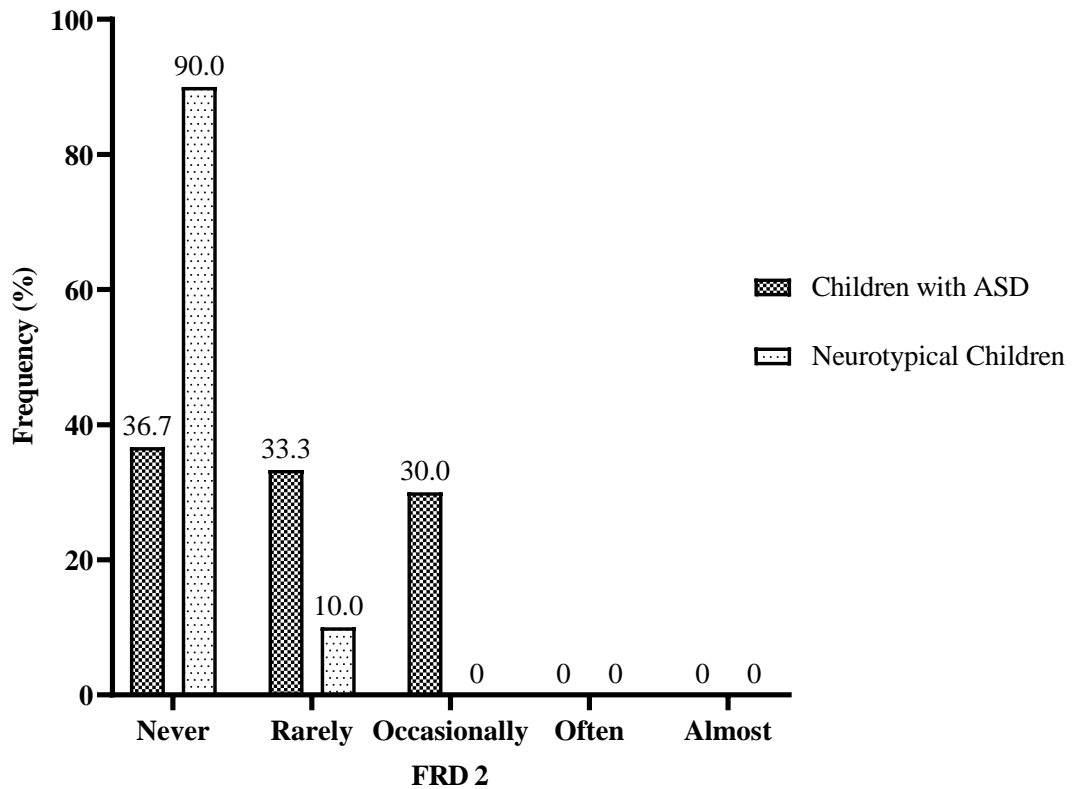
Frequency of Occurrence of FRD 7 Statement Among ASD and Neurotypical Children



Statement 2nd is about the child turns his/her face or body away from food. 30% of parents of children with ASD rated it as falling under occasionally, but in neurotypical population, 100% of the responses were falling in never and rarely category. The frequency of occurrence of FRD 2 among children with ASD and Neurotypical children is depicted in figure 4.15.

Figure 4.15

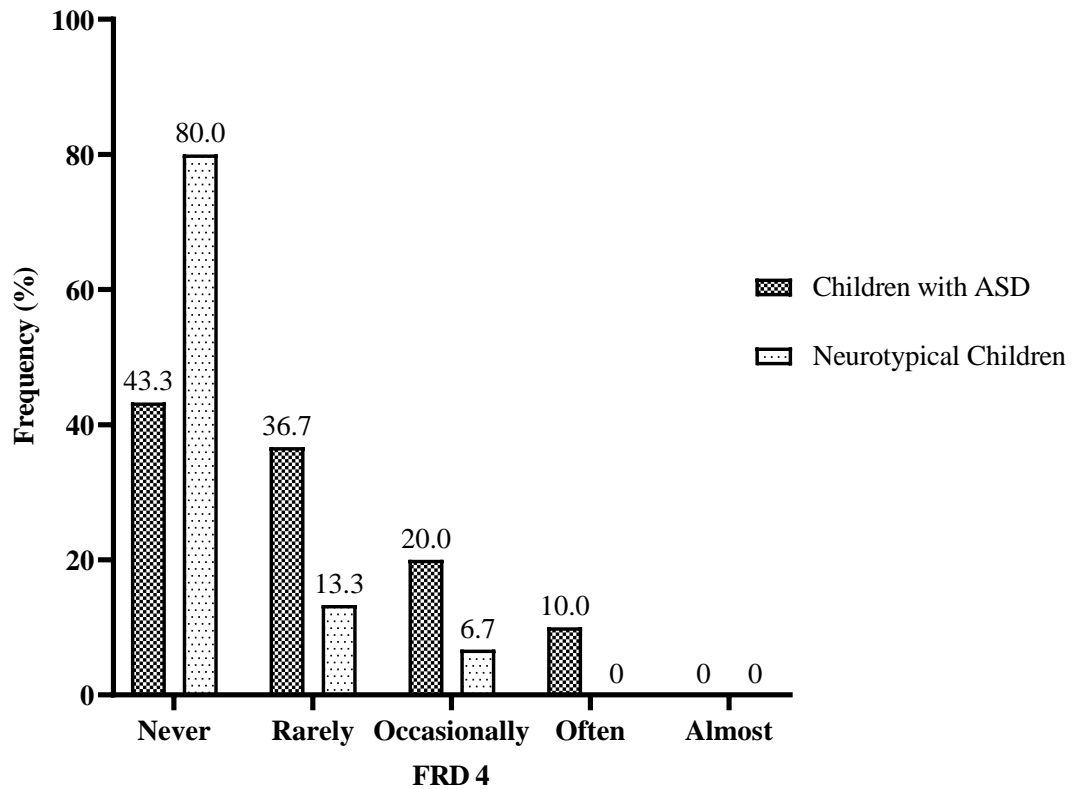
Frequency of Occurrence of FRD2 Statement Among ASD and Neurotypical Children



Statement 4th is about the child expels food that he/she has eaten. 30% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 93.3% of the responses were falling in never and rarely category. The frequency of occurrence of FRD 4 among children with ASD and Neurotypical children is depicted in figure 4.16.

Figure 4.16

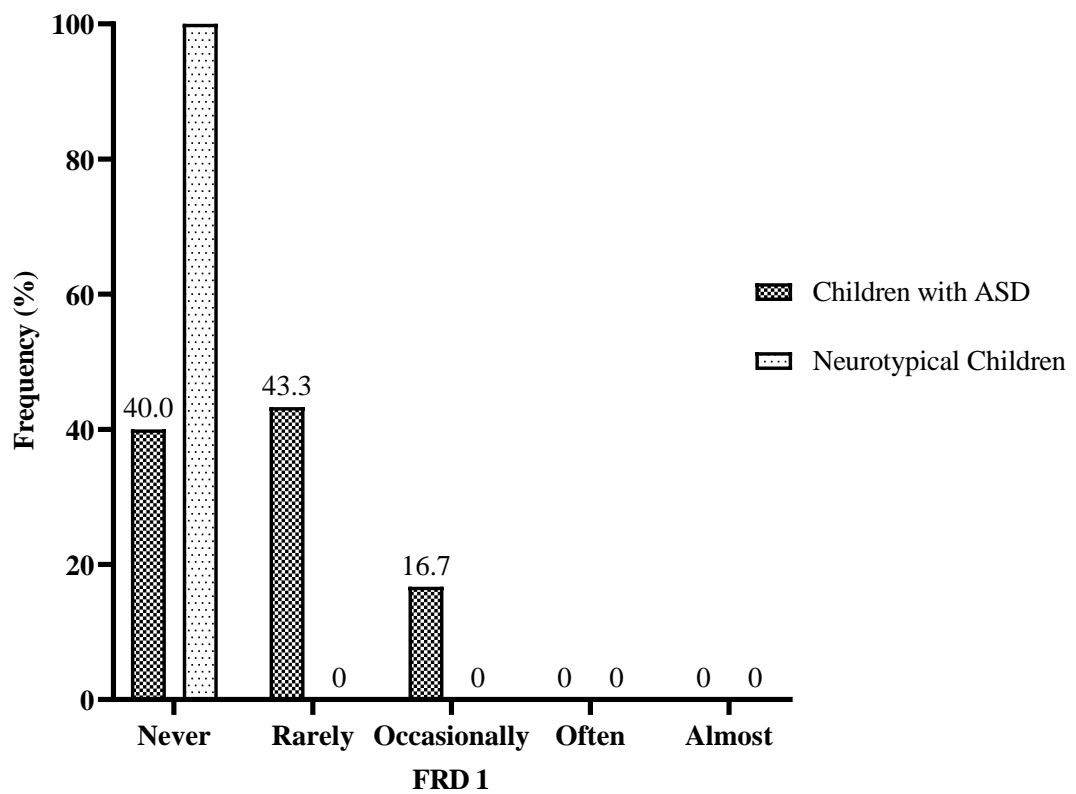
Frequency of Occurrence of FRD4 Statement Among ASD and Neurotypical Children



Statement 1st is about the child cries or scream during mealtimes. 16.7% of parents of children with ASD rated it as falling under occasionally, but in neurotypical population, 100% of the responses were falling in never category. The frequency of occurrence of FRD 1 among children with ASD and Neurotypical children is depicted in figure 4.17.

Figure 4.17

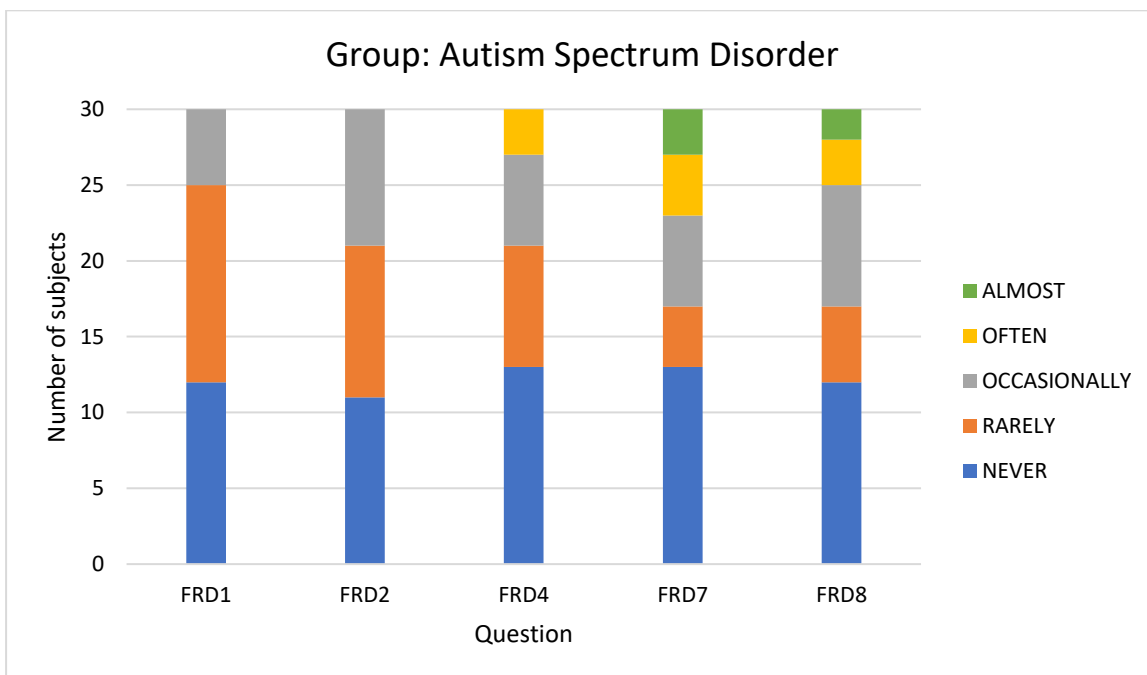
Frequency of Occurrence of FRD1 Statement Among ASD and Neurotypical Children



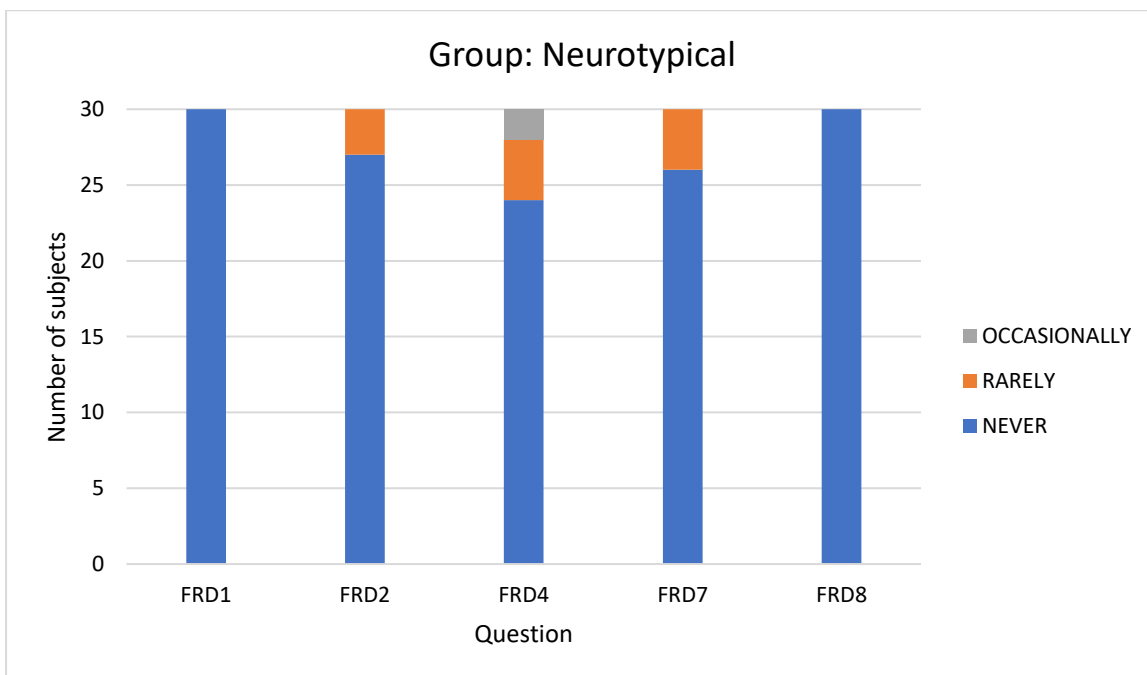
Figures 4.18 and 4.19 illustrate the distribution of all FRD statements within the "never" to "almost" categories among children with ASD and neurotypical children.

Figure 4.18

Graph Indicating distribution of FRD among ASD children.

**Figure 4.19**

Graph Indicating distribution of FRD among Neurotypical children



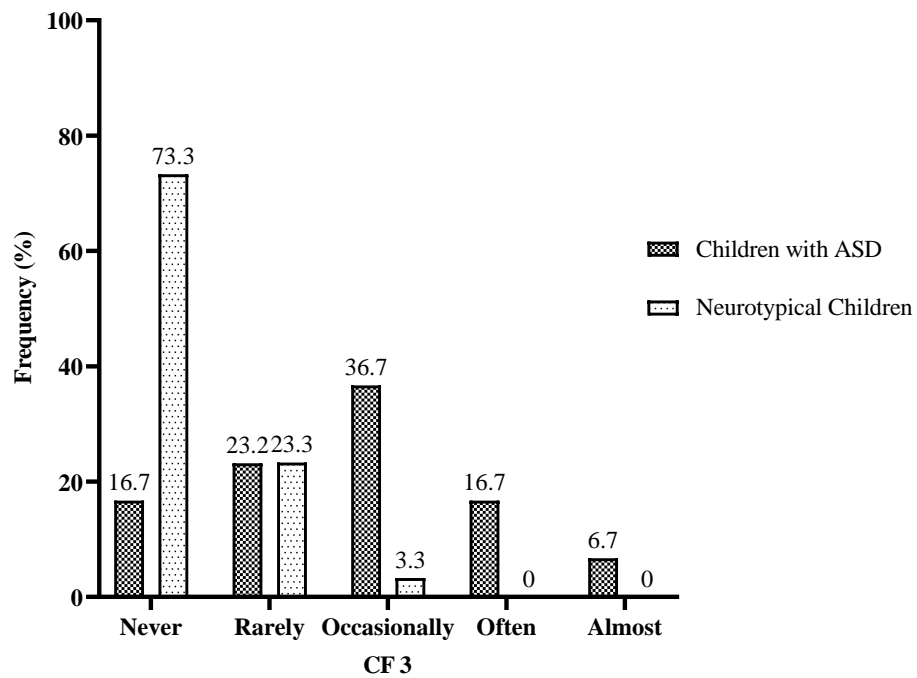
4.2.5.3 Across Characteristic Feature Domain. The findings revealed that in the characteristic feature in Children with ASD domain (CF), statements 3, 12 and 5 were the most frequently occurring behaviours (figure 4.20, 4.21 and 4.22) Statement 3 analyses the seating behaviour of child during mealtimes and statement 12 explores the child refuser behaviour to eat foods that require a lot of chewing. Item 3 (Figure 4.20) under this domain was found to be the most frequent among the Neurotypical population. Therefore, item number 3 is the most distinctive feature that distinguishes Children with ASD and Neurotypical children.

Statement 3 occurred frequently in both groups but comparatively greater in children with ASD. This statement explores the sitting tolerance of children during mealtime. More than 50% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 96.7% of the responses were falling in never and rarely category.

Statements 5 and 6 explore aggressive behaviour towards others and self-injurious behaviour respectively. Results indicated that respectively 30 and 20 percent of children with ASD exhibited this behaviour frequently according to this study.

Figure 4.20

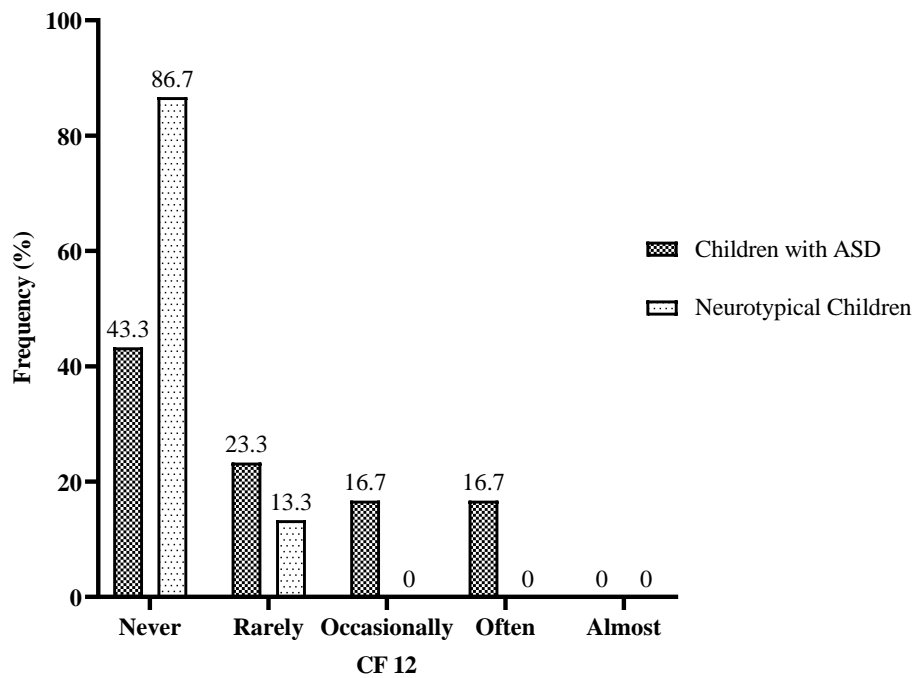
Frequency of Occurrence of CF3 Statement Among ASD and Neurotypical Children



Statement 12 is about the child refuser behaviour to eat foods that require a lot of chewing. 33.3% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 100% of the responses were falling in never and rarely category. The frequency of occurrence of CF 12 among children with ASD and Neurotypical children is depicted in figure 4.21.

Figure 4.21

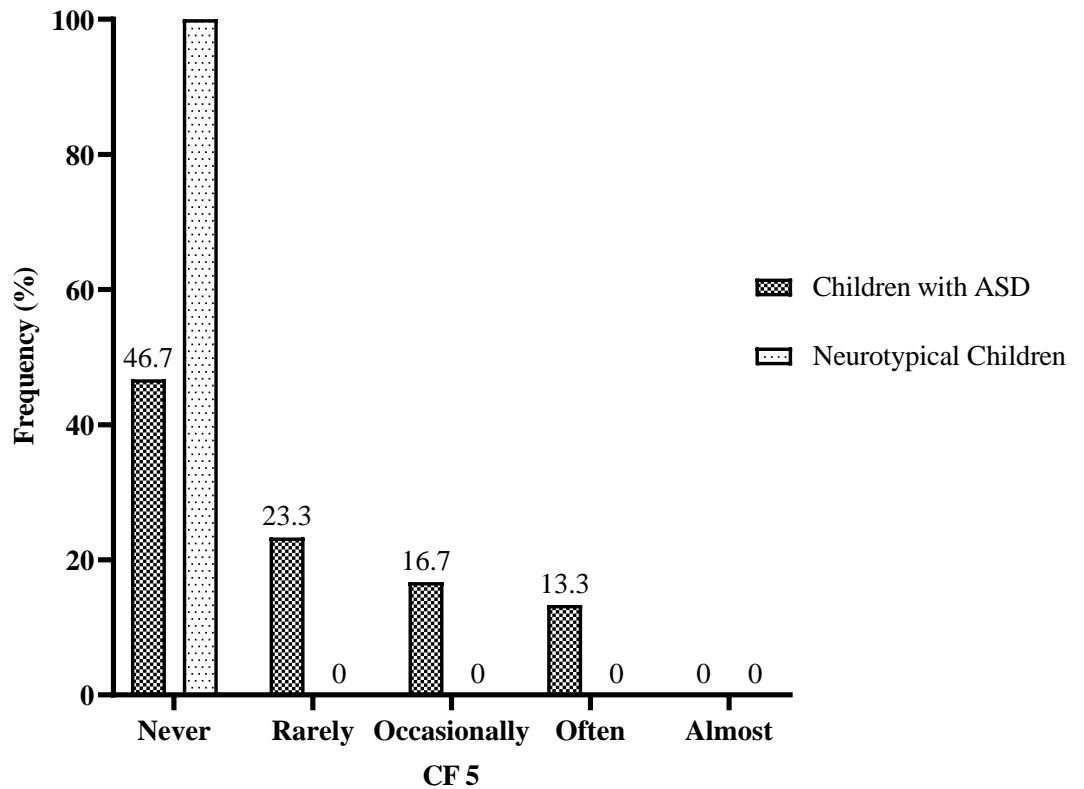
Frequency of Occurrence of CF12 Statement Among ASD and Neurotypical Children



Statement 5 is about the child aggressive behaviour during mealtime (Hitting, kicking, scratching others). 33.3% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 100% of the responses were falling in never and rarely category. The frequency of occurrence of CF 5 among children with ASD and Neurotypical children is depicted in figure 4.22.

Figure 4.22

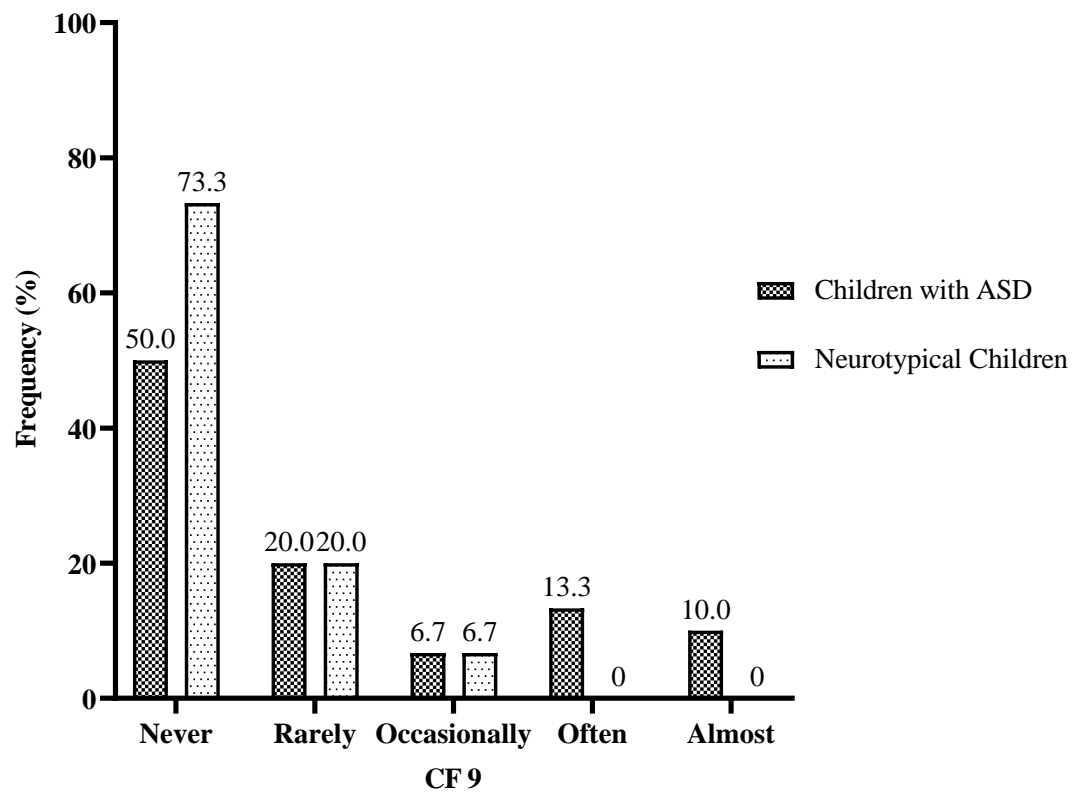
Frequency of Occurrence of CF5 Statement Among ASD and Neurotypical Children



Statement 9th is about the child isn't flexible about mealtime routine. 30% of parents of children with ASD rated it as falling under occasionally, often and almost, but in neurotypical population, 90.3% of the responses were falling in never and rarely category. The frequency of occurrence of CF 9 among children with ASD and Neurotypical children is depicted in figure 4.23.

Figure 4.23

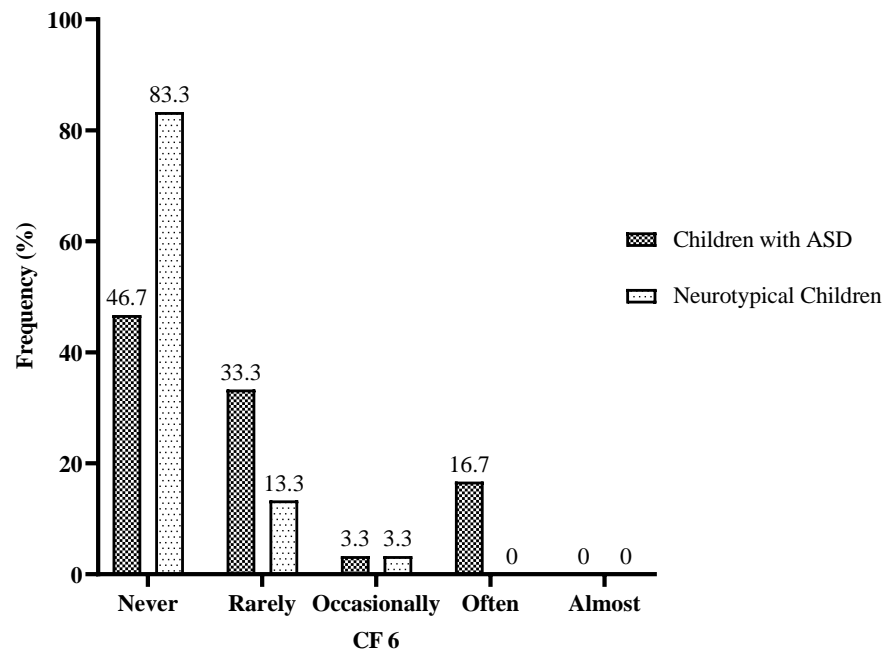
Frequency of Occurrence of CF9 Statement Among ASD and Neurotypical Children



Statement 6th is about the child displays self-injurious behaviour during mealtimes. 20% of parents of children with ASD rated it as falling under occasionally and often, but in neurotypical population, 96.7% of the responses were falling in never and rarely category. The frequency of occurrence of CF 6 among children with ASD and Neurotypical children is depicted in figure 4.24.

Figure 4.24

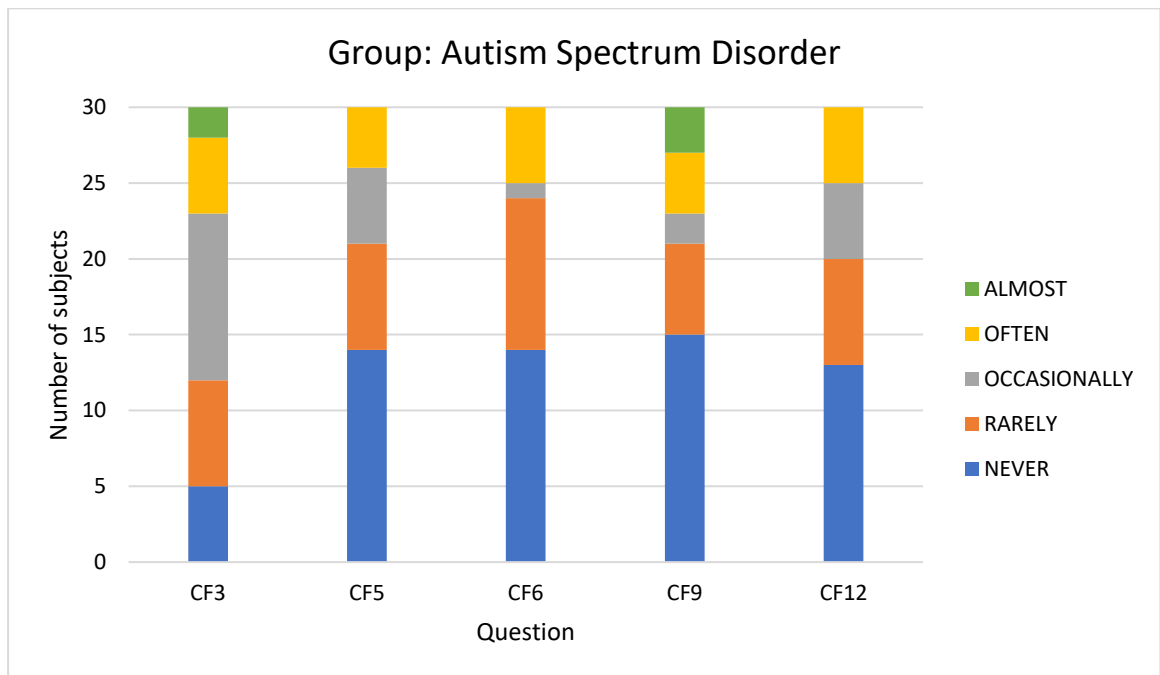
Frequency of Occurrence of CF6 Statement Among ASD and Neurotypical Children



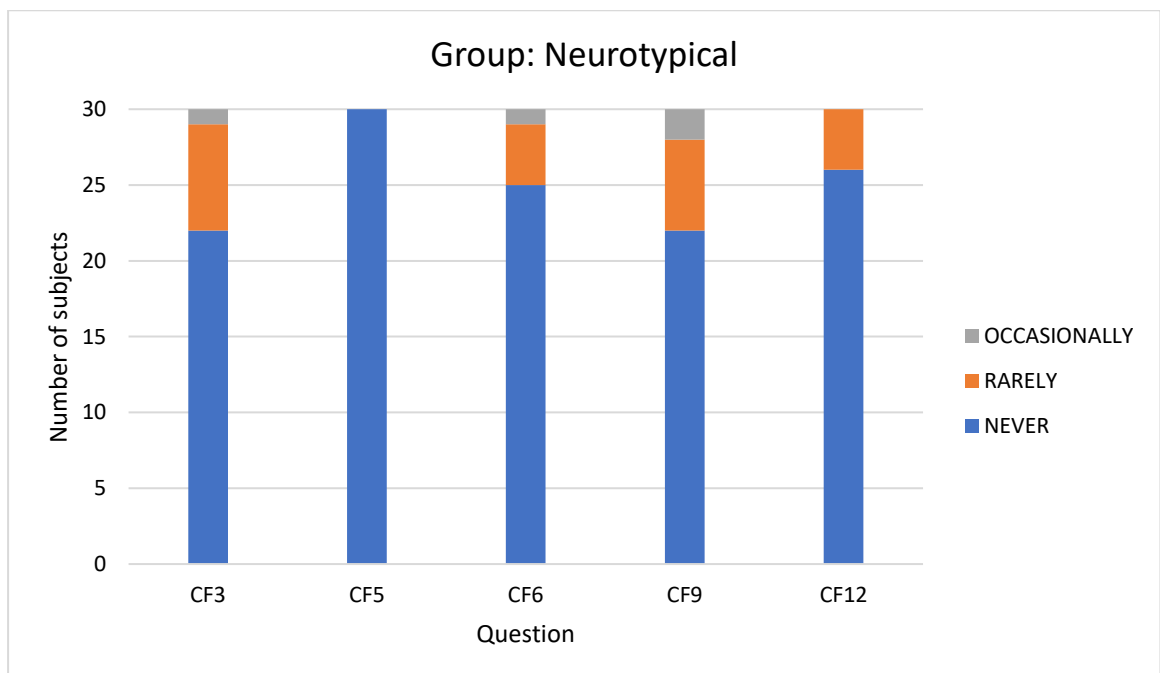
Figures 4.25 and 4.26 illustrate the distribution of all CF statements within the "never" to "almost" categories among children with ASD and neurotypical children.

Figure 4.25

Graph Indicating distribution of CF among ASD children.

**Figure 4.26**

Graph Indicating distribution of CF among Neurotypical children.



CHAPTER V

DISCUSSION

The Brief Autism Mealtime Behavioural Inventory (BAMBI) stands out as the first parental tool uniquely designed to evaluate feeding difficulties in children with ASD (Luckens & Linscheid, 2008). This tool was created with the goal of standardizing information regarding the nutrition and eating habits specific to children with ASD. BAMBI's comprehensive approach allows it to assess a wide range of problematic behaviors common among children with ASD, which other questionnaires often overlook. This specificity and thoroughness make BAMBI a quick and accurate clinical assessment tool for identifying feeding issues in children with ASD.

The original English version of the Brief Autism Mealtime Behavioural Inventory (BAMBI) includes 18 statements across three domains: Limited Variety, Food Refusal, and Features of Autism. It uses a five-point Likert scale to rate the frequency of feeding behaviors, ranging from 1 (never or rarely) to 5 (almost every meal) (Lukens & Linscheid, 2008). A frequency score is obtained by summing the Likert responses, with item numbers 3, 9, 10, and 15 reverse-scored. This questionnaire is crucial due to the high number of complaints and concerns from parents about problematic mealtimes. Many children with ASD face feeding difficulties due to the manifestation of their symptoms and associated behavioral, cognitive, psychological, or familial issues (Adams et al., 2022). The BAMBI is clinically significant as it addresses food behavior issues, which affect up to 80% of children with ASD (Vissoker et al., 2015).

The present study represents the first instance of a questionnaire being translated, adapted, and validated in Hindi to assess feeding issues in children with ASD. Validating this questionnaire facilitates its integration into clinical practice and

parental interventions concerning eating disorders and their consequences for this population. The original English BAMBI was initially translated and adapted into Hindi (BAMBI-H) following the adaptation process based on the principles outlined by the American Association of Orthopedic Surgeons (AAOS) and guidelines from Thimmaiah et al. (2016). During the pre-testing phase, efforts ensured cross-cultural validity, maintaining strict adherence to the original meanings of the words. The tool underwent final validation with 30 parents of children with ASD. Current study analyzed BAMBI-H scores in both children with and without ASD, revealing that children with ASD consistently exhibited more feeding-related difficulties across all domains, with higher frequencies compared to neurotypical children.

The first objective of the current study, carried out in Phase 1 was to translate and adapt the Brief Autism Mealtime Behavior Inventory questionnaire into Hindi. The Second objective, carried out in phase 2, was to validate the Hindi version of the questionnaire (BAMBI-H)

5.1 Translation and Adaptation of BAMBI.

The initial phase of the first objective involved forward translation, which resulted in the creation of two distinct Hindi versions of the questionnaire. In the synthesized common translation, these versions were consolidated into an appropriate single version. To ensure the accuracy of the questionnaire, it underwent backward translation by two individuals. Following this, the final version of BAMBI-H was achieved through expert review and field testing involving 15 caregivers of children with ASD. Throughout these concurrent revisions, adjustments and substitutions of words were made to develop a culturally adaptable tool assessed for simplicity,

familiarity, applicability, complexity, clarity, and cultural appropriateness. Feedback from judges was gathered across four stages of translation and field testing.

As a result, the final version of BAMBI-H comprises 18 questions distributed across three domains: the Limited Variety factor (items 10, 11, 13, 14, 15, 16, 17, 18), the Food Refusal factor (items 1, 2, 4, 7, and 8), and the Children with ASD Characteristics factor (items 3, 5, 6, 9, 12).

In BAMBI, parents are directed to self-administer the questionnaire using a Likert scale where responses are rounded to the nearest whole number. The scale includes five ratings: 1 (Never), 2 (Seldom), 3 (Occasionally), 4 (Often), and 5 (Almost). Specifically, items 3, 9, 10, and 15 require reverse scoring during the rating. However, during the translation phase, these four items were converted into problem statements to ensure uniformity. The primary objective of the current study was to translate and adapt the questionnaire into Hindi, ensuring that it maintained simplicity, familiarity, applicability, complexity, clarity, and cultural appropriateness throughout all stages of translation.

5.2 Validation of BAMBI-H

The second aim of this study was to validate the questionnaire by administering it to 30 parents of children diagnosed with ASD and another 30 parents of typically developing children. After administering BAMBI-H on 60 participants, a clear-cut distinction between the scores among the typical and disordered populations was found. Among 30 participants in the Children with ASD population, the highest BAMBI-H score is 50, and the lowest is 29. The highest BAMBI-H score in the typical population is 26, and the lowest is 18. These findings underscore a clear differentiation in mealtime behavior between children with ASD and their neurotypical peers.

5.3 Analyzing the Statements Across Different domains of BAMBI-H

When analyzing the statements across different domains, variations were observed in the frequency of occurrence of items.

5.3.1 Analyzing the Statements Across the domain: Limited Variety Factor

Examining the items within the Limited variety factor, the current study's findings revealed that item number 11 is frequently seen in the population of children with ASD; more than 70% of caregivers for children with ASD classified it as occurring occasionally, frequently or almost always. This suggests that children with ASD experience item 11 greater frequency. Item 11 evaluated child's aversion to specific foods or their consumption of a smaller variety of foods; in general, it gauges their food selectivity. In Comparison to typically developing children, children with ASD demonstrated limited acceptance of a variety of food texture and types, as well as food refusal (Schreck et al., 2004). Various literature has found that food selection was a prominent feeding difficulty in children with ASD. Sahan et al. (2021) has also found that children with ASD exhibit problematic feeding habits, and difficulty adopting certain food groups and novel foods than their counter peer members. In children with ASD a restricted range of foods, an excessive intake of only a few foods, and the selective eating of specific foods—such as those high in carbohydrates—are the hallmarks of food selectivity (Cermak et al., 2010). Parents of children with ASD have reported that their children exercised dietary restriction and refusal, eating only around half of the foods on the list. Williams and Schreck (2006).

Several studies have demonstrated that compared to their typically developing peers, children with ASD frequently exhibit greater food selectivity (Plaza-Diaz et al., 2021). On the other hand, when item 11 is examined in the general population, over 90% of the responses fall into the “never” and “rarely” categories, indicating a significantly lower prevalence of this behavior among typical population. Food selectivity, manifesting as food rejection, rapid eating, chewing difficulties, snatching food from peers, and vomiting, is identified as a primary issue in children with ASD (Leader et al., 2021).

In the current study’s findings, following item 11, the most frequently occurring problematic issues, in decreasing order of frequency, were items 14, 10 and 15. Item 14 addresses about the child’s preference towards crunchy foods. Current study results indicated that among children with ASD, 33.3 % of caregivers rated this behavior as occurring occasionally and often, and 16.7% rated it as occurring almost. This suggests a significant preference for crunchy texture among children with ASD.

Supporting this, other research has shown that children with ASD prefer certain textures, particularly crunchy textures, and tend to consume more processed foods while intake of fruits and vegetables is significantly less (Ranjan et al., 2015). Another study done by Huxham et al., 2021 also found that children with ASD clearly preferred crunchy or dry foods. Common mealtime problem behaviors in children with ASD include a preference for crunchy foods, food neophobia, and difficulties remaining seated at the table during meals (Catino et al., 2019).

Item number 10 assesses food neophobia in children. The current study found that children with ASD demonstrate significant food neophobia, with 26.7% of caregivers rating it as occurring occasionally and 13.3% rating it as occurring almost always. Food neophobia (FN) is commonly observed in children with ASD, and is

associated with negative impacts on health quality (Almeida et al., 2022). Kral et al. (2015) noted that children with ASD who have oral sensitivity issues report higher levels of food neophobia. According to Martins et al. (2008), children with ASD exhibit slightly poorer self-feeding abilities, and a higher frequency of food-neophobic behaviors. Difficulty accepting new foods in children with ASD may be due to sensory processing issues, taste perception, irrational fear of unfamiliar items, environmental factors, parental and peer modelling, and feeding practices (Blissett et al., 2013). Children with ASD frequently exhibit stereotyped food preferences and resistance to new taste experiences (Stafford et al., 2017). Additionally, studies have shown that children with ASD display more disruptive mealtime behaviors compared to their typically developing peers (Gentry & Luiselli, 2008), particularly when introduced to new foods.

Statement 15 assesses the acceptance and preference of children towards a variety of foods. In this study, 13.3% of children with ASD rated this item occurring occasionally and 13.3% rated it as occurring often. Most of the Children with ASD children showed less preference for a wide variety of foods compared to controls. Children with ASD eat a significantly narrower range of foods when compared to their typically developing peers (Schreck et al., 2004). Food rejection and limited variety are common issues observed in children with ASD (Levia-Garcia et al., 2019).

According to a study by Ledford and Gast (2006), 89% of children exhibited a range of restrictive and flexible feeding behaviors. Dietary intake in children with ASD has been found to be narrower (Lane et al., 2014) and limited variety of foods is frequently reported as a feeding difficulty in children with ASD (Castro et al., 2016). In addition to their preference for a narrow range of foods, children with ASD tend to

favor starches, snacks, and processed foods while exhibiting a bias against fruits, vegetables, and proteins (Ledford & Gast, 2006).

5.3.2 Analyzing the Statements Across Food Refusal Factor

While critically evaluating the next factor, i.e., food refusal factor, item 8 and 7 emerged as the most frequently occurring issues. More than 40% of children with ASD were rated it as occasionally, often, and almost always. However, the frequency of these behaviors in children with ASD is lower compared to the most frequently rated problematic issues in the Limited Variety factor domain. There have been reports of food refusal in children with ASD based on temperature, foods contacting other foods, or color, but not on texture, taste, smell, combinations, or shape (Hubbard et al., 2014).

Item number 8 states, “My child closes his/her mouth tightly when food is presented.” Item 7 states “My child is disruptive during mealtimes (pushing/throwing utensils, food).” Many children with ASD experience sensory processing difficulties, which may contribute to both behaviors of tightly closing the mouth and disruptive mealtime behaviors. Certain food textures, smells, or tastes can be overwhelming children with ASD, prompting them to close their mouths tightly and potentially leading to subsequent disruptive actions (Alexandra et al., 2016). Furthermore, the act of closing the mouth tightly in response to presented food may serve as a coping mechanism or a reaction to anxiety and stress associated with mealtimes. This anxiety or stress can manifest as disruptive behaviors, such as pushing or throwing utensils and food, as the child struggles to regulate their emotions during mealtime (Johnson et al., 2016).

Item number 2 states, “My child turns his/her face or body away from food. Item 4 explores the spitting behavior of a child during mealtime. Chewing and spitting behaviors are increasingly prevalent among children with ASD (Vissocker et al., 2015). Disruptive eating behaviors such as food rejection, spitting out food, hitting utensils, fleeing the food environment, crying, and yelling are another issue that is frequently reported in children with ASD (Sahan et al., 2021).

In contrast, in the typical population, the frequency of problematic behaviors related to these items (Item 2, Item 4, Item 8, and Item 7) and others in this category is significantly lower. More than 90% of responses indicate that typical children never or rarely exhibit these behaviors in this domain. This disparity underscores the distinct challenges and behaviors related to eating observed in children with ASD compared to their typically developing peers.

5.3.3 Analyzing the Statements Across Features of Autism Factor

Analysis of this current study questionnaire reveals that items 3 and 12 are the most frequently occurring behaviors among children with ASD. More than 60% of children with ASD rated this behavior on the Likert scale as occurring rarely, occasional, often, or almost always. Children with ASD also demonstrated less adaptability and flexibility in mealtime routines (Williams et al., 2000). A study conducted by Teresa et al. in 2022 reported that over 80% of participants noted difficulties with children remaining seated during mealtime, highlighting this as a common problem behavior.

Item 12 specifically addresses mealtime behavior where a child refuses to eat foods that require extensive chewing. This behavior can be particularly challenging for children with ASD and may be indicative of sensory sensitivities or oral-motor

difficulties common in this population. Research by Seiverling et al. (2018) underscores that children with ASD frequently exhibit problematic mealtime behaviors, including refusal to consume certain textures or foods necessitating extensive chewing. Such behaviors are often associated with sensory processing issues, emphasizing the need for targeted interventions to address these specific challenges.

Item 9 is the most distinctive feature differentiating children with ASD from typical children. This item evaluates the flexibility of mealtime routines a characteristic that is notably less adaptable in children with ASD compared to their typical peers. Schreck et al. (2004) highlighted that "ritualistic eating practices" are more prevalent among children with ASD, reflecting their tendency towards rigid and inflexible behaviors in various adaptive domains, including play, conversation, and eating (Baker, 2000). Children with ASD often exhibit insistence on specific, nonfunctional mealtime routines, as noted by Lane et al. (2014). Among the most frequently reported problematic feeding behaviors in children with ASD are inflexibility regarding mealtime routines, episodes of aggression and self-injury during meals, and challenges in remaining seated at the meal table. These behaviors underscore the pervasive nature of rigidity and the need for targeted interventions to address adaptive behaviors in children with ASD.

Additionally, according to the current study findings, for item 5 across the typical population, all responses consistently fall under the "never" category. This indicates a complete absence of the issues associated with item 5 among typical children. Conversely, item 3 within this domain emerges as the most frequently observed behavior among the typical population, with 3.3% of children exhibiting it occasionally and 23.3% exhibiting it rarely. This item specifically explores children's

tolerance to sitting during mealtime, highlighting variability in typical children's behavior in contrast to children with ASD.

5.4 Concurrent validity

The current study findings regarding concurrent validity indicate a notable positive correlation between BAMBI-H and the Feeding History Inventory (FHI), highlighting the efficacy of the newly developed tool in assessing feeding difficulties among children with ASD. The correlation coefficient of $r=0.848$, ($p<0.05$) suggests a strong relationship, implying that as scores on the FHI increase, scores on the new tool also increase proportionately.

This correlation supports the assertion that BAMBI-H can reliably evaluate feeding challenges in clinical settings. Its alignment with the FHI, considered a gold standard in assessing feeding behaviors, enhances confidence in BAMBI-H as a valid alternative tool for clinicians, particularly Speech-Language Pathologists (SLPs), involved in managing feeding issues in children with ASD. This validation underscores the potential of BAMBI-H to effectively contribute to diagnostic accuracy and inform targeted interventions tailored to the specific needs of children with ASD experiencing feeding difficulties.

5.5 Cut-Off Score of BAMBI-H Questionnaire

The current study's findings reveal that BAMBI-H exhibits a high level of diagnostic accuracy, as evidenced by an AUC value close to 1. This indicates its effectiveness in distinguishing children with ASD who have feeding issues from those who do not. The Receiver Operating Characteristic (ROC) curve analysis identified an optimal cut-off score of 27 for BAMBI-H, achieving both sensitivity and specificity

values of one. This suggests that BAMBI-H accurately identifies children with ASD who experience feeding difficulties and those who do not.

In contrast to the original BAMBI questionnaire, which did not specify a cut-off score (Demand et al., 2015), the BRCA-TEA questionnaire, a Portuguese translation of BAMBI, suggests a cut-off of ≥ 47 points (Castro et al., 2019). The current study introduces a specific cut-off score of 27 for BAMBI-H, supported by a high AUC value, indicating strong diagnostic accuracy. This cut-off score serves as a dependable indicator for identifying feeding issues in children with ASD within clinical settings.

By establishing a clear cut-off score, the current research enhances the utility of BAMBI-H in clinical decision-making processes, offering clinicians a practical tool to effectively assess and diagnose feeding difficulties in children with ASD. This standardized approach aids in early intervention and targeted therapeutic strategies, thereby improving outcomes for children facing feeding challenges associated with ASD.

5.6 Test-Retest Reliability

The test-retest reliability findings, indicated by a Spearman's rho coefficient of 0.65, suggest moderate to good reliability for BAMBI-H, underscoring its consistent performance upon repeated administrations in clinical settings. This reliability is essential for accurately monitoring progress and assessing the efficacy of feeding interventions over time in children with ASD.

However, despite these promising results, the study faces several limitations. The relatively small sample size of 30 children each in the ASD and neurotypical groups may restrict the generalizability of the findings to broader populations. Additionally, the uneven distribution of participant genders precluded a comprehensive

examination of gender effects on feeding behaviors. Future research endeavors should strive to replicate these findings in larger and more diverse samples to strengthen the robustness and applicability of BAMBI-H in varied clinical and demographic contexts.

CHAPTER VI

SUMMARY AND CONCLUSION

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition characterized by persistent challenges with social communication, restricted interests, and repetitive behaviors (DSM-5, 2013). Although ASD is considered a lifelong disorder, the degree of impairment can vary significantly between individuals. Feeding and mealtime difficulties are common among children with ASD; however, research on these issues within the Indian context is limited. To address this gap, there is a need for a standardized questionnaire to assess the feeding behaviors of Indian children with ASD.

The Brief Autism Mealtime Behavior Inventory (BAMBI), developed by Lukens and Linscheid in 2008, is a validated parent-administered tool for evaluating mealtime issues in children with ASD aged 3 to 11 years. This questionnaire could serve as a valuable resource for assessing feeding behaviors in the Indian ASD population.

This study aims to translate and adapt the Brief Autism Mealtime Behavior Inventory into Hindi (BAMBI-H) and validate it by administering it to caregivers of children with ASD. The original BAMBI was translated and cross-culturally adapted according to the guidelines outlined in the Process of Adaptation by the American Association of Orthopaedic Surgeons (AAOS) principles, as described by Thimmaiah et al. (2016). The adaptation process involved five stages: forward translation, synthesis of common translations, backward translation, expert committee review, and field testing. Fifteen caregivers of children with ASD participated in the field study, evaluating the questionnaire for simplicity, familiarity, applicability, complexity, clarity, and cultural appropriateness. Based on their feedback, two additional questions

were included. The final BAMBI-H consists of 18 questions across three domains: limited variety factor, food refusal factor, and characteristic feature factor. Following translation and adaptation, the questionnaire was validated by administering it to 30 caregivers of children with ASD and 30 caregivers of typical children.

The BAMBI scores for the typical population ranged from 18 to 26, while the scores for the ASD group ranged from 29 to 50. The Receiver Operating Characteristic (ROC) curve facilitated a clear distinction between the two groups, resulting in a cut-off score of 27. This indicates that individuals who score 27 or higher are likely to have feeding-related issues. The tool demonstrated perfect sensitivity and specificity, both being one.

Statement 11, which examines food selectivity under the domain of the limited variety factor, Statement 8, which examines My child closes his/her mouth tightly when food is presented under the Food Refusal factor and Statement 3, which examines My child does not remain seated until the meal is finished under the Characteristics of ASD, was the most frequently rated problem behavior among children with ASD. The test-retest reliability was high, with a Spearman's rho correlation coefficient of 0.65. The test also demonstrated very high sensitivity and specificity, with a cut-off score of 27. As the cut-off score increases, the frequency of problem behaviors also rises. The age groups examined in this study included 3-6 years, 6-9 years, and 9-11 years. Internal consistency analysis demonstrated strong reliability among different items for children with ASD, yielding a Cronbach's Alpha coefficient of 0.894, whereas for the typical population, the coefficient was 0.254.

BAMBI-H proves highly sensitive in detecting feeding-related issues in children with ASD. The distinct scoring differences between autistic and typical populations underscore the importance of early identification and management of these

issues. In conclusion, BAMBI-H exhibits robust test-retest reliability, as well as high sensitivity and specificity, making it suitable for both clinical assessments and research purposes.

6.1 Limitations of the Current Study:

- The findings are based on a limited sample size limiting the generalizability of the findings.
- The developed material is applicable only to Hindi-speaking children with ASD aged three to eleven years.
- The majority of participants in the ASD group were male.
- The severity of ASD was not assessed in this study.
- The sample size used to assess test-retest reliability was also limited.
- The potential for response bias among caregivers, where their responses might be influenced by their own perceptions or expectations rather than solely reflecting the child's behaviors.

6.2 Clinical implications

This study has translated, adapted and validated BAMBI-H. this is a novel tool to assess feeding skills for native Hindi speaking children with ASD who have feeding issues.

- In conjunction with direct feeding assessments, BAMBI-H will facilitate a comprehensive feeding assessment that will aid in intervention measures.
- The output of the study has generated a cut off score identify if the child with ASD has a feeding disorder or not, the cut off score is 27.
- BAMBI-H score is an objective measure that can be used clinically in the clinical assessment, management and in research.

- This study output provided a self-assessment tool for native Hindi-speaking children with feeding issues secondary to ASD. Currently, this will be the only tool in Hindi that will help in sensitively identifying ASD-related feeding problems in children.
- This tool can be used to emphasize the need to address feeding-related issues in this population. The tool will sensitize the caregivers on feeding issues.
- BAMBI-H is a parent-administered tool, it is simple to use, time efficient and economical. The tool can be incorporated in screening camps and rural setups.

6.3 Future Directions

- The study identified the most influential factors contributing to feeding issues in children with ASD. If further research corroborates these findings, these factors could serve as potential diagnostic indicators for children with ASD.
- Administering the tool in a larger sample would enhance its reliability and accuracy, providing stronger support for the findings obtained in this study.
- Effective intervention strategies corresponding to address the factors most impacted in children with ASD should be developed to enhance their overall health and alleviate parental concerns regarding feeding difficulties in this population.
- Investigating the longitudinal impact of early intervention strategies on feeding behaviors and overall developmental outcomes in children with ASD could offer valuable insights into enhancing long-term outcomes and quality of life for these individuals. Understanding the lasting effects of early interventions on feeding behaviors is crucial for optimizing support and care strategies for children with ASD.

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Appendix A

BAMBI

Think about mealtimes with your child over the past 6 months. Rate the following items according to how often each occurs, using the following scale:

Never/Rarely	Seldom	Occasionally	Often	At Almost
Every Meal				
1	2	3	4	5

Circle YES if you think an item is a problem for you or NO if you think it is not a problem.

- | | | | | | |
|---|---|---|---|---|----------|
| 1. My child cries or screams during mealtimes. | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |
| 2. My child turns his/her face or body away from food. | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |
| 3. My child remains seated at the table until the meal is finished. | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |
| 4. My child expels (spits out) food that he/she has eaten. | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |
| 5. My child is aggressive during mealtimes (hitting, kicking, | 1 | 2 | 3 | 4 | |
| scratching others). | | | | | 5 YES NO |
| 6. My child displays self-injurious behavior during mealtimes | 1 | 2 | 3 | 4 | |
| (hitting self, biting self). | | | | | 5 YES NO |
| 7. My child is disruptive during mealtimes | 1 | 2 | 3 | 4 | |
| (pushing/throwing utensils, food). | | | | | 5 YES NO |
| 8. My child closes his/her mouth tightly when food is presented. | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |
| 9. My child is flexible about mealtime routines | 1 | 2 | 3 | 4 | |
| | | | | | 5 YES NO |

(e.g., times for meals, seating arrangements, place settings).

- | | | | | |
|---|---|-----|----|---|
| 10. My child is willing to try new foods. | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 11. My child dislikes certain foods and won't eat them. | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 12. My child refuses to eat foods that require a lot of chewing | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| (e.g., eats only soft or pureed foods). | | | | |
| 13. My child prefers the same foods at each meal. | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 14. My child prefers "crunchy" foods (e.g., snacks, crackers). | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 15. My child accepts or prefers a variety of foods. | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 16. My child prefers to have food served in a particular way. | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 17. My child prefers only sweet foods (e.g, candy, sugary cereals). | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |
| 18. My child prefers food prepared in a particular way | 1 | 2 | 3 | 4 |
| | 5 | YES | NO | |

(e.g., eats mostly fried foods, cold cereals, raw vegetables).

Appendix B

BAMBI-H

पिछले छह महीनो में अपने बच्चे के भोजन समय को ध्यान में रखते हुए, निम्नलिखित घटनाओ को एक से पांच के बिच दिए गए विकल्पों में से रेंट करे।

कभी नहीं	बहुत कम	कभी कभी	ज्यादातर	हरसमय
१	२	३	४	५

यदि नीचे दिए गए प्रश्नों में से आपको किसी में समस्या हे, तो वहा पर सर्कल करे। यदि आपको लगता है कि समस्या नहीं हे तो ना पर सर्कल करे।

१	मेरा बच्चा खाने के समय रोता या चिल्लाता है।	१	२	३	४	५	हाँ	ना
२	मेरा बच्चा खाने को देखते ही अपना शरीर या मुँह मोड़ लेता है।	१	२	३	४	५	हाँ	ना
३	मेरा बच्चा खाना पूरा खाए बिना ही उठ जाता है।	१	२	३	४	५	हाँ	ना
४	मेरा बच्चा खाना खाते समय खाना मुँह से निकाल (थूक) देता है।	१	२	३	४	५	हाँ	ना
५	मेरा बच्चा खाने के समय बहुत गुस्सा करता है। (लात मारना, नाखून मारना)	१	२	३	४	५	हाँ	ना
६	मेरा बच्चा खाने के समय खुद को नुकसान पहुँचता है। (खुद को मारना, दांतो से खुद को काटना)	१	२	३	४	५	हाँ	ना
७	मेरा बच्चा खाना खाने के समय स्थिर नहीं बैठता। (भोजन या बर्तन को फेंकना या धकेलना)	१	२	३	४	५	हाँ	ना
८	मेरा बच्चा खाना खिलते समय अपना मुँह जोर से बंद कर लेता है।	१	२	३	४	५	हाँ	ना
९	मेरा बच्चा खाने की रोज की आदतों में किसी भी तरह के बदलाव को पसंद नहीं करता। (खाना खाने के समय या जगह का बदलना)	१	२	३	४	५	हाँ	ना
१०	मेरा बच्चा कोई नई खाने की चीज खाना नहीं चाहता।	१	२	३	४	५	हाँ	ना
११	मेरा बच्चा जो ना पसंद है, वो चीजे कभी नहीं खाता।	१	२	३	४	५	हाँ	ना

- १२ मेरा बच्चा जो चीजे ज्यादा चबानी पड़े वह नहीं खाता । १ २ ३ ४ ५ हाँ ना
(सिर्फ मुलायम या तरल चीजे खाता है)
-
- १३ मेरा बच्चा हर समय एक ही तरह का भोजन खाना चाहता १ २ ३ ४ ५ हाँ ना
है ।
-
- १४ मेरा बच्चा खाने में कुरकुरी चीजे पसंद करता है ।(चिप्स, १ २ ३ ४ ५ हाँ ना
भुजिया)
-
- १५ मेरा बच्चा अलग अलग तरह की चीजे खाना पसंद नहीं १ २ ३ ४ ५ हाँ ना
करता ।
-
- १६ मेरा बच्चा केवल विशेष तरीके से परोसें हुए खाने को ही १ २ ३ ४ ५ हाँ ना
पसंद करता है।
-
- १७ मेरा बच्चा केवल मीठा खाना पसंद करता है । (मिठाई या १ २ ३ ४ ५ हाँ ना
चॉकलेट)
-
- १८ मेरा बच्चा विशेष तरीके से बनाया हुआ खाना पसंद करता १ २ ३ ४ ५ हाँ ना
है । (तला हुआ, कच्ची सब्जियाँ)