DIET QUALITY AND PREDICTOR FACTORS OF BODY WEIGHT STATUS AMONG CHILDREN WITH LEARNING DISABILITIES IN KELANTAN

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by

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ADHD	Attention Deficit Hyperactivity Disorder
ASD	Autistic Spectrum Disorder
BMI	Body Mass Index
BWS	Body Weight Status
CBR	Community-based Rehabilitation centre
CDC	Centers for Disease Control and Prevention
CFPQ	Comprehensive Feeding Practice Questionnaire
DOSM	Department of Statistic Malaysia
DS	Down Syndrome
DSW	Department of Social Welfare
FFQ	Food Frequency Questionnaire
GDD	Global Developmental Delay
HEI	Healthy Eating Index
M-HEI	Malaysian Healthy Eating Index
ID	Intellectual Disabilities
LD	Learning Disabilities
MCO	Control Movement Order
MDG	Malaysian Dietary Guidelines
MLR	Multiple Linear Regression
MOE	Ministry of Education
NCD	Non-Communicable Diseases
NHMS	National Health and Morbidity Survey
OR	Odd Ratio
RNI	Recommended Nutrient Intakes
SD	Standard Deviation
SEIP	Special Education Integration Program
SES	Socio-economic Status
SLR	Simple Linear Regression
STEP-CHILD	The Screening Tool of Feeding Problems for children
TD	Typical Development
UK	United Kingdom
UNICEF	United Nations Children's Fund
US	United Stated
WHO	World Health Organization

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KUALITI DIET DAN FAKTOR PERAMAL STATUS BERAT BADAN DALAM KALANGAN KANAK-KANAK KURANG UPAYA PEMBELAJARAN DI KELANTAN

ABSTRAK

Kajian menunjukkan bahawa kanak-kanak yang mengalami kurang upaya pembelajaran mempunyai status berat badan yang tidak sihat dan corak pemakanan yang buruk. Kajian keratan rentas telah dijalankan untuk menentukan kualiti diet dan faktor peramal indeks jisim badan kanak-kanak kurang upaya pembelajaran. Kajian ini melibatkan kanak-kanak kurang upaya pembelajaran yang mengikuti Program Pendidikan Khas Integrasi dari sembilan buah sekolah yang terletak di daerah yang mempunyai status sosio-ekonomi tinggi, sederhana dan rendah di Kelantan. Ibu bapa melengkapkan satu set soalan kaji selidik dalam Bahasa Melayu tentang latar belakang demografi dan sosio-ekonomi, masalah anak ketika makan, kekerapan pengambilan makanan anak dan amalan pemakanan ibu bapa. Tinggi dan berat kanak-kanak diukur oleh penyelidik untuk menentukan status berat badan. Kualiti diet dinilai menggunakan Indeks Pemakanan Sihat untuk rakyat Malaysia. Analisis regresi linear berganda telah digunakan untuk menguji hipotesis kajian. Seramai 259 kanak-kanak kurang upaya pembelajaran dengan purata umur 10.54±1.69 tahun (68.0% lelaki, 32.0% perempuan) telah mengambil bahagian dalam kajian ini. Purata indeks jisim badan mereka ialah 18.38±4.79kg/m^2; lelaki (18.79±4.76kg/m^2) mempunyai indeks jisim badan yang ternyata lebih tinggi daripada perempuan (17.52±4.77kg/m^2), p= 0.046. Peratusan kanak-kanak yang mempunyai kurang berat badan, kurus dan amat kurus adalah 11.9%, manakala 28.1% adalah mempunyai lebih berat badan dan obes.

Purata skor kualiti diet ialah 48.15±9.23%, di mana 40.5% daripada kanak-kanak ini berisiko untuk kualiti diet yang rendah. Jumlah pengambilan tenaga harian ialah 1831.96±542.15 kcal dengan purata pengambilan karbohidrat (241.80±74.75g), protein (76.10±25.54g) dan lemak (63.42±21.33g). Majoriti kanak-kanak mempunyai skor yang tinggi untuk kerap makan dengan cepat (2.00±1.32), enggan makan (1.47±1.35), dan memilih makanan (1.26±1.13) semasa waktu makan dalam tempoh enam bulan yang lalu. Amalan pemakanan ibu bapa termasuk paksaan untuk makan (Beta =-0.282), pengawalan berat badan yang tegas (Beta =0.351) dan pemodelan (Beta =-0.162), umur kanak-kanak (Beta =0.222), dan berat ketika lahir (Beta =0.137) adalah penyumbang secara signifikan kepada indeks jisim badan ($R=0.561$, $R^2=0.315$; $F(5,217)=19.972$, $p<0.001$). Kajian ini mencadangkan bahawa pengesanan awal isu pemakanan kanak-kanak kurang upaya pembelajaran dan amalan pemakanan yang positif oleh ibu bapa semasa waktu makan adalah penting untuk menangani masalah pemakanan dalam kalangan kanak-kanak ini.

DIET QUALITY AND PREDICTOR FACTORS OF BODY WEIGHT STATUS AMONG CHILDREN WITH LEARNING DISABILITIES IN KELANTAN

ABSTRACT

Evidence suggests that children with learning disabilities (LD) have unhealthy body weight status (BWS) and poor dietary patterns. A cross-sectional study was conducted to determine the diet quality and the predictors of body mass index (BMI) of LD children. This study recruited LD children who attended the Special Education Integration Program from nine schools located in districts with high, moderate and low socio-economic status in Kelantan. Parents completed a Malay language self-administered questionnaire on demographic and socio-economic background, child's feeding problems, food frequency questionnaire and comprehensive parental feeding practices. Height and weight of children were measured by researcher to determine BWS. Diet quality was assessed using The Malaysian Healthy Eating Index. Multiple linear regression analysis was applied to test the research hypothesis. A total of 259 children with LD aged 10.54±1.69 years (68.0% males, 32.0% females) participated in this study. Their average BMI was 18.38±4.79 kg/m^2; males (18.79±4.76 kg/m^2) had significantly higher BMI than females (17.52±4.77 kg/m^2), p= 0.046. The prevalence of underweight, thin and severely thin were 11.9%, while 28.1% were overweight and obese. The diet quality average score was 48.15±9.23%, where 40.5% of the children were at risk of poor diet quality. The total daily energy intake was 1831.96±542.15 kcal with a mean carbohydrate intake (241.80±74.75g), protein intake (76.10±25.54g) and fat intake (63.42±21.33g), respectively. Majority of children had

a higher score for the occurrence of rapid eating (2.00±1.32), food refusal (1.47±1.35), and food selectivity (1.26±1.13) during mealtimes in the past six months. Parental feeding practice including pressure to eat (Beta =-0.282), restriction of weight control (Beta =0.351) and modelling (Beta =-0.162), child age (Beta =0.222), and childbirth weight (Beta =0.137) were significantly related to BMI (R=0.561, R^2=0.315; F(5,217) =19.972, p<0.001). The current findings suggested that early detection of nutrition issues in children with LD and regular positive feeding practice by parents during mealtime is essential to address the poor nutritional status of LD children.

CHAPTER 1

INTRODUCTION

1.1 Background

Body weight status (BWS) is an important determinant of nutritional status as well as overall health status. Early determination of BWS aids in the prevention of poor health status because being severely obese or thin may increases the chance of developing chronic diseases (Ahmad et al., 2017). BWS is presented as body mass index (BMI) and classified into thinness, normal, overweight and obesity. Overweight and obesity could happen due to excessive fat accumulation in the body; meanwhile, being underweight, thin, wasting or stunted could indicate a nutritional deficiency. Underweight status is assessed based on weight for age for children less than five years, and stunted is to determine whether children's height is suitable with their age (CDC, 2022; WHO, 2020).

According to The European Association for the Study of Obesity, overweight and obesity are the fifth leading risk for global deaths (EASO, 2020). Overweight or obesity is one of the major risk factors for non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, hyperlipidaemia and hypertension. World Health Organisation (WHO) (2016) estimated that almost 18.4% of children and adolescents aged 5 to 19 years were overweight and 6.8% were obese worldwide in the year 2016 as compared to 14.8% overweight and 4.9% obesity in 2010. The prevalence of overweight and obesity had risen gradually among both boys and girls, whereby 1.0% of children and adolescents (both sexes) were obese in 1975 while 6.0% of girls and 8.0% of boys were obese in 2016 (WHO, 2020). Meanwhile, the prevalence of thinness among children and adolescents aged 5 to 19 years in 2016 was 10.5% which was

lower than in 2010 (11.0%) (WHO, 2016). In Malaysia, The National Health & Morbidity Survey (NHMS) 2015 reported the national prevalence of thinness (BMI for age <-2SD) among Malaysian children aged 5 to 17 years was 7.8% which was lower than NHMS 2019 (10.0%). Meanwhile, NHMS 2015 reported the prevalence of obesity (BMI for age >+2SD) was 11.9%, which was higher lower than NHMS 2019 (14.8%). Overweight and obesity have become a common health problem among children worldwide. Although substantial information is available on children underweight, overweight and obese in the general population, less is known about BWS in children with disabilities.

. In Malaysia, The Department of Social Welfare (DSW) stated that there are seven categories of disability for registration purposes. These categories are hearing disability, visual disability, speech disability, physical disability, learning disability, mental disability and multiple disabilities. Learning disabilities had the highest prevalence of registered children (140,924) in 2019 as compared to the other categories, which were hearing disability (9,285), visual disability (7,192), speech disability (1,221), physical disability (25,611), mental disability (797) and multiple disabilities (11,816) (DWS, 2019). The data from DSW reported that there are increments in registered children with LD in 2019 (140,924) as compared to 2015 (75,152) in Malaysia (DSW, 2015).

Learning disabilities is defined as disorders in learning, cognition and intelligence that are inconsistent with their chronological age and demonstrate difficulties in performing daily activities (DSW, 2020). They further stated that the category of LD includes conditions such as Down Syndrome (DS), Attention Deficit Hyperactivity Disorder (ADHD), Autistic Spectrum Disorder (ASD), Global Developmental Delay (GDD), Intellectual Disability (ID) and specific learning

disabilities (Specific LD) such as (dyslexia, dyscalculia and dysgraphia). Meanwhile, according to The National Joint Committee on Learning Disabilities (NJCLD) (2016), learning disabilities (LD) is defined as "a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities". NJCLD defined LD as a combination of disorders and more focused on learning skills compared to the definition of LD in Malaysia, which was more general and included a specific category of disorder.

The United Nations Children's Fund (UNICEF) (2018) estimated that at least 93 million children with disabilities globally, 1 in 20 children aged 14 or younger, live with moderate to severe disabilities. Meanwhile, in Central and Eastern Europe and Central Asia, there were 5.1 million children with disabilities in these regions, in which almost 3.6 million uncounted in social registers. In developed countries, Kraus et al. (2018) reported that among United Stated (US) population, there were 0.7% of children under five years and 5.6% of ages 5 to 17 years had a disability. However, the data included all types of disabilities, did not disaggregate; either by intellectual disabilities, physical disabilities or any type of disabilities. The number might increase due to unregistered children with disabilities in Malaysia or worldwide.

Children with LD who have cognitive, sensory and other limitations are considered a vulnerable group. They have intellectual inabilities that limit their adaptive behaviour in daily activities such as eating, playing and self-management (Schalock et al., 2010). They are more likely to live with complex health conditions, limited access to quality health care and health promotion programs, poor health management, mental health problems and medication dependence (CDC, 2009). Besides, their disabilities also caused them to face daily discrimination in the form of negative attitudes, isolation from participation, improper nutrition and medical service

as well as a higher risk of getting physical abuse (UNICEF, 2018). They may have limited knowledge and understanding to make a good dietary choices and having difficulties feeding themselves, causing them to rely on the help and guidance of the others in their daily lifestyle.

Nutritional status is a fundamental determinant for good health and development during the early years of life. Proper nutrition gives children the energy for daily activities, protects against malnourishment, strengthens the immune system, and prevents infectious diseases. Consumption of enough food groups and nutrient intake (macro-and micronutrients) based on their age requirements is crucial to achieve good diet quality, healthy growth and development, and healthy BWS during childhood and throughout the life course (Majid et al., 2016). However, unhealthy dietary intake such as high consumption of fat, sugar, salt and low fruit and vegetable intake has led to nutrition-related health problems such as under and over nutrition among children. Previous studies revealed that overweight and obesity had become a significant health problem among children with typical development (TD) as well as children with disabilities due to poor dietary intake (Loh et al., 2016; Scharf & DeBoer, 2016) and low diet quality (Bahadoor et al., 2016; Jennings et al., 2011). Children with typical development is defined as "a normal progression by which children change as they grow older by acquiring and refining knowledge, behaviours, and skills" (IGI Global, 2022).

In Malaysia, a recent study by Eow, Gan and Awang (2021) among children with ASD reported the prevalence of overweight and obese was 21.5% and 4.0% was wasted. Another published study on BWS among children and adolescents with LD by Chen et al. (2015) discovered that almost half of them were underweight (22.5%) and overweight/obese (22.1%). They further suggested that children with disabilities have

nutrient intake, unhealthy eating behaviour, and feeding difficulties. Thus, nutritional status is an essential indicator of the health status and well-being of children with disabilities as these groups are vulnerable to poor nutritional status.

1.2 Problem Statement

Children with LD have a higher probability of experiencing poor health status than children without LD due to lack of ability to comprehend and evaluate information on nutrition and health. Poor health status will increase the risk of developing NCDs as a secondary health condition among disabled people (Bellamy, 2016; Rimmer et al., 2010). A systematic review reported that disabled children are three times more likely to be underweight and twice as likely to have wasting and stunting than children with TD (Hume-nixon & Kuper, 2018). However, another systematic review by Maïano et al. (2016) revealed that disabled children have a 1.54 times more risk of being overweight-obesity and 1.80 times for obesity than children with TD, which were parallel with the other previous studies (Ogwu, 2012; Sayin & Ilik, 2017). Disabled children who are obese will be vulnerable to remain obese during adulthood and prone to have other health problems such as diabetes, hypertension, and heart disease (Raghi et al., 2016). These findings suggest that unhealthy BWS among disabled children is a problem that place burden on health care costs and therefore, it warrants further investigation, especially in Malaysia.

Previous studies suggested that some of the risk factors associated with unhealthy BWS among children and adolescents with LD were age, gender, sedentary behaviour, higher intakes of energy-dense food, comorbidities and genetic disorders (Choi et al., 2012; Ha, Vann, & Choi, 2010; Wang et al., 2018). Besides, several

previous studies in Malaysia assessed the prevalence of underweight, overweight and obesity with the risk factors of socio-economic, feeding difficulties, physical activity, and sleep disturbances among disabled children, which included autism, learning disabilities and neurological impairment (Chen et al., 2015; Jaafar, 2019; Nor et al., 2019). A review by Hamiza et al. (2017) stated that lack of study showed an association between dietary patterns and malnutrition risk among children with LD because the previous studies in their review paper showed a significant relationship between dietary pattern and behavioural problem with ADHD. Lack of recent research focuses on diet quality and BWS among this vulnerable group in Malaysia as most previous studies were conducted in other countries (Johnson et al., 2014; Zeybek & Yurttagül, 2020). Several studies on the diet quality assessment of normal Malaysian children found poor diet quality (Chua et al., 2012; Shan et al., 2018; Zalilah et al., 2005). Diet quality refers to the uptake of specific nutrients and the amount of nutrients to support body maintenance, growth, physiological status, physical activity and protection against infection.

Conventionally, previous nutritional epidemiology studies investigated various aspects of diet such as dietary intake, dietary behaviour, and one single nutrient or food group and examined its association with health. However, realising the complexity of an individual's diet, which comprises various foods and nutrients, research focusing on a single or a few nutrients or food groups has several limitations. Thus, a new approach to studying diet quality has emerged to determine the interactions and effects of foods and nutrients on health (Champagne et al., 2007). The Malaysian Healthy Eating Index (M-HEI) by Lee et al. (2011) is one of the indexes of overall diet quality based on the degree of compliance to dietary recommendations in the Malaysian Dietary Guidelines (MDG) on both nutrients and food groups, unlike other indexes

that are based on either nutrients or food groups alone. Based on our current knowledge, this study attempts to examine the diet quality of children with LD by using the Malaysian HEI. There are still gaps and lacking research regarding diet quality and BWS among children with LD in Malaysia.

Since the prevalence of underweight and overweight/obesity is relatively high among children with LD in Malaysia, ranging from 4.0% to 22.1% and 21.5% to 33.2%, respectively (Chen et al., 2015; Eow, Gan, & Awang, 2021; Norazlin et al., 2019); therefore, diet quality and other factors correlated with BWS should be investigated. Thus, more information is needed to understand diet quality and the relationship between BWS with other factors among this vulnerable group.

1.3 Significance of the Study

The body weight status (BWS) problem still exists, in which the prevalence of overweight and obesity gradually increased, and it became one of the significant health problems among children with LD (Bandini et al., 2015; Chen et al., 2015; Hamiza et al., 2017; Hume-nixon & Kuper, 2018). Healthy body weight is important for children to ensure proper growth and development throughout the life course. More information is needed to understand the factors that are potentially associated with BWS among children with LD. This study could contribute to the body of knowledge and provide valuable current insight on the associated factors of BWS among children with LD.

The findings from this study also will provide fundamental information on diet quality which assessed both nutrients and food groups, unlike other studies, which only determined one single nutrient or food group. Establishing a good diet quality in early life is essential for optimal growth and development as well as for long-term health.

Good diet quality reflects the children's sufficient nutrient intake to enhance their physical, cognitive, and psychosocial development (Cheng & Buyken, 2013). Meanwhile, poor diet quality happens due to not having enough healthy foods each day, affecting their nutrient intake, including energy, protein, carbohydrates, essential fatty acids, vitamins and minerals. Poor diet quality is one of the contributing factors of unhealthy BWS among children, which may decrease quality of life (Jennings et al., 2011). Assessing diet quality among children is essential to combat unhealthy dietary intake and practices established during childhood as it might affect their health until adulthood (Shan et al.,2018). To our knowledge, a recent published study in Malaysia by Eow, Gan and Awang (2021) was focused on the dietary intake of children with ASD and did not further evaluate their diet quality. Thus, this current study will evaluate diet quality and its relationship with BWS among children with LD.

On the other hand, this study should be carried out due to the lack of studies in Malaysia that focus on nutrition among special needs children. It is one of the topics included in the latest Nutrition Research Priorities in Malaysia for the 12th Malaysia Plan (2021-2025) (MOH, 2020). Besides, a UNICEF survey found that 6 out of 10 people in Malaysia have a lack of information about disabled children (Yusof, 2017). An extensive understanding of the factors related to BWS was an important issue to help in developing effective nutrition-related intervention programs to promote healthy body weight and eating behaviours among children with LD. Additionally, this study provided baseline data for future research related to diet quality and factors correlated with BWS among LD children. Hence, it is crucial to explore these issues to help other researchers, healthcare practitioners, nutritionists, dietitians, and health

promotion planners to identify an effective plan to improve the quality of life among children with LD in Malaysia.

1.4 Conceptual Framework

Figure 1.0 shows the conceptual framework of this study. The independent variables are demographic and socio-economic factors, child factors and parental factors, while the dependent variable is body weight status. This study will investigate the relationship between these factors as the previous research showed mixed findings among children with LD and TD. At the same time, there are still limited information among children with LD in Malaysia. Other potential risk factors such as physical activity, sedentary activities, sleep quality, maternal BMI that might related with BWS of children with LD were not investigated in this study because the current study will focus on dietary factors, child's behaviour and parental practices during meal times.

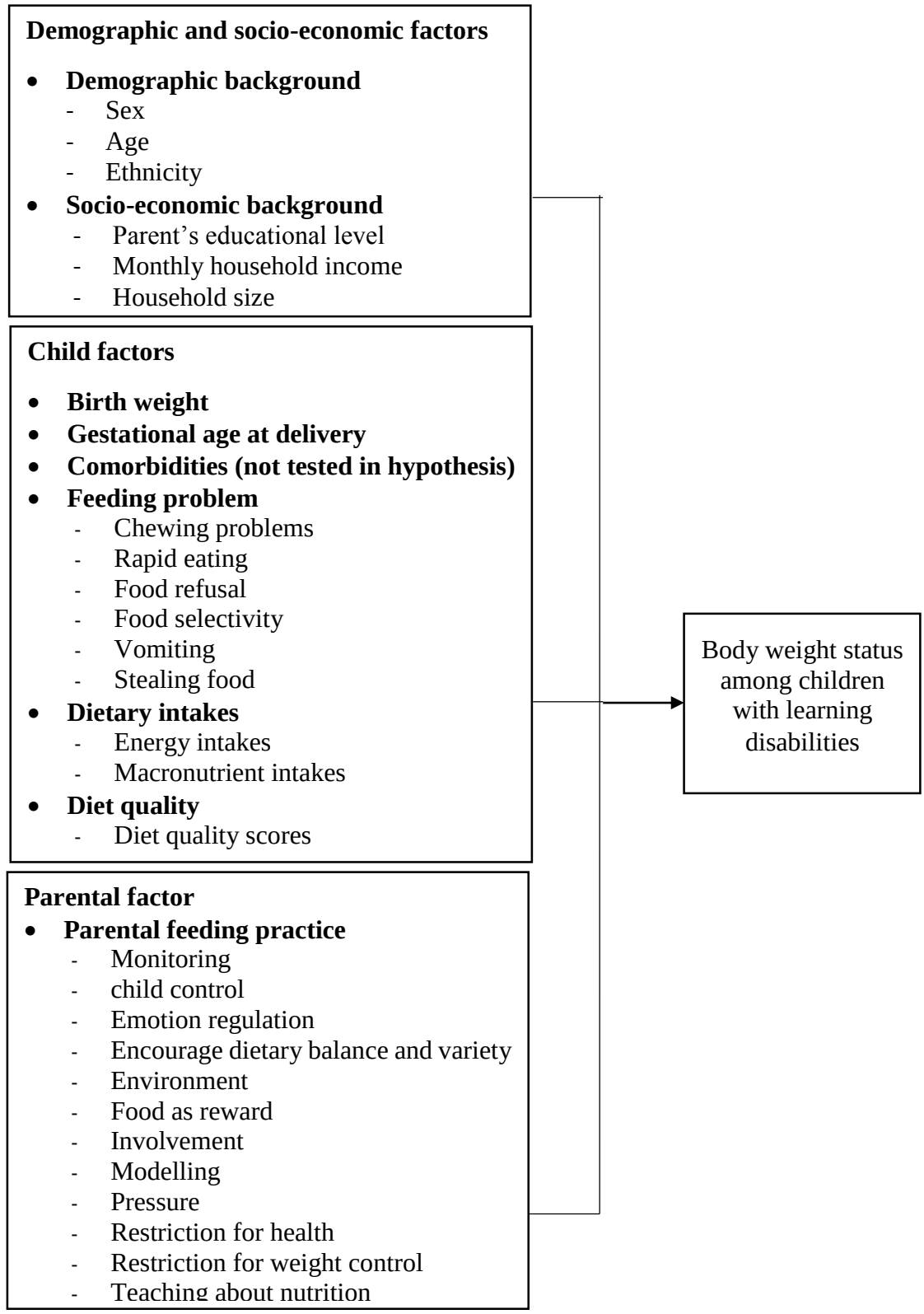


Figure 1.1 Conceptual framework for diet quality and factors correlated with body weight status among children with learning disabilities

1.5 Research Questions

The purpose of this study is to predict relationship between demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality), parental factor (parental feeding practice) and body mass index of children with learning disabilities. A few research questions have arisen for this study which are:

1. What is the prevalence of thinness, overweight and obese among children with learning disabilities attending primary school in Kelantan?
2. What are the diet quality scores of children with learning disabilities using The Malaysian Healthy Eating Index (M-HEI)?
3. Do demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality) and parental factor (parental feeding practice) contribute to the body mass index of children with learning disabilities?

1.6 Objective

1.6.1 General objective

To predict relationship between demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality), parental factor (parental feeding practice) and body mass index of children with learning disabilities.

1.6.2 Specific objectives

1. To examine demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, comorbidities, feeding problems and dietary intakes), and parental factor (parental feeding practice) among children with learning disabilities.

2. To evaluate the diet quality of children with learning disabilities using The Malaysian Healthy Eating Index (M-HEI).

3. To determine the prevalence of thinness, overweight and obesity among children with learning disabilities.

4. To determine the contribution of demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality) and parental factor (parental feeding practice) towards body mass index of children with learning disabilities.

1.7 Research Hypothesis

1. There is a significant relationship between demographic and socio-economic factors, child factors (birth weight, gestational age, feeding problem, dietary intakes and diet quality) and parental feeding practice with body mass index among children with learning disabilities.

2. There is a significant contribution of demographic and socio-economic factors, child factors (birth weight, gestational age, feeding problem, dietary intakes and diet quality) and parental feeding practice towards body mass index of children with learning disabilities.

1.8 Definition of terms

Conceptual definition

Children with learning disabilities

According to The Malaysian Department of Social Welfare (DSW), the category of LD included conditions such as Down Syndrome (DS), Attention Deficit Hyperactivity Disorder (ADHD), Autistic Spectrum Disorder (ASD), Global Developmental Delay (GDD), Intellectual Disability (ID), slow learner and specific learning disabilities (Specific LD) such as (dyslexia, dyscalculia and dysgraphia). LD is defined as disorders in learning, cognition, and intelligence that were inconsistent with their chronological age and demonstrated some difficulties in performing their daily living (DSW, 2020).

Operational definition

Body weight status

Body weight status (BWS) is presented as a body mass index (BMI). BMI is determined by using Quetelet's index: BMI (kg/m^2)= body weight (kg) / height $(m)^2$. For children, BWS is categorized based on BMI-for-age z-score in which the cut-off values for thinness is <-2SD, normal is -2 SD $\leq z \leq$ + 1 SD; while for overweight is >1 SD and >2 SD for obesity (WHO, 2007).

Diet quality

Diet quality is determined by cereal/grains, vegetables, fruit, milk/milk products, poultry/meat/egg, fish, and legumes to assess on person's degree of compliance with the food groups intake recommended by Malaysian Dietary Guidelines for Children and Adolescents (MDG) and recommendation of the percentage of energy from fat

and sodium intake by MDG (Fara Wahida et al., 2015). The higher diet quality score indicates good diet quality. The categories for the HEI score were divided into two: at risk of poor diet quality (≤ 46.0%) and low risk of poor diet quality (> 46.0%) (Fara Wahida et al., 2015).

Dietary intake

Dietary intake is measured by using semi-quantitative food frequency questionnaire and presented a value of energy (kcal) and each macronutrient (gram) such as carbohydrate, protein and fat intake per day.

Feeding problems

The feeding problem faced by children, including chewing problems, rapid eating, food refusal, food selectivity, vomiting, and stealing food. The higher scores of the "Screening Tool of Feeding Problems" children version (STEP-CHILD) indicated higher feeding problems (Seiverling et al., 2011).

Parental feeding practice

Parental feeding practices, including monitoring, child control, emotion regulation, encourage balance and variety, environment, food as reward, involvement, modelling, pressure, restriction for health, restriction for weight control and teaching about nutrition are measured by the Comprehensive Feeding Practice Questionnaire (CFPQ). Higher total scores of the subscales reflect a higher intensity of the specific parental feeding practices (Shohaimi et al., 2014).

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of learning disabilities

According to The National Joint Committee on Learning Disabilities (NJCLD) (2016), learning disabilities (LD) is defined as "a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities." Meanwhile, the Learning Disabilities Association of Canada (LDAC) (2017) refers LD as several disabilities that may affect the acquisition, organisation, retention, understanding or use of verbal or nonverbal information and demonstrate at least average abilities for thinking and/or reasoning. Children with LD show an uneven cognitive and social development pattern and difficulty learning, understanding, communicating, playing, and doing other things than other children of the same age.

2.1.1 Learning disabilities in Malaysia

LD is a group of disorders, not a single disorder (NJCLD, 2016; NECIC, 2013). Khoo (2010), through MyHEALTH Portal of the Ministry of Health Malaysia explained that the general or more global form of LD could be resulted from a variety of causes such as genetic disorders (e.g. Down Syndrome), abnormal brain development and formation, specific medical disorders (e.g. uncontrolled epilepsy, autism, ADHD), brain damage due to complications during pregnancy, birth or early childhood (e.g. brain infection or injury), endocrine disorders or environmental factors.

According to The Malaysian Department of Social Welfare (DSW), there are seven categories of disability for registration purposes which are hearing disability, visual disability, speech disability, physical disability, learning disabilities, mental disability and multiple disabilities. This present study will focus on learning disabilities. The category of LD included conditions such as Down Syndrome (DS), Attention Deficit Hyperactivity Disorder (ADHD), Autistic Spectrum Disorder (ASD), Global Developmental Delay (GDD), Intellectual Disability (ID), slow learner and specific learning disabilities (Specific LD) such as (dyslexia, dyscalculia and dysgraphia). DSW defined LD as disorders in learning, cognition, and intelligence that were inconsistent with their chronological age and demonstrated some difficulties in performing daily activities (DSW, 2020).

The Ministry of Education Malaysia (MOE) refers the term 'learning disabilities' as a group of students with special needs who have learning problems in schools. This term is similar to the one used by the Social Welfare Department. Through the Special Education Division (2015), MOE stated that the students with LD would be enrolled in the Special Education Integration Program (SEIP) in a primary and secondary school. Children who have been diagnosed by a doctor and obtained a disabled card from DSW are qualified for this program. Meanwhile, the children who have not been diagnosed by a doctor at an early age will be tested using *'Instrumen Pengesanan Murid Mempunyai Masalah Pembelajaran'* to distinguish students with LD (MOE, 2020). Children who have failed this test will be referred to a health clinic to identify and confirm for any learning difficulties. Recently, data reported that almost 25,685 children with LD enrolled in SEIP in primary schools in Malaysia (MOE, 2019). Thus, this present study was investigated the nutritional status of children with LD who were qualified for school entry. They have barriers in learning

but do not have other severe disabilities such as Cerebral palsy, severe autism, severe Down Syndrome, severe intellectual disability, deafness, etc. (NECIC, 2013).

Several previous studies in Malaysia had studied a few issues related to children with LD who attend SEIP. For example, Isa et al. (2017) examined the levels and predictors of perceived stress; while Kamaruddin and Mamat (2015) investigated the level of stress among caregivers of children with LD in Malaysia. Another study by Sulaiman, Baki and Rahman (2011) in Malacca examined the cognitive ability of children with LD; while, Muzaliha et al. (2012) studied visual acuity and visual skills in 1010 children with LD aged between 8 to 12 years in primary schools in Kota Bharu, Kelantan. To our knowledge, a published study by Chen et al. (2015) studied factors affecting body mass index (BMI) of children and adolescents with LD at the Community-based Rehabilitation centre (CBR) and reported the relationship between socio-economic, feeding characteristics and BMI. Another previous study among children and adolescents with ASD who attend the Child Development Center and an autism intervention centre located in Kuala Lumpur examined the risk factors associated with obesity, including physical activity, sleep disturbances, autism severity and feeding problems (Eow et al., 2020; Norazlin et al., 2019). Thus, this present study will further investigate diet quality and other factors correlated with BWS among children with LD in Kelantan who attended SEIP in primary school.

2.2 Diet quality

The Nutrition Transition in dietary consumption and energy expenditure is worrying when the trends of shifting from traditional diets high in cereal and fibre to modern diets high in sugar, fat, and animal-source have emerged steadily. Over the past

decades, several transitions in dietary patterns have been observed in Asian countries. For instance, the changes in the portion of dietary energy derived from oils and fats, replacing complex carbohydrate sources, rice-based diets of Asian has been replaced with wheat consumption and increment in the proportion of energy intake derived from caloric sweeteners, meat as well as processed, packaged and convenience foods (Goh et al., 2020; Kelly, 2016). These foods are energy dense and low in nutrients (higher in fats, sugars and salt) linked to increased diet-related NCDs (Kelly, 2016). In The United Stated, poor diet was one of the risk factors associated with a higher proportion of deaths from heart disease, stroke, and type 2 diabetes that warrants further intention (Micha et al., 2017). Meanwhile, a systematic analysis among 195 countries observed high sodium intake, low intake of whole grains, and fruits were the leading dietary pattern associated with the global burden of disease from 1990 to 2017; which potentially leads to death (Afshin et al., 2019).

Previous nutrition studies were investigated on various aspects of diet such as dietary intake, dietary behaviour, single nutrient or food group consumption to examine the associations between diet and health. For example, high consumption of fat is related to the increased risk of obesity (Wang et al., 2018) and cardiovascular diseases (Julibert et al., 2019), while a high intake of sodium is associated with hypertension (Grillo et al., 2019; Yang & Zhang, 2018). However, research that focuses on a single or a few nutrients or groups has several limitations, realising the complexity of an individual's diet, which comprises various foods and nutrients. A new approach in studying the combination of food groups and nutrients emerged, known as diet quality; to better capture its interactions toward health (Champagne et al., 2007).

2.2.1 Definition of diet quality

According to the International Atomic Energy Agency, diet quality can be defined as a diversified food to cover a person's nutrient needs, a balanced diet, and a healthy diet that provides energy and essential nutrients for growth and health. It refers to the uptake of specific nutrients from each food group and the amount of nutrients to support body maintenance, growth, physiological status, physical activity and protection against infection (IAEA, 2019). In a general way, diet quality is used to describe how well an individual's diet conforms to dietary recommendations. Assessing diet quality is more relevant to track overall individual diet and adequate nutrition rather than focusing on a single nutrient or food group. Due to the nutrition transition, dietary concern focuses not only on the adequacy of nutrition but also on excess and inadequate nutrition as it directly affects nutritional status (Arimond et al., 2011).

2.2.2 Diet quality index

Diet quality indices are the measurement used to determine diet quality. It provides a single numerical value representing a score for overall diet quality based on current scientific evidence and dietary recommendations to measure whether diets adhere to those guidelines (Thorpe et al., 2014). Higher diet quality scores indicate better diet quality or better adherence to dietary recommendations. It reflects the sufficient nutrients and food groups' intake required by the body to enhance growth and development in physical, cognitive and psychosocial (Cheng & Buyken, 2013). Children with better diet quality and have normal body weight are more likely to have a good health-related quality of life scores (Wu et al., 2012). Meanwhile, low diet quality scores reflect unhealthy dietary intake and poor compliance with the dietary

guidelines. Consumption of unhealthy food will affect their food groups' intake and nutrient intake, including energy, protein, carbohydrates, essential fatty acids, vitamins and minerals.

Previous studies showed that diet quality was assessed using different diet quality indices. For instance, Torun and Yildiz (2013) evaluated the diet quality of 229 male adolescents aged 10 to 14 years using the Mediterranean Diet Quality Index (KIDMED); an index for assessing Mediterranean and Healthy Diet based on the principles of dietary pattern. Besides, a study among 1282 children aged 7 to 10 years in Brazil assessed diet quality using ALES–School Child Diet Index, which considers the nutritional recommendations for the Brazilian population; based on the consumption of 15 food items and the habit of having breakfast (Molina et al., 2010).

Research of Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) used Diet Quality Index for Adolescents, including a specific Meal index (DQI-AM) to assess diet quality (Béghin et al., 2014). DQI-AM measured four components, namely diet quality, dietary diversity, dietary balance (based on food groups) and meal frequency. Besides, Cheng et al. (2016) developed the Chinese Children Dietary Index which measured the combination of nutrients and food groups based on the Chinese Dietary Guidelines and Chinese Dietary Reference Intakes (DRIs) and health-promoting behaviour to assess overall diet quality among children in aged 7 to 15 years South China.

Another study by Zeybek and Yurttagül (2020) and Johnson et al. (2014) evaluated diet quality among autistic children in Northern Cyprus and North America by using the Healthy Eating Index (HEI). These studies assessed diet quality based on adherence to the dietary guidelines in these countries. Table 2.1 shows the summary

of diet quality indexes that had been used in previous studies worldwide. In short, some studies examined diet quality based on several nutrients, food and food groups that assessed the adherence to the national dietary guidelines; while, other studies measured with the combination of dietary pattern and dietary behaviour. Thus, this present study assessed diet quality by using The Malaysian Healthy Eating Index (M-HEI) because it measure the adherence of diet to dietary recommendations based on the Malaysia Dietary Guidelines (MDG) for children and adolescents.

Table 2-1 Diet quality index

Author	Diet quality index	Population	Measurement	Remark
Béghin et al. (2014)	Diet Quality Index - Meal index (DQI-AM)	12.5 to 17.5 years of adolescence in northern Europe	Measure four components, namely diet quality, dietary diversity, dietary balance (based on food groups) and meal frequency	Measure diet quality, dietary diversity, dietary balance and meal frequency
Torun and Yildiz (2013)	Mediterranean Diet Quality Index (KIDMED)	10 to 14 years children in Turkey	Assess the Mediterranean and Healthy Diet based on the principles of dietary pattern and the factor that undermine it.	Combination of adherence to the dietary
Molina et al. (2010)	ALES–School Child Diet Index	7 to 10 years children in Brazil	Determine based on the nutritional recommendations for the Brazilian population; based on the consumption of 15 food items and the habit of having breakfast	recommendation and the child's behaviour
Cheng et al. (2016)	Chinese Children Dietary Index	7 to 15 years children in South China	Measured the combination of nutrients and food groups based on the Chinese Dietary Guidelines and Chinese Dietary Reference Intakes (DRIs) and health-promoting behaviour to assess overall diet quality	
Zeybek and Yurttagül (2020)	Healthy Eating Index (HEI)	3 to 18 years autistic children in Northern Cyprus	Assess diet quality based on adherence to the dietary guidelines in these countries	HEI measures adherence to the dietary
Johnson et al. (2014)	The Healthy Eating Index (HEI) from 3 day food record (3DFR)	2 to 11 years autistic children in North America	How well an individual's intake agrees with federal dietary guidelines	guidelines- Involve all food groups
Lee et al., (2011), Fara Wahida et al. (2015), Appannah et al. (2020), Shan et al. (2018), Pei et al. (2018)	The Malaysian Healthy Eating Index (M-HEI)	children and adolescents and adults in Malaysia	The degree of compliance to dietary recommendations in the Malaysian Dietary Guidelines (MDG) on both nutrients and food groups	

2.2.3 Diet quality of children with typical development and learning disabilities

Children with LD are prone to have low diet quality due to limited food choices and feeding problems, which increase the risk for particular macro and micronutrient deficiencies. The prevalence of poor diet quality has been observed in previous studies. For example, Torun and Yildiz (2013) reported that 10.5% of children and adolescents with TD aged 10 to 14 years in Turkey had low diet quality, 64.2% had mid- diet quality and 25.3% had optimal diet quality. Besides, a study in Brazil found that 41.0% of the children with TD aged 7 to 10 years had low diet quality, with the prevalence higher in girls (42.7%) compared to boys (37.7%) (Molina et al., 2010). This study further suggested a higher prevalence of children who were not consuming a good quality diet due to lower maternal educational levels who lacked access to adequate information on healthy food. The suggestion was consistent with a study in European countries by Béghin et al. (2014), which found that parental educational level and occupation were positively correlated with diet quality scores. However, the parental educational level only showed a positive association with adolescents' diet quality in northern Europe but not in southern Europe; due to cultural and geographical factors that indirectly affect diet quality. Besides, Cheng et al. (2016) reported that more than 50.0% of the children with TD in China aged 7 to 15 years met the recommended intake for sugar-sweetened beverages, fatty acids, breakfast and dinner components. At the same time, over 60.0% of them consumed vegetables and fruits below the recommendations.

Another study by Zeybek and Yurttagül (2020) evaluated diet quality among autistic children in Northern Cyprus. The mean score was 57.2 ± 14.6 in which 7.7% had good, 64.1% needed improvement and 28.2% had poor diet quality. This study further reported that 70.0% of children had food selectivity, which resulted in

insufficient nutrients and reduced diet quality. This finding was similar to the past study conducted among 256 children with ASD, aged 2 to 11 years old in North America which reported the diet quality score was 59.69 ± 12.03 in which the diet quality would decline when their feeding and mealtime behaviours worsened (r=-0.306) (Johnson et al., 2014). The findings from most of the previous studies suggested that a higher prevalence of children and adolescents have poor diet quality.

2.2.4 Diet quality of children in Malaysia

Several previous studies in Malaysia examined the diet quality among children with TD and reported that most children and adolescents had poor diet quality (Fara Wahida et al., 2015; Hui et al., 2014; Shan et al., 2018). These studies further reported that many cases had a lower intake of staple foods, especially rice, noodles and bread, as well as micronutrients such as fruits, green leafy vegetables, milk and dairy products, and consumed more unhealthy snacks and sweet drinks. For example, a study among children with TD aged 7 to 12 years in Terengganu assessed diet quality using the M-HEI based on the Malaysian Dietary Guidelines for Children and Adolescents (Shan et al., 2018). The findings reported that the mean total M-HEI score was 50.45±5.27, with 61.0% of the children had poor dietary quality. Furthermore, the children had low median M-HEI scores for vegetable, fruit and dairy components, while high scores for the total fat, saturated fat, cholesterol and sodium.

A study by Zalilah et al. (2005) among 332 children with TD aged 7 to 9 years in Selangor had poor diet quality due to lack of food variety, high dietary fat and low carbohydrate intakes. However, a recent published study in Malaysia by Eow, Gan, and Awang (2021) was focused on dietary intake of children with ASD and did not

further evaluate their diet quality. Thus, this current study will evaluate the diet quality among children with LD as they are at high risk for macro and micronutrient deficiencies and are prone to being underweight or overweight/obese.

2.2.5 Diet quality and body weight status

Several studies among children without LD found that diet quality was associated with BWS (Bahadoor et al., 2016; El-kassas & Ziade, 2017; Jennings et al., 2011). Bahadoor et al. (2016) examined diet quality among 212 children aged 10 to 12 years in Mauritius and reported that obese children had significantly lower diet quality scores than normal-weight children (p=0.001). A cross-sectional study on factors associated with diet quality among 1700 children aged 9 to 10 years in the United Kingdom found that higher diet quality scores were significantly associated with improved weight status. The diet quality scores was also associated with lower weight (-5.9%; P = 0.002) and BMI (-4.2%; P = 0.004) (Jennings et al., 2011). Meanwhile, Cheng et al. (2016) found that children with higher diet quality scores had lower BMI among children aged 7 to 15 years in South China (r=-0.06, p=0.02).

However, Wong et al. (2014) investigated diet quality and body composition in a sample of New Zealand adolescents aged 14 to 18 years and found that diet quality scores had no association between BMI, waist circumference or waist-to-height ratio. A study in Malaysia also found no significant association between total diet quality score and BMI among children with typical development (Shan et al., 2018). Meanwhile, other studies examined the factors associated with diet quality such as parental healthy-eating attitudes and knowledge, self-efficacy for healthy eating, and

availability of healthy foods (Fara Wahida et al., 2015; Romanos-nanclares et al., 2018).

A person with LD would face nutrition problems as they may have difficulties in making good dietary choices due to lack of capability to think wisely (Kolset et al., 2018). A review by Hamiza et al. (2017) stated that lack of study showed a clear relationship between dietary patterns and malnutrition among children with LD as the significant relationship was found between dietary patterns, behavioural problems and ADHD. On the other hand, Krause et al. (2016) suggested that further investigation is needed on the association between dietary factors and BWS among the disabled population as these variables showed significant results among the general population. They are at risk of having low diet quality as they tend to eat high caloric food without parental guidance. Although a recent published study in Malaysia among children with ASD documented on dietary intake (Eow, Gan, & Awang, 2021); however, this study did not further evaluate the diet quality among children with disabilities.

2.3 Body weight status among children

2.3.1 Definition of body weight status

Body weight status (BWS) is presented as a body mass index (BMI). BMI is determined by using a person's weight in kilograms divided by the square of height in meters (kg/m^2). BMI is often referred to as BMI-for-age for children and adolescents, which is determined using an age- and sex-specific percentile. This is because of children's weight, height and body composition change during growth and development that varies as they aged between boys and girls. BMI can be a reliable indicator for determining nutritional status (CDC, 2020).

According to the Centers of Disease Control and Prevention (CDC) (2020), a high BMI can indicate high body fatness, and a low BMI can indicate low body fatness. However, it can only be used as a screening tool, not as a diagnostic tool of an individual's body fatness or health. BMI could not measure body fat directly, but it showed good agreement with dual-energy X-ray absorptiometry (DXA) results (Casey, 2013). BMI is simple, quick and provides direct results, but researchers still need to be cautious as it measures fat-free mass and body fat as one value (Nuttall, 2015). Individuals with greater BMI than normal range will be categorised as overweight or obese, while those with lower BMI are underweight, thin or wasting.

2.3.2 Body weight status of children with typical development

Overweight and obesity refer to a person who has a higher weight than a healthy weight due to excessive fat accumulation in the body. This condition can happen when the energy consumed is higher than energy expenditure. For example, they consume more energy-dense food such as sugars, fats and oils and perform less physical activity to burn calories. Being overweight and obese is one of the risk factors of getting diet-related NCDs such as heart attacks, stroke, hypertension, certain cancers, and diabetes. People with excess body weight had a lower health-related quality of life than normal weight and tended to be more worried, sad or unhappy. Several previous studies supported that obesity can cause lower emotional functioning, reduce self-esteem and impair psychosocial functioning (Swallen et al., 2005; Williams et al., 2005; Rimmer et al., 2010).

Meanwhile, the weight that is lower than the healthy weight for a given height at that age is described as underweight, thin or wasting. According to WHO (2021),

wasting or thinness (low weight-for-height) refers to recent and severe weight loss due to inadequate dietary intake, acute starvation, or infectious diseases such as diarrhoea. The chronic or recurrent undernutrition that suppresses them from reaching physical and cognitive potential will result in stunting (low height-for-age). Stunting might happen due to poor socio-economic status (SES), inappropriate infant and children feeding practices, poor maternal health and nutrition and/or frequent illness in early life. Underweight children may face stunted, wasted or both.

WHO (2020) estimated that almost 340 million or 18.0% of children and adolescents aged 5 to 19 years in 2016 were overweight and obese worldwide compared to 4.0% in 1975. Meanwhile, Global Nutritional Report (2019) has reported a declining prevalence of underweight from 39.5% in 2000 and 33.7% in 2016 among children and adolescents (aged 5-19) in the Asian countries. However, overweight and obesity among children and adolescents showed a rising trend from 2000 until 2016 from 7.0% to 17.3% and 1.7% to 6.5%, respectively. Even though the prevalence of underweight decreased, it remained a problem because the decline was too slow while overweight and obesity kept rising rapidly. This problem suggested that the double burden of malnutrition (over and undernutrition) would co-occur in the same country, which imposed a heavy burden on the health care system.

In Malaysia, WHO (2016) reported the prevalence of obesity among children and adolescents aged 5 to 19 years was 12.7% in 2016 which was higher than 9.6% in 2010; while the prevalence of thinness was 7.4% in 2016 which is lower than in 2010 (8.3%). On the other hand, a Global Nutritional Report (2019) reported the prevalence of overweight and obesity were 26.8% and 12.9% in 2016 as compared to 12.2% and 4.9% in 2000; while, the prevalence for underweight was 26.5% in 2016 which was lower than 34.9% in 2000. Besides, the findings from the Nutrition Survey of

Malaysian Children (SEANUTS Malaysia) among children aged 6 months to 12 years reported the prevalence of overweight, obesity, thinness and stunting was 9.8%, 11.8%, 5.4 % and 8.4 %, respectively (Poh et al., 2013). These BWS patterns were observed in a general population of children in Malaysia that did not differentiate either typically developing or disabled children.

2.3.3 Body weight status of children with Down syndrome

According to the Centers for Disease Control and Prevention, Down Syndrome (DS) is a genetic disorder caused by having an extra copy of chromosome 21, referred to as Trisomy 21, which affects the body's and brain's development. Some common physical characteristics of DS included a flattened face, almond-shaped eyes that slant up, short neck, tongue that tends to stick out of the mouth, small hands and feet, poor muscle tone or loose joints, and shorter height (CDC, 2021). The most common chromosomal condition diagnosed in the United States (U.S.) is DS. Approximately 1 in 707 cases per birth, equivalent to 5,568 babies born every year (Mai et al., 2019). Children with DS usually have a mildly-to-moderately low intelligence level than normal children and are categorized under learning disabilities by The Malaysian Department of Social Welfare.

Children with DS grow differently from other children and have different body features due to growth retardation. Their growth tends to be slower, have different weight, height, and BMI than peers, and have a lower resting metabolic rate which further predisposes them to weight gain (Chaudhary, 2019; Hatch-Stein et al., 2016). Zemel et al. (2015) explained that children with DS have shorter limbs than children without DS, resulting in a different distribution of body mass relative to height. They

suggested that the use of CDC 2000 BMI charts and other growth charts for children might be inappropriate to define obesity as the altered body mass distribution characteristic of DS. In 2011, the American Academy of Pediatrics (AAP) recommended using standard CDC or WHO reference curves, including BMI, to monitor children with DS until new DS-specific growth charts were available (AAP, 2011).

Recently, Zemel et al. (2015) developed a new growth chart for the U.S. DS population and included growth charts for BMI, reflecting the BMI distribution of contemporary children with DS in the United States. They suggested a new specific growth chart for children and adolescents with DS aged 2 to 20 years due to their lower height and higher BMI compared to the CDC charts. Besides, they expected the growth of children with DS nowadays to improve with advances in medical care and increased access to care that has improved individuals' health and well-being. The researchers also suggested that the available growth charts of age- and gender-appropriate percentiles for height and weight based on the published DS growth charts from 1988 by Cronk et al. (1988) that was used widely by other previous studies do not adequately characterise the growth of contemporary US children. Thus, the previous growth charts would lack reliability to assess DS children's nutritional status. The Down Syndrome Growing Up Study (DSGS) cooperated with CDC to develop growth curves based on systematically obtained growth measurements and modern statistical techniques for developing reference percentiles to address these concerns. Due to the absence of standard values of BMI-for-age for Asian children with DS and limit of the existing charts, this study was referred to Zemel et al. (2015) for body mass index (BMI) growth charts for a sample of children with DS as recommended by CDC (2021).

Several previous studies reported the prevalence of overweight and obesity was significantly higher among children with DS than children with TD. A study among children and adolescents with DS aged 4 to 16 years in Ireland found that 51.6% of males and 40.0% of females were overweight/obese compared to 32.0% and 14.8%, respectively, of the general population (O' Shea et al., 2018). Previous studies in the U.S. and Spain estimated the prevalence of overweight and obesity ranged from 40.9% to 43.6%, in which the occurrence of obesity was more frequent among females than males children with DS (Amo-Setién et al., 2020; Pierce et al., 2019). Another study in Pakistan observed the highest prevalence of overweight and obese (63.2%) compared to the other studies (Chaudhary, 2019). Besides, the underweight problem also required further attention, as Valentini et al. (2021) found that being underweight was significantly more frequent in the youngest children with DS. It is a treatable medical condition that warrants multidisciplinary focus.

2.3.4 Body weight status of children with LD

The overweight and obesity trend has been rising steadily over the years, especially among children and lowered quality of life. Children with disabilities have a higher risk of suffering underweight, overweight or obese. An analysis of 2005 to 2012 The National Health and Nutrition Examination Survey (NHANES) data conducted among 5 to 17 year old found that 35.0% of children and youth with intellectual and learning disabilities were more likely to be obese than peers without disabilities. Meanwhile, the data from 2011 The National Survey of Children's Health (NSCH) involving children aged 10 to 17 years indicated that children and youth with disabilities showed 27.0% more likely to be obese than those without disabilities (Bandini et al., 2015). A systematic review by Maïano et al. (2016) suggested that adolescents with ID were

1.54 and 1.80 times prone to get overweight and obese; yet, no data available in the children population.

On the other hand, several studies in Asian countries such as Hong Kong, Korea, Taiwan and India found the prevalence of underweight among LD children ranged from 13.4% to 70.5%, while overweight and obesity ranged from 6.3% to 23.6% (Choi et al., 2012; Pan et al., 2016; Pise et al., 2019; Wang et al., 2018). The estimated prevalence of underweight among children and adolescents with LD in different countries such as Taiwan, China, Korea and French ranged from 3.4% to 36.0% (Hamiza et al., 2017). Meanwhile, a systematic review on undernutrition and childhood disability in low- and middle-income countries reported pooled Odd Ratios (OR) for underweight (OR 2.97), stunting (OR 1.82) and wasting (OR 1.90), compared to controls (Hume-nixon & Kuper, 2018). These findings showed that disabled children were three times more likely to be underweight and nearly twice at risk of becoming stunted and wasted. Several studies suggested that lower SES, inadequate dietary intake and food insecurity become potential determinants of undernutrition among children (Chowdhury et al.,2018; Kim et al., 2017).

Besides, a study among 112 Turkish children with ID aged 7 to 12 years reported a higher percentage of underweight (8.0%), overweight (26.0%) and obese (16.0%) compared to 108 typically developing children who were underweight (1.0%), overweight (19.0%) and obese (12.0%) (Sayin & Ilik, 2017). This study was parallel with a study by Ogwu (2012) as he found that children with ID from Central Pennsylvania had a significantly greater BMI (22.1 ±6.88) compared to children without ID (17.4 ± 3.77). Most of the previous studies suggested that children with disabilities have a higher prevalence of underweight, overweight and obesity than children without disabilities. Bandini et al. (2015) stated that little is known of the

actual magnitude of the BWS among children with disabilities, although a lot of previous research had been carried out in different countries and varied types of disabilities. Thus, this present study investigated the prevalence of underweight, overweight and obesity among children with LD in Malaysia.

2.3.5 Body weight status of children with LD in Malaysia

Most of the studies related to disabled children in Malaysia were conducted at Community Based Rehabilitation Centre (CBR). For example, Chen et al. (2015) studied factors affecting children and adolescents' body mass index with LD at 32 CBR around Malaysia. This study reported the prevalence of underweight and overweight /obese among LD children in Kelantan was 22.5% and 22.1%, respectively and found that socio-economic and feeding characteristics such as feeding duration and food texture modification were associated with BMI. Meanwhile, an intervention study at CBR by Jaafar (2019) studied the effectiveness of an integrated nutrition training program among caregivers of individuals with neurological impairments. Other studies investigated oral health among this population (Abduludin et al., 2019; Mokhtar et al., 2016).

However, only a few studies related to nutritional status and health among disabled children were conducted in Special Education Integration Programme (SEIP) in a primary school in Malaysia. SEIP is a specific class in mainstream schools dedicated to children with special needs in Malaysia. Most of the studies conducted in SEIP in Malaysia explored education-related issues (Khairuddin et al., 2016; Omar & Sulaiman, 2018; Salleh & Woollard, 2019). Another study studied the quality of life among special needs children in SEIP (Ismail et al., 2016). Thus, this study will focus

on body weight status, diet quality and other related factors among children with LD attending SEIP in primary schools. BWS of children with LD except DS was determined based on WHO 2007 growth chart because they have similar body features as children with TD.

2.4 Factors associated with body weight status

2.4.1 Demographic factors and body weight status

2.4.1.1 Age

Several previous studies showed that socio-demographic factors such as age, sex, and ethnicity are non-modified risk factors of overweight and obesity. Earlier studies in the United States (Ogwu, 2012), Korea (Choi et al., 2012), Taiwan (Pan et al., 2016), Indonesia (Tamin et al., 2014) reported that the age of disabled children was positively associated with BMI. For example, Choi et al. (2012) reported that age of both genders was positively associated with the prevalence of overweight and obesity ($P < 0.0001$), in which children aged 15 to 18 years had the highest prevalence (32.0%) compared with children aged 7 to 10 years (14.0%). The researchers suggested that older groups of children had a higher prevalence of overweight and obesity due to the greater risk of weight gain during the transition from childhood to adolescence.

Another study analysed nutritional status among autistic children and found that increasing age had shown the rising prevalence of underweight and/or overweight (Ranjan & Nasser, 2015). They further stated that autistic children aged 2 to 5 years had a lower prevalence of underweight (14.2%) and overweight (31.8%) compared with age 6 to 11 years, which were 50.0% and 37.9%, respectively. Meanwhile, Ha et al. (2010) reported that overweight children were slightly older than underweight and

normal-weight children ($p<0.0005$). Ogwu (2012) found a significant association between children's age and BMI among children with ID in the United States in which children in the age group of 1 to 5 years old had significantly lower BMI (16.9 ± 3.86) compared to the children and adolescents in the higher age groups (13 to 17 years old) which was 23.2 ± 5.55.

A study in Malaysia among children and adolescents with ASD aged 2 to 18 years found that increasing age was associated with higher BMI, whereby the overweight and obesity group showed a significant difference in median age (8.5 years) compared to non-overweight/obese group which was 6.33 years ($p=0.001$) (Norazlin et al., 2019). This study further explained that the higher overweight and obesity were due to a decline in physical activity level as they grow and spent more time in sedentary activities.

2.4.1.2 Sex and ethnicity

As for sexes, most of the previous studies found that girls had a higher prevalence of overweight and obesity than boys (i.e., Barria et al., 2018; Choi et al., 2012; Ha et al., 2010; Krause et al., 2016). For instance, Choi et al. (2012) studied among Korean children with ID found that the prevalence of overweight and obesity were significantly higher in girls (28.8%) than boys (22.1%); specifically, girls at the age of 15 to 18 years as the rate of BWS increased when they grew up ($p < 0.0001$). This study explained that gender differences become greater during pubertal maturation as females enter puberty earlier than males and have different body fat compositions. Girls who have delayed puberty were positively correlated with body density, yet negatively associated with obesity, body fat percentage, fat mass and fat-free mass (He

et al., 2017). Meanwhile, Ha et al. (2010) found that females (50.0%) were more likely to be overweight than males (45.0%). This study suggested that different physical activity levels for both sexes may explain sex-related differences in weight status distribution. However, other contributing factors such as dietary intake, body composition and others have not been fully explained.

Another study among adolescents with ID in Australia also reported that females had a higher prevalence of overweight (23.1%) and obesity (26.7%) compared with males (22.0% and 21.4%, respectively); in which females were more likely to be obese (OR = 1.19) (Krause et al., 2016). Similar findings among disabled children in Chile found that girls (22.84±4.52) showed high values of BMI compared with boys (20.67±5.82) (p=0.011) (Barria et al., 2018). Most of the previous studies reported that girls had a higher prevalence of overweight and obesity; yet, Nogay (2013) found that the prevalence of obesity was higher in boys (17.4%) than girls with ID (12.5%) in Turkey.

A study among Japanese children with ID stated the onset of obesity among boys was more likely to occur at the early ages (6 to 8 years old) with a higher prevalence of obesity (25.8%) than girls. In comparison, girls' onset of obesity occurs later with a higher prevalence of obesity (21.1%) at 15 to 17 years old than boys (Haga & Aihara, 2015). However, no significant differences were found between sex and the prevalence of obesity. A cohort study among a sample of British children found that children with ID were more likely to be obese at age five (OR = 1.32), seven (OR = 1.39) and eleven years old (OR = 1.68). The increased risk of obesity among children with ID was only shown among boys at the ages of five and seven, while for girls, it starts appearing at eleven years old (Emerson et al., 2016). Emerson et al. (2016) also

found that child ethnicity was the other risk factors associated with childhood obesity as ID children who is mixed Black or Black British had higher risk of obesity.

A study in England by Falconer et al. (2014) examined ethnicity as a predictor of obesity-related behaviours among children found that black and Asian children were three times more likely to have obesity-related lifestyles than white children. The obesity-related behaviours included a low level of physical activity, unhealthy dietary behaviours and excessive screen time, which became the risk factors of unhealthy BWS. Cultural beliefs and behavioural norms performed by various ethnicities possibly influence obesity-related behaviours (Liu et al., 2012). Besides, the ethnic differences in child feeding practice and child-rearing also could contribute to a different lifestyle. Thus, it is suggested to focus on culturally specific interventions to address the obesity-related behaviours among different ethnic groups (Falconer et al., 2014).

2.4.2 Socio-economic factors and body weight status

Over the last few decades, the positive economic transition has led to the evolution of people's lifestyles and dietary habits worldwide. This can be contributing factor to the rising prevalence of overweight and obesity. Socio-economic status (SES) is measured by determining the families' economic, social position, and working experience based on income, education, and occupation (Zahiyah, 2012). According to the National Center for Education Statistics (2012), household size should be included when measuring family income. It is suggested that family income has to be distributed across the household members so that financial resources are available to each individual, especially children. In this present study, SES was focused on parents'

educational level, household incomes and household size. SES is one of the factors that should be considered in evaluating the BWS among children.

2.4.2.1 Parent's educational level

Past studies showed that parental educational level could direct or indirectly affect BWS among children. Higher or lower educational levels differently influenced the child's health status as it could relate to the level of awareness, knowledge, attitude and practice on nutrition management of parents. For example, a study by Smith et al. (2018) conducted among 377 children with TD aged 9 to 15 years to examine the effect of parents' educational level on children's BMI found that parents with higher education levels had 1.64 more likely to have overweight and obesity child. They further stated that the results contradict the assumption that higher education levels should lead to a healthy lifestyle choice. Smith et al. (2018) suggested that working parents with time constraints could neglect their children's nutritional education and health care, resulting in unhealthy body weight. This finding was similar to a study in northeast China, which indicated that the father's education level was linked with household wealth that influences childhood obesity in the urban area (Liu et al., 2018).

However, the results from a study conducted in 12 countries among children aged 9 to 11 years reported a positive relationship found between maternal education and child overweight in Colombia (OR=1.90) and Kenya (OR=4.80), while a negative correlation between paternal education and overweight children in Brazil (OR=0.55) and the USA (OR=0.54) (Muthuri et al., 2016). This study explained that educated parents from higher economic status countries would have a higher level of knowledge and awareness on nutrition and health that could positively affect their child's healthy

body weight. Similarly, a few studies in Malaysia also found that children with educated parents showed a higher prevalence of overweight and obesity (Izzah et al., 2019; Naidu et al., 2013).

Similar findings were found among children with disabilities. For example, a cohort study investigated the prevalence of obesity and risk factors associated with obesity in a sample of British children with and without intellectual disability that found that higher maternal education (who get education from overseas) was associated with the risk of obesity at age eleven (Emerson et al., 2016). Meanwhile, another study in Indonesia found that the prevalence of obesity among children and adolescents with ID was significantly different between father education ($p<0.006$) and mother education ($p<0.001$) (Tamin et al., 2014). This study further explained that parents with a higher education level would increase the family's SES and have a higher ability to consume more food or unhealthy food, which increase the possibility of a child becoming obese.

However, a study in Morroco among 325 autistic children reported that parents' education level was negatively related to malnutrition. More than 50.0% of children with thinness and underweight had parents of low education levels (Hafid & Touhamiahami, 2018). Meanwhile, Chen et al. (2015) conducted a study among children and adolescents with LD in Kelantan found that the highest educational level received by most of the parents/ caregivers is at lower secondary school. This study found a negative association between caregivers' years of education and BMI ($\beta=-0.26$, $p=0.003$). The researchers suggested that parents with low educational levels have poor nutrition and health knowledge that eventually affect a child's nutritional status. Thus, more research needs to determine the relationship between parental education and BWS, as it is difficult to predict in a different population.

2.4.2.2 Monthly household income

Monthly household income can be described as the combined gross income of all household members who are 15 years or older (Julia, 2020). Household income could influence the nutritional status of a family. Little money or financial resources may cause difficulties in purchasing healthier food such as fruits and vegetables that are more expensive than other food. They tend to buy cheaper, more energy-dense processed foods and consume more calories but fewer nutrients. For example, they may opt to buy more affordable snacks and soda drinks that are higher in energy and added sugar instead of buying fruit or milk. This eating pattern would potentially contribute to obesity.

A study among children with ID in Turkey with poor economic status reported that the prevalence of overweight and obesity was 24.2%, which is considered relatively high (Sari & Bahceci, 2012). They suggested that it was due to inadequate income, imbalanced nutrient intake and higher consumption of carbohydrate diet, limited protein, fruits and vegetables. Yen and Lin (2010) supported this finding as they revealed that adolescents with ID who come from low-income families were more likely to have less-healthy food intake ($p=0.001$). A meta-analysis by Kim and Knesebeck, (2018) also found that individuals with lower income were more likely to develop obesity (OR= 1.27; RR= 1.52). Meanwhile, a study in Kelantan reported that the monthly household income was RM 988.62 among caregivers of children with LD; with 50.0% of the participants earned less than RM 500, categorised as low income (Chen et al., 2015). However, this study found no association between household income and BMI.

Contradicted findings were found among children with typical development in Malaysia. Previous studies in Malaysia among normal children showed that higher

household income was positively related to overweight and obesity (Ahmad et al., 2018; Izzah et al., 2019; Naidu et al., 2013). For example, Ahmad et al. (2018) found that higher household income was associated with higher BMI among children in rural ($r=0.104$, $p=0.002$) and urban areas ($r=0.122$, $p<0.001$). Meanwhile, Izzah et al. (2019) reported that a higher household income of more than RM 3,000 was two times more likely to have an obese adolescent in the house (OR=2.240; $p=0.049$). These studies suggested that higher household income would affect the dietary pattern, eating behaviour (Ahmad et al., 2018), food affordability, and purchasing power (Herforth & Ahmed, 2015).

Besides, it also reflected that the higher percentage of working parents have less control over their children's food intake, eating habits, physical activity and increased demand to dine outside due to less time spent in cooking and taking care of their children (Naidu et al., 2013). Another study also stated that lower SES was related to poor weight status and malnourishment (Hui et al., 2014; Hume-nixon & Kuper, 2018). Thus, more studies are needed to determine the relationship between household incomes with BWS, especially among children with ID in Malaysia, because previous studies showed mixed findings.

2.4.2.3 Household size

Large household sizes or a higher number of members in one house could be a proxy for low SES. In Malaysia, according to the Household Expenditure Survey (HES), " the average household size is 4.3 persons, and about 56.0% were small size households (less than five persons), 37.0% were medium size (five to seven persons) and 8.0% were large (eight or more persons)" (Mok et al., 2011). Recently, according to The

Household Income and Basic Amenities Survey Report, in 2019, the household sizes declined to 3.9 people than 4.1 people per household in 2016 (DOSM, 2020b). A previous study had investigated the association between household sizes and BMI among children with TD in Malaysia and reported a significant association (Ahmad et al., 2018). This study found that the children had a 36.0% lower risk of becoming obese than the medium household size group (aOR=0.64) and 50.0% less risk than the large household size group (aOR=0.5) when household size increased. However, a study in Sudan among mentally disabled children found that large household sizes, which are family members equal to or more than five was significantly associated with a higher prevalence of obesity (p=0.05) (Raghi et al., 2016).

A higher number of family members in one household could affect a person's nutritional status because food allocation per person would decrease. In this situation, a child would receive less food or higher energy-dense food as the entire family may also have inadequate food intake. Families with low household incomes and large household sizes opt to buy cheaper food that is usually higher in energy to meet the family needs. Thus, this situation would increase the risk of malnutrition among children due to higher energy intake and nutrient deficiency.

2.4.3 Child factors and body weight status

2.4.3.1 Childbirth weight

Birth weight is the first weight of a newborn that is measured exactly within one hour after birth. Low birth weight can be defined as weight less than 2500 g (5.5 lb) (UNICEF & WHO, 2019). A small birth weight baby has a higher risk of having health problems and may suffer short term or long term problems such as delayed motor and

social development or learning disabilities if absent of proper health care. Catch up growth is encouraged for low birth weight babies to accelerate the growth rate for age. However, low birth weight babies who showed catch-up growth have positive and negative consequences (Cheryl, 2019). Those who showed catch-up growth have a higher risk of having childhood obesity and other metabolic disorder; while, those who did not show catch-up growth may have a cognitive problem than other children.

According to The Western Australian Pregnancy Cohort (Raine) Study, birth weight was significantly associated with BMI in children (Meyerkort et al., 2012). This study suggested that birth weight and infant weight gain appear to be more important determinants of children's BMI than diet and nutrition as it would increase obesity risk later in life. This finding was consistent with several previous cross-sectional studies that reported that birth weight was associated with BMI among children (Chen et al., 2015; Hui et al., 2014; Jansen et al., 2012).

For example, Chen et al. (2012) showed a similar finding among 7930 children aged 9 to 14 years in Taiwan, where high birth weight was positively associated with childhood overweight/obesity. Besides, Chen et al. (2015) examined the factors associated with BMI among children and adolescents with LD in Kelantan and found that birth weight was significantly associated with BMI (β=1.41, p=0.005). A meta-analysis by Yu et al. (2011) found that high birth weight (>4000g) children had twice the risk of obesity (OR=2.07) as compared to those with birth weight ≤4000g. Meanwhile, low birth weight (<2500g) was associated with decreased risk of obesity (OR=0.61) compared with birth weight ≥2500g. Higher birth weight could become one of the early life risk factors correlating to the development of obesity in the future (Pocock et al., 2010).

On the other hand, another previous study found that low birth weight was linked to being malnourished. For example, Nayak et al. (2018) studied the risk factors of malnutrition among children and reported that children with birth weight less than 2000 g and between 2000 g and 2500 g had 1.9 times and 3.9 times higher risk of being malnourished, as compared to birth weight more than 2500 g. Moreover, Lian et al. (2012) also stated that low birth weight was one of the contributing factors of undernourished children as they might be affected by the mother's nutritional status. Meanwhile, Phillips et al. (2014) suggested that low birth weight was associated with obesity among adolescents with developmental disabilities (DD) but was not associated among adolescents without DD. However, Tang et al. (2018) found no significant association between childbirth weight with BMI among Chinese preschool children.

2.4.3.2 Comorbidities

Children with LD who are overweight and obese have a greater risk for experiencing multiple related comorbidities and serious health problems such as cardiovascular diseases and type 2 diabetes (Reichard et al., 2011; Rimmer et al., 2010). Past studies among 461 adolescents with intellectual/developmental disabilities (IDD) aged between 12 to 18 years across 49 U.S. states have found that secondary health conditions were higher in obese adolescents with IDD than healthy weight adolescents without IDD. They further reported that overweight adolescents with cognitive disabilities such as autism, DS and ID had a significantly higher prevalence of secondary health conditions such as high blood cholesterol, diabetes, preoccupation with weight and early maturation ($p<0.05$) (Rimmer et al., 2010).

Phillips et al. (2014) stated that adolescents with developmental disabilities (DDs) who were obese may suffer additional health conditions as they had a 30.0% to 50.0 % higher prevalence of asthma, respiratory allergy, eczema or skin allergy, and frequent severe headaches or migraines than non-obese adolescents with DDs. Disabled children who are obese and have other comorbidities may have a lower quality of life. They require frequent medical check-ups, hospital visits, or other healthcare services that children with TD generally do not need. This problem will also increase their family's healthcare expenses to seek consultation, treatment, and drug prescription at public or private facilities (Lavelle et al., 2014). The family will spend extra financial costs and time caring for their disabled children with comorbidities.

2.4.3.3 Feeding problems

Feeding is a complex sensorimotor process involving the nervous system and the muscles. Feeding helps the child to grow, develop, and learn social and communicational skills with others. It is an adaptive function in which difficulties in feeding during chewing, swallowing and drinking may affect the quality of life, especially among LD people (Rezaei et al., 2011). Feeding problems include behavioural difficulties at mealtime such as refusing to eat, selective eating, eating too fast or too slow, tantrums at mealtime, spitting out food as well as overeating. Parents who have children with disabilities assume that they cannot learn and develop in the same way as other children. Therefore such children may lack of skill to feed themselves and rely more on family members for food.

A few factors may influence feeding problems in children with LD. For example, children who have painful early experiences with food such as gastro-

oesophageal reflux, choking or gagging, may learn to fear to eat as they associate it with pain and discomfort. As a result, they will avoid and reject food. Specific syndrome or disorders in children with LD such as Down's syndrome who have small oral cavities and delayed development of teeth would result in chewing difficulties. Besides, children with autism commonly showed feeding problems such as food refusal, selective eating, over-eating and behavioural problems at mealtimes (Cherif et al., 2018; Norazlin et al., 2019). These feeding problems can be supported by a study among autistic children in Kuwait as the survey showed that 55.4% reported the children refusing food upon the introduction of a new food item, 58.5% had mood changes when introducing new food and 15.9% were not calm during mealtime (Alkazemi et al., 2016).

In Malaysia, a study by Norazlin et al. (2019) among children and adolescents with ASD found less food refusal (B=-0.71, p=0.001) and high food selectivity due to limited food variety (B=0.39, p=0.001) were the risk factors for high BMI. Food refusal was frequently observed in the non-obese group while less frequent in the obese group, contributing to the higher weight gain. This study further stated that mealtime feeding problems appeared to be associated with overweight status among them. Some children may refuse meals deviating from their selective criteria and eat a narrower range of food groups. Picky eating can be related to nutritional problems such as inadequate macro or micronutrients, which might influence weight status.

Another study in Malaysia examined the feeding characteristics such as feeding duration and food texture modification among children and adolescents with LD and found that it was associated with BMI (Chen et al., 2015). They further revealed that eating duration (β=-0.06, p=0.025) and not needing food texture modification (β=2.63, p=0.001) were significantly associated with participants' BMI.

These findings suggested that the children and adolescents who prefer normal food textures were predicted to have higher BMI. At the same time, those who showed a longer eating duration were at risk of being undernutrition. However, eating ability (self-fed or fed by others) did not show any association. Thus, children with feeding problems and poor eating skills could increase the risk of illness, malnutrition, and life-long problems.

The previous studies among 112 Turkish and 144 Iranian children with ID found they were more exposed to feeding problems than children with TD (Rezaei et al., 2011; Sayin & Ilik, 2017). The frequent feeding problems reported were lack of feeding skills, limited food variety, eating fast and overeating, while the less frequent was difficulty swallowing and skipping dinner. This finding was parallel with a study among children with disabilities in Kenya where they were likely to experience difficulties in feeding (OR=1.9), to have their food prepared differently (OR=2.1) and unable to feed themselves (OR=6.5) than controls (Kuper et al., 2015). Nutritional deficiencies may threaten children with disabilities who exhibit feeding problems due to difficulties in daily food intake.

Besides, several other studies measure feeding problems and its association with BWS among disabled children. For example, Seiverling et al. (2011) and Tareq et al. (2019) assessed feeding problems, including chewing problems, rapid eating, food refusal, food selectivity, vomiting, and stealing food among special needs children. Seiverling et al. (2011) found that rapid eating was significantly associated with higher BMI% scores (β=0.336, $p<0.001$), in which overweight children showed significantly more rapid eating than other categories. Rapid eating is one of the predictors of weight gain as it happens when children consumed a large portion of food in a short period and continue to eat as long as the food is presented. Meanwhile, Tareq

et al. (2019) reported that chewing problem was negatively correlated with BMI among Down Syndrome aged 2–19 years in the United Arab Emirates (UAE) ($r=-0.29$, $p<0.001$). This study further reported that there was 50.0% of the children were swallowing without sufficient chewing.

Seiverling et al. (2011) suggested that a thorough understanding of feeding problems among special needs children is needed because the types of feeding problems assessed in the previous findings varied and lack standardised assessment to measure its association with children's body weight. Thus, this study will use The Screening Tool of Feeding Problems for children (STEP-CHILD) to assess feeding problems and its association with BWS among children with LD. STEP-CHILD was designed to quickly and efficiently identify common feeding problems among persons with ID and assessed feeding and mealtime problems (Fodstad & Matson, 2008).

2.4.3.4 Dietary intakes

Dietary intake is one of the markers to assess the nutritional status to determine the adequacies or inadequacies of nutrient intakes. Children with LD may have a diminished ability to comprehend and assess nutrition information; and limited ability to purchase and prepare food, leading to poor dietary choices. Besides, some might face eating difficulties due to less capability in feeding skills, chewing and swallowing. Some of them require food texture modification and assistance to cut up food or be fed to overcome feedings problems (Hamzaid, O'connor, & Flood, 2020). As a result, a lack of adequate assistance from parents or people surrounding them may negatively affect their dietary intake. Thus, a proper nutritional intake is a significant determinant to optimise health and modify the risk of lifestyle disease among children with LD.

Dietary intakes among disabled children had been observed in a few previous studies (Joo et al., 2019; Meguid et al., 2015). Joo et al. (2019) reported that the children with autism in Korea were met the estimated energy requirement for energy, which was 1,716.5 ± 400 kcal per day; in which boys consumed 1,772.7 ± 471.3 kcal while girls took in 1,625.0 kcal per day. This study further reported that the macronutrient intake for boys was 69.7g of protein and 55.8 g of fat; meanwhile, girls took 62.8 g of protein and 48.6 g of fat per day. Meguid et al. (2015) found that children with ASD have a relatively higher energy intake, 1875.82 ± 55.32 kcal. Their macronutrient intake was 35.58 ± 7.95 g of protein, 297.79 ±32.54 g of carbohydrate and 60.26 ±11.80 g of fat in which the intakes of protein and fat were higher than Recommended Dietary Allowances (RDA) values. On the other hand, a study among children with ID in Turkey aged 7 to 12 years reported that they consume more daily servings of juice and sweetened non-dairy products and desserts, which are considered unhealthy food; yet fewer servings of healthy food such as vegetables (Sayin & Ilik, 2017).

Besides, Barnhill et al. (2015) reported that most children with ASD consumed an adequate amount of calories, protein, fat and carbohydrate, which were 80.0%, 98.3%, 75.8% and 96.7%, respectively. Another study compared nutrient and food group intake and overall diet quality among children with autism to both typically developing and developmentally delayed children and found that all groups had inadequate fiber, vitamin D, and vegetable intake (Graf-Myles et al., 2013). Meanwhile, Hyman et al. (2012) assessed the macronutrient intake of children with ASD in North America and found that it was still within an acceptable range, even though they consumed less energy and protein; but a greater percentage of carbohydrate. This study further stated no significant difference between inadequate

amounts of nutrient intake with weight categories. The findings on dietary intake among disabled children seem to be inconsistent as it might be due to feeding problems, selective eating, food restriction and food refusal that influence their ability to consume adequate nutrients.

Consumption of higher energy intake than energy expenditure is one of the factors associated with overweight and obesity. For example, an individual consumes more energy-dense food such as sugars, fats and oils while engaging in more sedentary activities. Wang et al. (2018) reported higher intakes of energy-dense foods, and consumption of meats, fish, and eggs became the risk factors of overweight and obesity among ID children in Hong Kong. Another study in China observed higher mean BMI and nutritional inadequacies among ASD children than children with TD aged 4 to 6 years (Sun et al., 2013). This finding was believed that children with autism exhibited eating problems more frequently than children with TD, potentially leading to nutritional inadequacies. Inadequate dietary intake can cause weight loss due to insufficient energy, carbohydrate, protein, fat, and micronutrient deficiency.

In our knowledge, dietary intake and its relationship with BWS among children with LD have not been well studied in Malaysia. Poor dietary intake during childhood has been associated with several health problems in adulthood. Healthy dietary intake should be initiated early in life, especially in childhood as it could influence their dietary practice later in life. Thus, the appropriate support system from family, siblings or caregivers is necessary to consume high quality, nutrient-dense diet, particularly in children with disabilities that are in line with recommended dietary guidelines.

2.4.4 Parental factor and body weight status

2.4.4.1 Parental feeding practice

Parents strongly influence their children's eating habits because they are the one who chooses the foods and dictates the appropriate time, place, and method to consume food. Feeding practices refer to the specific goal-directed behaviours used by parents to influence their children's eating habits, including attempts to increase or decrease the intake of certain foods (Gevers et al., 2014). Gevers et al. (2014) stated the common feeding practices include modelling eating behaviours, restricting certain types of food, pressuring children to eat, rewarding positive behaviours with food, and availability of food at home. Parental feeding practice plays a critical role in children's nutritional status as it helps the development of child taste preferences, eating habits, dietary intake, and eventual weight status (Nordin et al., 2018).

Parents may believe that underweight or obesity in children with LD is a small concern and unaware of the severe health consequences associated as compared with other challenges that these children face. A previous systematic review suggested that parental feeding practices directly influenced BWS among children (Shloim et al., 2015). For example, parents use food to calm down their children or reward their positive behaviours. Parents may feel guilty when they refuse their food requests, and as a result, the children manage to obtain their desired food such as ice cream and other sweets as a reward (Reinehr et al., 2010; Rimmer, Rowland, & Yamaki, 2007). The practice of rewarding with nutritionally empty foods will affect a child's nutritional status, especially when the parents assumed body weight was less important (Grondhuis & Aman, 2014). Besides, some parents may use food as reinforcement or emotional regulation. As a result, children with disabilities may assume food as a treatment for an uncomfortable feeling when sad or upset.

Another study in China reported that parental feeding practice on the pressure to eat more was negatively associated with overweight and obesity among ID children (Wang et al., 2018). This finding was consistent with the results among children with TD in Australia and Texas (Gregory, Paxton, & Brozovic, 2010; Wehrly et al., 2014). Parents who were pressuring their children to eat more would cause less enjoyment of eating, food avoidance, negative feeding experience, and decreased consumption of particular food, affecting their weight (Powell, Farrow, & Meyer, 2011; Webber et al., 2010). Furthermore, a less restrictive family environment at home will shape children's lifestyles as they are more exposed to a broader range of food habits. Some of them may potentially exacerbate the development of lifestyle diseases such as overweight and obesity.

A few studies in Malaysia among children with TD were studied on parental feeding practice, attitude, and relationship with children BWS (Noor Azimah et al., 2012; Nordin et al., 2018). For example, Nordin et al. (2018) found that parents' negative attitudes, unhealthy practices, and poor environment had resulted in overweight and obese children. Another study by Noor Azimah et al. (2012) stated that parents with overweight children tend to control their feeding compared to underweight children who did not exert control over their feeding. Meanwhile, the other studies in Malaysia explored the relationship between parental feeding practice, attitude, and belief with academic achievement among children with TD (Juhari & Chin, 2019; Lee & Wan, 2014).

To our knowledge, there is a limited study that determines the relationship between parental feeding practices with BWS among children with LD in Malaysia. Parental attitude and practice on nutrition management help to improve nutrition status among children. Parents who understand the BWS of their children will boost their

child's health condition, even though they have encountered other risk factors, such as illnesses, genetic or other diseases. However, if parents are unable to understand their child's weight status, they do not take any steps to avoid unnecessary weight gain. This could contribute to more serious issues in the future, not only from a physical but also psychological standpoint (Molina et al., 2010). Sarrafzadegan et al. (2013) suggested that lack of weight management among childhood obesity causes increased social acceptance of being overweight, which leads to less pressure to lose weight. Thus, it is helpful to assess parental factors because family is the closest supporter to promote children's healthy eating. Parental involvement in the intervention will help prevent or treat malnutrition.

In short, the factors such as demographic and SES, dietary intake, diet quality and parental factors and its relationship with BWS have not been well studied among children with LD in Malaysia. These factors have documented mixed findings among children with LD or TD and further research is needed because BWS is one of the indicators of child's health status. The feeding problem usually occurs among children with LD. This factor needs to be assessed as they may have difficulties feeding themselves and relying on other people for food during mealtime.

CHAPTER 3

METHODOLOGY

3.1 Study Design

This study was a cross-sectional study aimed to predict relationship between demographic and socio-economic factors, child factors and parental factor with body weight status among children with learning disabilities.

3.2 Study Location

This study was conducted at three districts which are Kota Bharu, Tanah Merah and Kuala Krai in Kelantan. Kelantan is a rural state area located in the northeast of Peninsular Malaysia with a population of 1.86 million in the year 2018 covering an area of 15,040 km^2 (Department of Statistic Malaysia, 2019). This study was conducted among children who enrolled in Special Education Integration Program (SEIP) in government primary schools (*Sekolah Kebangsaan, SK*) in Kelantan. Ministry of Education reported 111 primary schools with SEIP in Kelantan (MOE, 2020).

3.3 Sample Size Determination

Specific objective 3:

According to a recent review article in Malaysia, the prevalence of underweight among worldwide disabled children was 3.4 - 36%, overweight 7.6 - 37% and obesity 5.7 - 52% (Hamiza et al., 2017). Meanwhile, another study found the prevalence of underweight, overweight and obese among learning disabilities children in Kelantan

was 17.8%, 7.6% and 7.6%, respectively (Chen, 2014). Therefore, a single proportion formula by Daniel (1999) was used to calculate the minimum sample size for this study:

$N = z^2P(1-P)/d^2$

$= 1.96^2 \times 0.178(1-0.178)/0.05^2$

$= 225$

So, the required sample size by taking into account the 10% dropout rate was 248 children with LD in Kelantan.

Specific objective 4:

The sample size was calculated for multiple linear regression tests using G-Power version 3.1.9.4 software (Faul et al., 2009). With a significant level (α) of 5% two-tailed, power of 95%, the effect size of 0.2 and the number of predictors is 15, the total sample size calculated is 145. So, the required sample size by taking into account a 10% dropout rate was 160 children with LD in SIEP in primary school, Kelantan.

Thus, the biggest sample size was chosen, which was 248 respondents.

3.4 Study population

Students with learning disabilities (age 7 to 14) year 1,2,3,4,5 and 6 diagnosed by a registered doctor who enrolled in Special Education Integration Program in a primary school in Kelantan. Students were involved in height and weight measurement while their parents/caregivers were answered the questionnaire.

3.5 Subject criteria

Inclusion criteria were children with learning disabilities 1) aged 7 to 14 years old who attend SEIP; 2) no consideration of aetiology or cause of disability; 3) able to stand straight and still without assistance during anthropometric measurement; 4) willing to participate, cooperate and able to follow instructions and 5) whose parent/primary caregiver willing to participate and answer the questionnaire.

Exclusion criteria were children 1) who were following a special diet due to medical reasons and 2) had oedema or physical deformities of limbs and spine because of difficulty in anthropometric measurements.

Withdrawal criteria included parents or primary caregivers who requested to withdraw from this study.

3.6 Sampling Method and Subject Recruitment

The data collection was conducted in the Special Education Integration Program (SEIP) in primary schools in Kelantan. Three districts were selected based on the mean of monthly household gross income in each district in Kelantan. The selected districts were Kota Bharu, Tanah Merah and Kuala Krai, with mean monthly household income of RM5,577, RM4,338 and RM3,979, respectively, to represent the three SES levels of the population in Kelantan for the year 2019 (DOSM, 2020a). There are a total of 37 primary schools with SEIP in these three districts; with 11 schools located in an urban areas and 26 in rural areas (Appendix A) (MOE, 2020). The schools located in rural and urban area in Kelantan have been defined by MOE and a list of schools from MOE was referred to select the school (MOE, 2020). Based on the calculated ratio of 1:2, one school was randomly selected from the urban area and two schools were

randomly selected from a rural area in each district. All students enrolled in SEIP in the selected primary schools who met the inclusion criteria were invited to participate in this study.

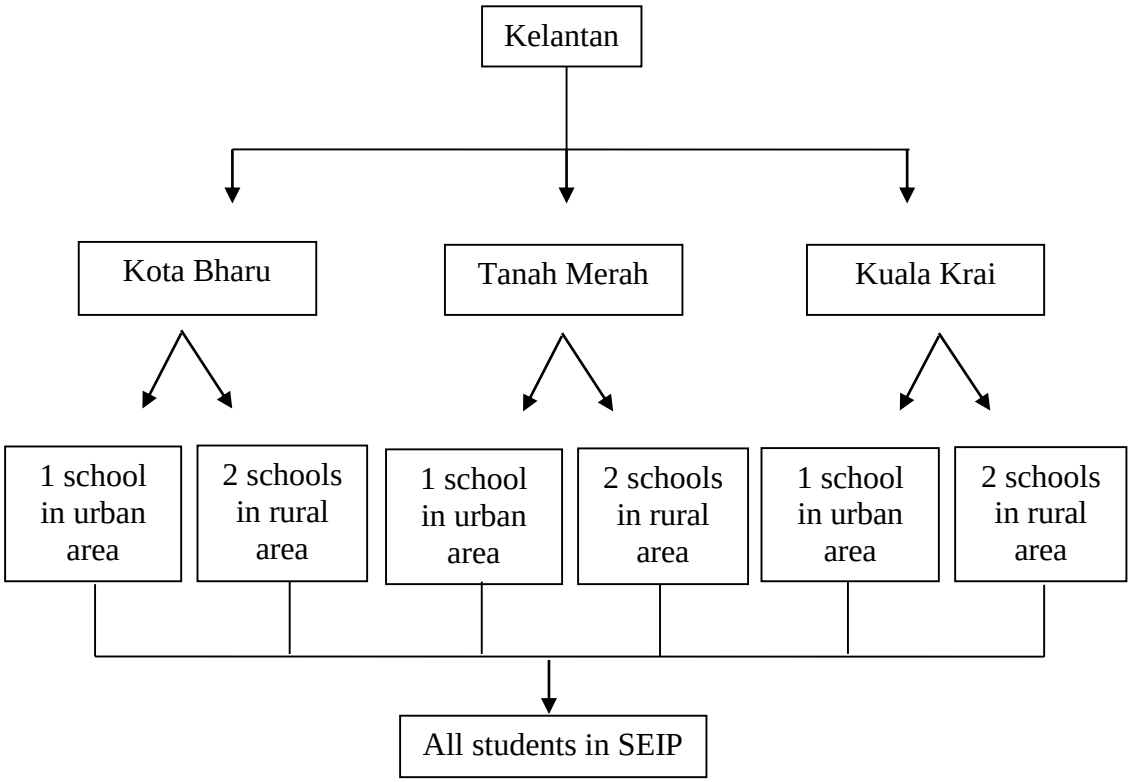


Figure 3.1 Simple random sampling with stratified sampling

3.7 Research Instruments

A set of Malay language questionnaires was used during the data collection (Appendix B). Parent or caregiver completed information on demographic and socio-economic background, child factors (feeding problems and dietary intakes) and parental feeding practice. The body height and weight of the children was measured according to the standard protocol.

3.7.1 Questionnaire

a) Demographic and socio-economic background

The information on age, sex, ethnicity**,** parent's educational level, monthly household income and household size of the respondents were self-reported by the parents or primary caregiver. According to Department of Statistic Malaysia, monthly household income of Malaysian population was classified into B40 (< RM4,850), M40 (RM4,850 – RM10,959) and T20 (> RM10,959) (DOSM, 2021a). As for Kelantan, the classification of monthly household income by state was B40 (< RM3,030), M40 (RM3,030 – RM6,619) and T20 (> RM6,620) (DOSM, 2020b). Meanwhile, household size was classified into small size (less than five persons), medium size (five to seven persons) and large size households (eight or more persons) (Mok et al., 2011).

b) Childbirth weight

Childbirth weight was recorded as child weight in kilogram (kg) during birth. It was obtained from self-reported by parents/primary caregivers. WHO guidelines were used to categorize infant birth weight into low birth weight (< 2.5 kg), normal (2.5 kg – 4.0 kg) and high birth weight (> 4.0 kg) (WHO, 2011).

c) Gestational age at delivery

Gestational age at delivery was reported as the number of weeks of pregnancy during delivery. It was obtained from self-reported by parents/primary caregivers. Gestational age was categorized into pre-term (<37 weeks), term (37-41 weeks) and post-term (≥42 weeks) (WHO, 2011).

d) Comorbidities

The parents chose 'Yes' or 'No' for any comorbidities present for their children and they have to state the kind of comorbidities if applicable.

e) Feeding problems

Feeding problems were assessed by using the "Screening Tool of Feeding Problems" children version (STEP-CHILD) (Seiverling et al., 2011; Tareq et al., 2019). STEP-CHILD was used to assess the occurrence of feeding problems among disabled children. It consists of 15 items with six subscales which are chewing problems, rapid eating, food refusal, food selectivity, vomiting, and stealing food. The frequency was rated on a 3-point Likert-type scales which were "0" = no occurrence of the behaviour, "1" = the behaviour occurred between 1 and 10 times per month, and "2" = the behaviour has occurred more than ten times per month. The mean Cronbach's alpha value of internal reliability across all six STEP-CHILD subscales is 0.62 (Seiverling et al., 2011). The total feeding problem is determined by the sum of 15 items and the scores ranging from 0 to 30 (Tareq et al., 2019). To our knowledge, no published study in Malaysia uses STEP-CHILD to assess feeding problems among the disabled. The Cronbach's alpha coefficient for each subscale which were chewing problems, was 0.562, rapid eating was 0.414 and food refusal was 0.536. Meanwhile, the Spearman-Brown (internal consistency) coefficient for two-item scale: food selectivity was 0.593, vomiting was 0.779, and stealing food was 0.665. The Cronbach's alpha coefficient for 15 items of STEP-CHILD in this study was 0.850, indicating a good internal consistency reliability.

f) Dietary intakes

Dietary intakes were assessed using a validated Semi-quantitative Food Frequency Questionnaire among Malaysia children aged 7 to 12 years, adapted from South East Asian Nutrition Surveys (SEANUTS) (Fatihah et al., 2015). The reproducibility of the FFQ, as assessed by Cronbach's alpha, ranged from 0.61 to 0.70; while moderate correlations were noted between FFQ and 3 days diet recall (ranged from r = 0.310 to 0.497). There were 94 food items with 12 main food groups which were (a) cereals and cereal products; (b) meat and meat products; (c) fish and seafood; (d) eggs; (e) legumes and legume products; (f) milk and dairy products; (g) vegetables; (h) fruits; (i) confectionary; (j) beverages; (k) spreads; and (l) seasonings and flavourings.

The frequency of intake was evaluated based on habitual intake over the previous month. Food frequency consumption of each item was evaluated using eight categories which were (a) never; (b) 1–3 times per month; (c) once a week; (d) 2–4 times per week; (e) 5–6 times per week; (f) once a day; (g) 2–3 times per day; and (h) ≥ 4 times per day. The caregivers were asked how often their children consumed the food items and the serving size that was usually consumed each time. According to the Nutrient Composition of Malaysian Foods and the Atlas of Food Exchanges and Portion Sizes, each food item in the FFQ was assigned a portion size using local household units such as plate, bowl, tablespoon, etc. The amount of daily food intake was calculated from the FFQ according to the following formula: frequency of intake (conversion factor) × serving size × total number of servings × weight of food in one serving (Poh et al., 2013). The mean and standard deviation (SD) intake was calculated for energy and each macronutrient (i.e. carbohydrate, protein and fat). The prevalence of under and over-reporting were determined by reporting the energy and each

macronutrient intake below 2.5th percentile and 97.5th percentile (Konstantinova et al., 2008).

g) Diet quality

Diet quality was measured by using The Malaysian Healthy Eating Index (M-HEI) Lee et al. (2011). HEI for Malaysian consists of nine components in which the components one to seven assessed a person's degree of compliance with the food groups intake; (1)cereals and grains, (2)vegetables, (3)fruits, (4)poultry, meat and eggs, (5)fish, (6)legumes, (7)milk and dairy products, recommended by Malaysian Dietary Guidelines for Children and Adolescents (MDG). Components eight and nine assessed compliance with the recommendation of the percentage of energy from fat and sodium intake by MDG (Fara Wahida et al., 2015). The scores based on information from food frequency questionnaires. The scores for each component ranged from 0 (for lack of compliance) to 10 (for full compliance). The score of each food group was calculated using the formula: (actual serving consumed based on respondent's diet recall/recommended serving size based on MDG) × 10. The total score of the HEI was obtained by summing up the score of each component, and a composite score in percentage for the HEI was calculated. The percentage of the composite score for the HEI was calculated using the following formula: (total score of 9 components/ 90) × 100%. The possible composite score of the HEI range from 0 to 100, with a high score indicates good diet quality. The composite score for the HEI also divided into two categories which were at risk of poor diet quality (≤ 46.0%) and low risk of poor diet quality (> 46.0%) (Fara Wahida et al., 2015).

Table 3-1: Criteria scoring for Malaysian Healthy Eating Index components based on Malaysian Dietary Guidelines for Children and Adolescents

	Boy			Girl		
Age (years)	7-9	10-12	13-15	7-9	10-12	13-15
Energy (kcal)	1800	2200	2700	1600	2000	2200
Number of serving sizes recommended						
Cereals and grains	5	7	8	5	6	8
Vegetables	3	3	3	3	3	3
Fruits	2	2	2	2	2	2
Poultry, meat and eggs	1	1 ½	2	1	1	2
Fish	1	1	2	1	1	1
Legumes	1	1	1	½	1	1
Milk & dairy products	2	2	3	2	2	3
Fat (g/day)	25 and 30% of energy			25 and 30% of energy		
	50-60	61.1-73.3	75-90	44.4-53.3	55.6-66.7	61.1-73.3
Sodium*	Adequate Intake (AI) (mg/day)			Tolerable Upper Intake Level (UL) (mg/day)		
Age (years)	4-8	9-13	14-18	4-8	9-13	14-18
Boy &girl	1200	1500	1500	1900	2200	2300

Source: MDG for Children and Adolescents (2013)
*Source: MDG for Adult (2010); refer to the recommendation table for children

h) Parental feeding practice

Parental feeding practice was assessed by using the Malay version Comprehensive Feeding Practice Questionnaire (CFPQ). CFPQ consists of 12 subscales and 39 items. The 12 subscales were 1) monitoring (i.e. parents keep track of child's intake of less healthy foods), 2) child control (i.e. parents allow the child control of his/her eating behaviours), 3) emotion regulation. (i.e. parents use food to regulate the child's emotional states), 4) encourage dietary balance and variety (i.e. parents promote balanced food intake) 5) environment (i.e. parents make healthy foods available in the home), 6) food as a reward (i.e. parents use food as a reward for child behaviour), 7) involvement (i.e. parents encourage child's involvement in meal planning and

preparation), 8) modelling (i.e. parents actively demonstrate healthy eating for the child, 9) pressure (i.e. parents pressure the child to consume more food at meals, 10) restriction for health. (i.e. parents control the child's food intake with the purpose of limiting less healthy foods and sweets), 11) restriction for weight control (i.e. parents control the child's food intake with the purpose of decreasing or maintaining the child's weight), and 12) teaching about nutrition (i.e. parents provide nutrition knowledge to the children during meal). Each item in each subscale was evaluated by the parent using a five-point scale. The scores for each item of each subscale were summed to obtain the total score for each subscale. Higher total scores on the subscales reflected a higher intensity of the specific parental feeding practices. The internal consistency reliability of the CFPQ in the previous study among children aged 7 to 9 years in Malaysia ranged from 0.45-0.90 with factor loadings ranging from 0.43 to 0.90 (Shohaimi et al., 2014). The internal consistency reliability in this study was reported by the Cronbach's alpha coefficient and the Spearman-Brown (internal consistency) coefficient for each subscale. The Cronbach's alpha coefficient value for monitoring was 0.826, child control was 0.517, emotion regulation was 0.785, encourage balance and variety was 0.394, involvement was 0.386, modelling was 0.822, pressure was 0.609 and restriction for weight control was 0.857. Meanwhile, the Spearman-Brown (internal consistency) coefficient for two-item scale: environment was 0.598, food as reward was 0.473, restriction for health was 0.547, and teaching about nutrition was 0.784. The Cronbach's alpha coefficient for all items in this study was 0.856, indicating a good internal consistency reliability.

3.7.2 Anthropometric measurements

Body height was measured by using a SECA 206 Body Meter (SECA, Germany) to the nearest 0.1 cm, while body weight was measured by using a SECA Robusta 813 digital weighing scale (SECA, Germany) to the nearest 0.1 kg. Researcher performed all anthropometric measurements twice and for each measurement, the mean value was used in the analyses. The anthropometric status was classified by using WHO Growth Reference 2007. The WHO AnthroPlus Version 1.0.4 software was used to obtain the z- score for BMI-for-age for each respondent. Table 3.2 shows the classification of BMI-for-age for children (WHO, 2007). For Down Syndrome children, Zemel et al. (2015) developed a new growth chart for the U.S. DS population and included growth charts for BMI, reflecting the BMI distribution of contemporary children with DS in the United States. Due to the absence of standard values of BMI-for-age for Asian children with DS and limited of the existing charts, this study was referred to Zemel et al. (2015) for BMI growth charts for a sample of children with DS as recommended by CDC (2021). Underweight is defined as BMI percentile less than fifth percentile; normal weight is fifth percentile to less than 85th percentile, overweight is 85th percentile to less than the 95th percentile, and obesity is 95th percentile or higher.

Table 3-2: Classification of BMI-for-age for children by WHO

Body weight status	Z-score
Severe thinness	< -3 SD
Thinness	< -2 SD
Normal	-2 SD ≤ z ≤ + 1 SD
Overweight	>+1 SD
Obesity	>+2 SD
Severely obesity	>+3 SD

Source: WHO (2007)

3.8 Ethical Approval

Prior to the data collection, ethical approval for the study protocol was obtained from Human Research Ethics Committee USM (HREC), Universiti Sains Malaysia (Reference No. USM/JEPeM/19110827; see Appendix D). Besides, permission from the Ministry of Education (MOE; Reference No. KPM.600-3/2/3-eras(9246); see Appendix E) and Kelantan state Department of Education (Reference No. JPKN/SPS/.100-1/25.Jld 1 (100); see Appendix F) were obtained.

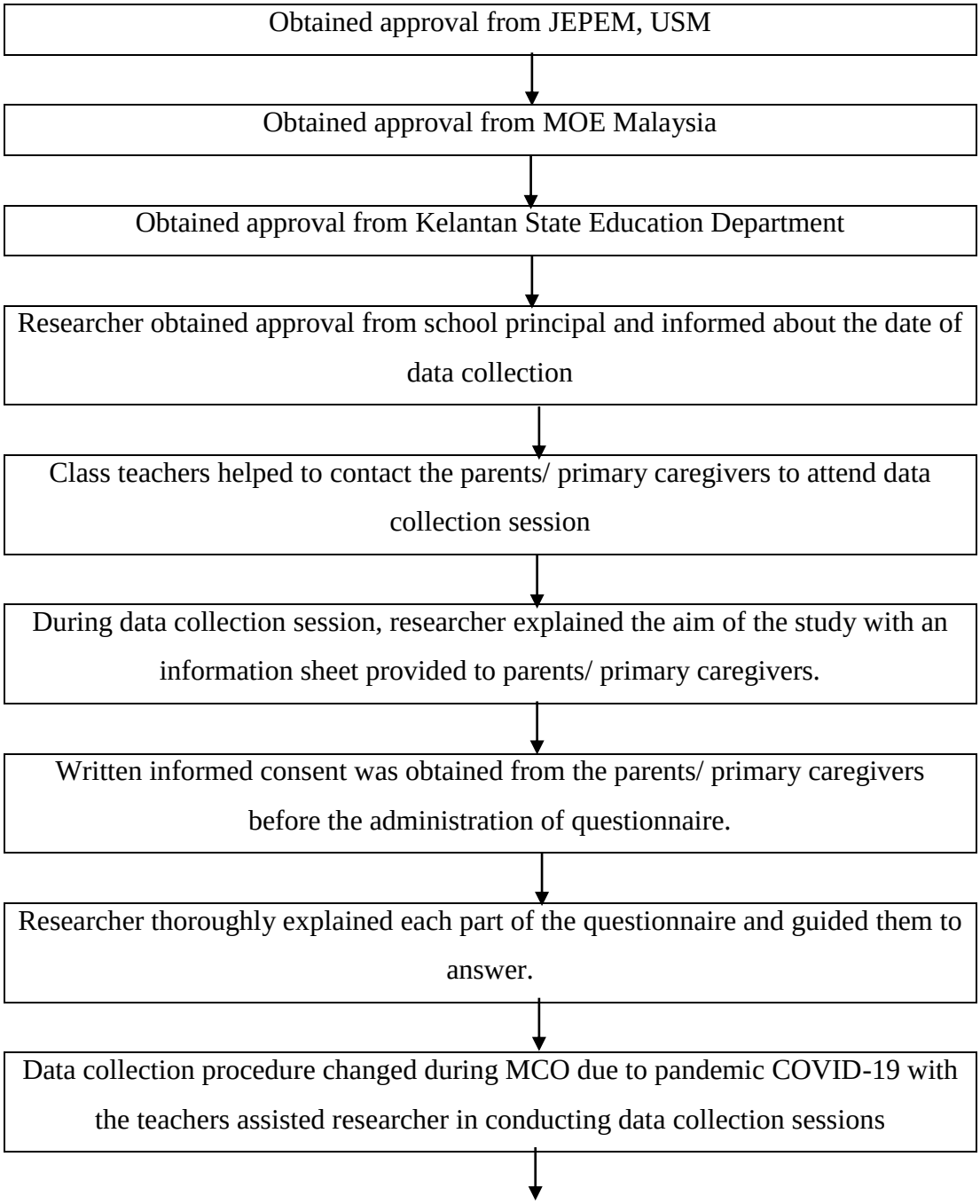
3.9 Data collection and procedures

Data collection was conducted from September 2020 to April 2021 at the nine selected primary schools. No prerequisite or IQ test performed prior data collection because school authorities had identified the children with learning disabilities. Researcher had obtained approval from school principal and informed about the date of data collection. Class teachers were then helped to distribute the invitation letter or contact the parent/ primary caregiver to attend data collection session. During data collection session, researcher explained the aim of this study with an information sheet provided to parent/ primary caregiver. Written informed consent was obtained from parents/ primary caregivers before the administration of the questionnaire. Information on demographic and socio-economic background, child feeding problem, child's dietary intake and parental feeding practice were obtained from parent/ primary caregiver. Researcher explained thoroughly each part of questionnaire and guided the respondents to answer. It took about 40 minutes to fill up the questionnaires and was conducted at school canteen after school hours when they came to pick up their children. Parent/ primary caregiver who are illiterate but interested to join this study were interviewed by researcher.

However, the data collection procedure changed during Control Movement Order (MCO) due to pandemic COVID-19. The procedure was adjusted to suit the current Standard Operation Procedures (SOPs) published by the National Security Council and *Garis Panduan Pengurusan dan Pengoperasian Sekolah dalam Norma Baharu 2.0* published by MOE (MOE, 2021). Since no face to face interview or meeting was allowed, the teachers assisted researcher in conducting data collection sessions. Researcher explained the purpose of the study with the information sheets provided and guided the teachers on how to fill out the questionnaire. Several set of questionnaire based on the number of students was given and the teacher distributed to parents/ primary caregivers. Teacher helped to explain the study's purpose and guided them to fill up the questionnaire when they came to pick up their children or through *Whatsapp* mobile application in order to minimise face-to-face interaction and maintain physical distancing. Parents answered a self-administered questionnaire at home and returned the next day. Parent/ primary caregivers who are illiterate but interested in joining this study were interviewed through a phone call by the researcher.

On the next day, anthropometry measurements were taken on the children with the school's permission by practising strict SOPs to prevent COVID-19 transmission. The researcher must not have any symptoms of COVID-19, wear a mask, wash hands or use hand sanitizer before touching, practice minimal skin-to-skin contact with children during measuring height and weight, and always watch the distance between children and teachers. Body height was measured by using a SECA Body Meter to the nearest 0.1 cm. Respondents stood straight with head on a Frankfort plane; head, shoulder blades and buttocks should be against the wall, shoulder relaxed, arms at sides, feet bare and flat on the floor, while heels close together and against the wall. Body weight was measured by using a SECA Robusta 813 digital weighing scale to

the nearest 0.1 kg with minimal clothing and no shoes. Weighing scale was placed on the most level, stable hard-floor surface and set at zero reading. Respondents were stepped on the scale platform, with both feet on the platform, and remained still with arms hanging naturally at side and looking forward. Each respondent received an honorarium for his/her participation.



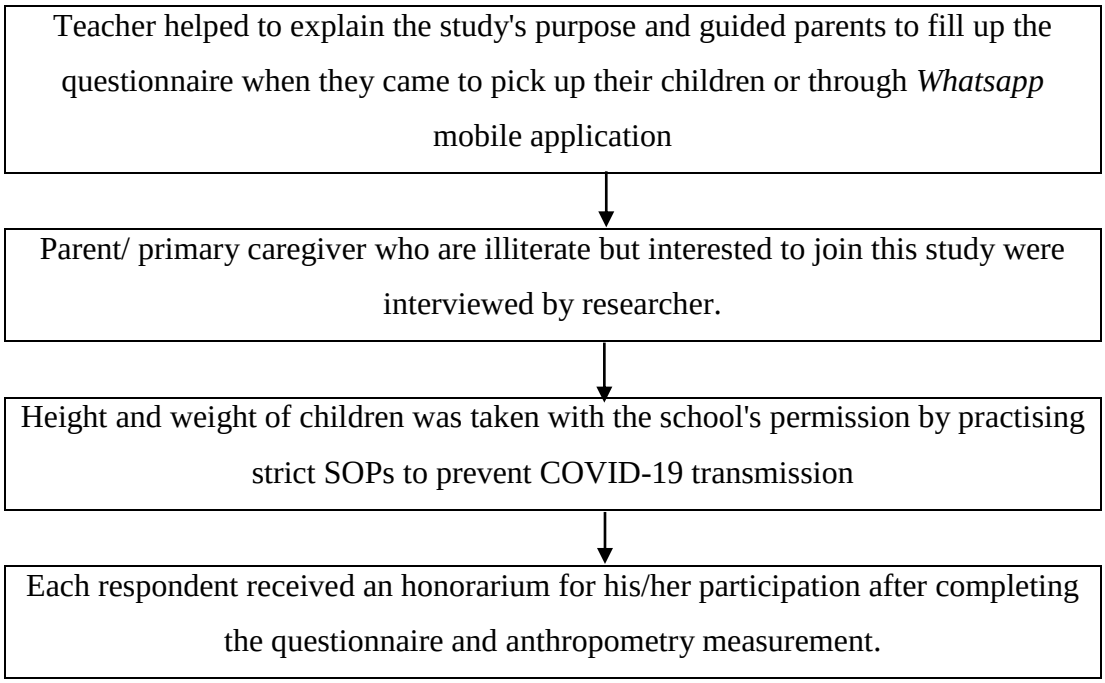


Figure 3.2 Flow chart of the data collection process

3.10 Statistical Analysis

All the statistical analyses were performed by using IBM SPSS Statistics 26. Descriptive data were analysed using univariate analysis and the results were presented as frequencies and percentages for categorical variables and as means and standard deviations for continuous variables. The research hypothesis was tested by using multiple linear regression to determine the relationship for all variables. A nonparametric test which was Spearman's rho correlation was used to determine the correlation between the data that was not normally distributed. The level of statistical significance was set at $p<0.05$.

CHAPTER 4

RESULTS

4.1 Demographic and socio-economic background

This study was conducted among children with LD aged 7 to 14 years old at nine selected primary schools in Kelantan. A total of 333 respondents were eligible to participate in this study and a set of questionnaire had been distributed. However, only 276 respondents responded and returned the questionnaire, yielding a response rate of 82.8%. After excluding missing parts and incomplete data, the eligible respondents for data analysis were 259, in which they had completed a set of self-administered questionnaires and took anthropometric measurements. Seventeen respondents were excluded from data analysis as they did not complete the questionnaire and some of them refused to take anthropometric measurements.

As shown in Table 4.1, a total of 259 respondents (68.0% males and 32.0% females) participated in this study. The mean age of children was 10.54 ± 1.69 years with 63.3% of them aged 10 to 12 years. A majority of the respondents were Malay (98.1%). For the father's educational level, most of them (57.3%) had completed secondary school (PMR/SPM/O-Level). A small proportion (5.1%) of the fathers had no formal education, followed by 7.1% who had a PhD/Master/Bachelor. Similarly, most of the mothers (56.5%) had completed secondary school (PMR/SPM/O-Level), while only 4.3% had no formal education. As for monthly household income, most of them (80.0%) were categorised under B40 with income less than RM3,030 per month and only 9.8% earned more than RM6,620, categorised as T20 (DOSM, 2020a). The mean of household sizes was 5.58 ±1.81 persons, as more than half (54.9%) had five to seven family members staying in a house.

Table 4-1 Demographic and socio-economic characteristics of the respondents (N=259)

Characteristic	n(%)	Mean ± SD
Children		
Sex	179 (68.0)	
Male	83 (32.0)	
Female		
Age (years)		10.54 ± 1.69
7-9	58 (22.4)	
10-12	164 (63.3)	
13-14	37 (14.3)	
Ethnicity		
Malay	254 (98.1)	
Chinese	4 (1.5)	
Indian	1 (0.4)	
Parents		
Father's education level (n=253)		
PhD/Master/Bachelor	18 (7.1)	
STPM/Diploma/A-Level	37 (14.6)	
Secondary school (PMR/SPM/O-Level)	145 (57.3)	
Primary school (UPSR)	40 (15.8)	
No formal education	13 (5.1)	
Mother's education level (n=255)		
PhD/ Master / Bachelor	33 (12.9)	
STPM / Diploma / A-Level	37 (14.5)	
Secondary school (PMR/SPM/O-Level)	144 (56.5)	
Primary school (UPSR)	30 (11.8)	
No formal education	11 (4.3)	
Monthly household income (RM) (n=255)*		2385.98 ±3189.05
B40 (< RM3,030)	204 (80.0)	
M40 (RM3,030 – RM6,619)	26 (10.2)	
T20 (> RM6,620)	25 (9.8)	
Household sizes (n=257)		5.58 ±1.81
<5	77 (30.0)	
5-7	141 (54.9)	
>8	39 (15.2)	

*Classification based on monthly household income by household group and state for Kelantan, 2019 (DOSM, 2020b)

UPSR: *Ujian Penilaian Sekolah Rendah*; PMR: *Penilaian Menengah Rendah*; SPM: *Sijil Pelajaran Malaysia;* STPM: Sijil Tinggi Pelajaran Malaysia; RM: *Ringgit Malaysia;* B40: Bawah 40; M40: Medium 40; T20: Tinggi 20

4.2 Child factors

4.2.1 Birth weight, gestational age and comorbidities

As shown in Table 4.2, the mean birth weight of children was 2.92 ± 0.59 kg and majority of them (80.9%) had normal weight, which was more than 2.50 kg during birth. Almost 19.1% of children had low and very low birth weight which was less than 2.50 kg. As for gestational age, the mean was 37.77 ± 2.71 weeks. Majority of them (77.4%) were delivered in full-term between 37 to 41 weeks. Only 18.1% of respondents had comorbidities with most of them having epilepsy, asthma and cardiovascular diseases.

Table 4-2 Birth weight, gestational age and comorbidities of children with learning disabilities (N=259)

Characteristic	n(%)	Mean ± SD
Birth weight (kg) (n=246)		2.92 ± 0.59
Very low birth weight (<1.49)	4 (1.6)	
Low birth weight (<2.50)	43 (17.5)	
Normal birth weight (≥2.50)	199 (80.9)	
Gestational age (weeks) (n=235)		37.77 ± 2.71
<37	50 (21.3)	
37–41	182 (77.4)	
≥42	3 (1.3)	
Comorbidities		
Yes	47 (18.1)	
Epilepsy	11 (4.2)	
Asthma	11 (4.2)	
Cardiovascular diseases	11 (4.2)	
Others (thyroid disease, kidney disease, vision problems and skin allergy)	14 (5.5)	
No	212 (81.9)	

4.2.2 Feeding problems

Table 4.3 shows the distribution of respondents by items in the "Screening Tool of Feeding Problems" children version (STEP-CHILD) questionnaire. The mean score for each subscale was chewing problems (0.84±1.17), rapid eating (2.00±1.32), food refusal (1.47±1.35), food selectivity (1.26±1.13), vomiting (0.41±0.88), and stealing food (0.70±1.00). The total score for feeding problems was 6.68±5.08.

Majority of the parents reported that their children never had a chewing problem during the past six months. The children could independently feed themselves (63.7%), able to demonstrate the ability to chew (92.7%) and swallow with chewing sufficiently (74.9%). Only 28.6% reported that their children could not independently feed themselves, which occurred between 1 and 10 times in a month. For rapid eating, 60.2% reported that their children only eat a small amount of food presented while almost half of them (42.5%) will continue to eat as long as food is presented and 34.4 % eats large amounts in a short time, which occurred between 1 and 10 times in a month.

For food refusal subscale, half of the parents reported that their children never have problem behaviours during meals (63.3%), pushes food away or attempt to leave area (50.6%) and only eats foods at a certain temperature (60.6%). Some children (42.1%) attempt between 1 and 10 times in a month to push food away or leave the area. More than half of them also have problems with food selectivity. Almost 43.6% and 36.7% have a problem between 1 and 10 times in a month as they only eat select types of foods and certain textures; while 14.7% have a problem more than 10 times in a month eating select types of foods only.

Majority of parents reported that their children did not have a problem with vomiting as 88.0% reported their children never regurgitate or re-swallows food and 60.6% never vomits during or right after meals, while 32.8% reported having this problem between 1 and 10 times in a month. As for stealing food, 76.4% and 64.1% never steal or attempt to steal food during meals and outside mealtimes; while some of them (30.9%) have an attempt between 1 and 10 times in a month to steal food outside mealtimes.

Table 4-3 Distribution of respondents by items in the "Screening Tool of Feeding Problems" children version (STEP-CHILD) questionnaire and scores by subscales (N=259)

Items	n%		
	Never occur	Occurs between 1 and 10 times/month	Occurs more than 10 times/month
Chewing problem			
My child cannot independently feed	165 (63.7)	74 (28.6)	20 (7.7)
My child does not demonstrate ability to chew	240 (92.7)	12 (4.6)	7 (2.7)
My child swallows without chewing sufficient	194 (74.9)	52 (20.1)	13 (5.0)
Mean ± SD		0.84±1.17	
Min-Max		0-6	
Rapid eating			
My child only eats a small amount of food presented	76 (29.3)	156 (60.2)	27 (10.4)
My child will continue to eat as long as food is presented	120 (46.3)	110 (42.5)	29 (11.2)
My child eats large amounts in short time	145 (56.0)	89 (34.4)	25 (9.7)
Mean ± SD		2.00±1.32	
Min-Max		0-6	
Food refusal			
My child's problem behaviours increase during meals	164 (63.3)	75 (29.0)	20 (7.7)
My child pushes food away or attempts to leave area	131 (50.6)	109 (42.1)	19 (7.3)
My child only eats foods at certain temperature	157 (60.6)	85 (32.8)	17 (6.6)
Mean ± SD		1.47±1.35	
Min-Max		0-6	
Food selectivity			
My child will only eat select types of foods	108 (41.7)	11 (43.6)	38 (14.7)
My child only eats certain textures	143 (55.2)	95 (36.7)	21 (8.1)
Mean ± SD		1.26±1.13	
Min-Max		0-4	

Table 4.3 Continued

Items	n%		
	Never occur	**Occurs between 1 and 10 times/month**	**Occurs more than 10 times/month**
Vomiting			
My child regurgitates or re-swallows food	228 (88.0)	20 (7.7)	11 (4.2)
My child vomits during or right after meals	157 (60.6)	85 (32.8)	17 (6.6)
Mean ± SD		0.41±0.88	
Min-Max		0-4	
Stealing food			
My child steals or attempts to steal food during meals	198 (76.4)	47 (18.1)	14 (5.4)
My child steals or attempts to steal food outside mealtimes	166 (64.1)	80 (30.9)	13 (5.0)
Mean ± SD		0.70±1.00	
Min-Max		0-4	
Total score			
Mean ± SD		6.68±5.08	
Min-Max		0-30	

4.2.3 Dietary intake

Table 4.4 shows the results for energy and macronutrient intake of children with LD. The mean energy intake per day was 1831.96±542.15 kcal. The total carbohydrate intake was 241.80±74.75g per day, protein intake was 76.10±25.54g per day and fat intake was 63.42±21.33g per day.

Table 4-4 Dietary intake of children with learning disabilities (n=237)

Items	Mean ± SD	Min - Max	Median	IQR
Energy (kcal)	1831.96±542.15	421.27-3494.42	1850.37	719.14
Carbohydrate (g)	241.80±74.75	60.58-439.35	234.65	102.18
Protein (g)	76.10±25.54	15.83-176.59	75.32	38.30
Fat (g)	63.42±21.33	13.06-141.81	64.95	30.07

Table 4.5 shows the prevalence of under and over-reporting of dietary intake of children with learning disabilities. There were 2.1% was under-reporting and 2.1% was over-reporting for energy, carbohydrate, protein and fat intake, respectively. However, the respondents with under- and over-reporting dietary intake were not excluded from this study because the focus of this study was to evaluate the energy and nutrient intakes of all the selected sample of children with LD with the limited sample size recruited. In addition, the data for energy, carbohydrate, protein and fat were still fulfilled the assumption of the normality test with the skewness ±2.

Table 4-5 Prevalence of under- and over-reporting of dietary intake of children with learning disabilities (n=237)

Items	n(%)		
	Under reporters	Acceptable reporters	Over reporters
Energy	5 (2.1)	227 (95.8)	5 (2.1)
Carbohydrate	5 (2.1)	227 (95.8)	5 (2.1)
Protein	5 (2.1)	227 (95.8)	5 (2.1)
Fat	5 (2.1)	227 (95.8)	5 (2.1)

In addition, Table 4.6 shows the dietary adequacy of children with LD compared to Recommended Nutrient Intakes (RNI) for Malaysian children. Half of the respondents have more energy intake than RNI while another half consumed energy less than RNI. As for the percentage of energy derived from carbohydrates, 21.1% of children had exceeded the recommendation (>65%) while 44.7% were not meet the RNI requirement (<50%). Meanwhile, 12.2% of children consumed protein below the acceptable macronutrient distribution range (AMDR) which is less than 10%. On the other hand, 24.1% had exceeded the upper range. As for the percentage of energy derived from fat, 15.6% of the children consumed fat within the AMDR. The remaining was either over consumption (54.0%) or under consumption (30.4%)

Table 4-6 Dietary adequacy based on Recommended Nutrient Intakes for Malaysia of children with LD by genders

Nutrients	**n(%)**		
	Boys	**Girls**	**Total**
Energy (kcal)			
<RNI	80 (49.4)	37 (49.3)	117 (49.4)
≥RNI	82 (50.6)	38 (50.7)	120 (50.6)
Percentages of energy from carbohydrate (%)			
<50%	74 (45.7)	32 (42.7)	106 (44.7)
50-65%	57 (35.2)	24 (32.0)	81 (34.2)
>65%	31 (19.1)	19 (25.3)	50 (21.1)
Percentages of energy from protein (%)			
<10%	20 (12.3)	9 (12.0)	29 (12.2)
10-20%	104 (64.2)	47 (62.7)	151 (63.7)
>20%	38 (23.5)	19 (25.3)	57 (24.1)
Percentages of energy from fat (%)			
<25%	46 (28.4)	26 (34.7)	72 (30.4)
25-30%	27 (16.7)	10 (13.3)	37 (15.6)
>30%	89 (54.9)	39 (52.0)	128 (54.0)

RNI: Recommended Nutrient Intakes

4.2.4 Diet quality

Table 4.7 shows the diet quality scores measured by using nine components of The Malaysian Healthy Eating Index (M-HEI) to assess the degree of compliance of food groups' intake, percentage of energy from fat and sodium based on the recommendation by Malaysian Dietary Guidelines for Children and Adolescents (MDG). The results found that the poultry, meat and eggs components (9.18± 1.80) had the highest mean score, followed by cereals and grains (6.10±2.29) and fish (6.02± 3.67). Legumes had the lowest mean score (1.57± 2.11) and followed by vegetables (2.00±2.53). The composite scores of the M-HEI among the respondents ranged from 19.67% to 72.11%, with a mean composite score of 48.15± 9.23%.

Table 4-7 Diet quality scores (The Malaysian Healthy Eating Index (M-HEI) component) of children with learning disabilities (n=237)

HEI components	Possible range of score	Criteria for minimum score of 0	Criteria for perfect score of 10	Total (Mean ± SD)	Min - Max	Median	IQR
Cereals and grains	0 to 10	0 serving	5-8 servings	6.10±2.29	0.49-10.0	5.93	3.50
Vegetables	0 to 10	0 serving	3 servings	2.00±2.53	0-10.0	1.08	2.31
Fruits	0 to 10	0 serving	2 servings	4.80±3.40	0-10.0	3.73	6.37
Poultry, meat and eggs	0 to 10	0 serving	1-2 servings	9.18± 1.80	0-10.0	10.0	0.32
Fish	0 to 10	0 serving	1-2 servings	6.02± 3.67	0-10.0	6.55	7.28
Legumes	0 to 10	0 serving	1/2 -1 servings	1.57± 2.11	0-10.0	0.70	2.10
Milk & dairy products	0 to 10	0 serving	2-3 servings	5.11± 3.10	0-10.0	4.54	5.56
Fat (g/day)	0 to 10	>30% of energy intake	<25% of energy intake	5.08± 4.64	0-10.0	5.20	10.00
Sodium*	0 to 10	1900-2300	1200-1500	3.49± 4.25	0-10.0	0	8.25
HEI composite score	0 to 100	-	-	48.15± 9.23	19.67-72.11	47.56	12.61

Source: MDG for Children and Adolescents (2013); refer to the recommendation for aged 7 to 15 years
*Source: MDG for Adult (2010); refer to the recommendation for aged 4 to 18 years

Table 4.8 and Table 4.9 show the distribution of respondents by diet quality category, sexes and age groups. This study reported that more than half of them (59.5%) had low risk of poor diet quality, while 40.5% were at risk of poor diet quality.

Table 4-8 Distribution of respondents by diet quality category and sexes (n=237)

Diet quality category	n (%)			x^2	*p-value*
	Male (n=162)	Female (n=75)	Total		
At risk of poor diet quality	71 (43.8)	25 (33.3)	96 (40.5)	0.165	0.082
Low risk of poor diet quality	91 (56.2)	50 (66.7)	141 (59.5)		

*Significant was at p<0.05

Table 4-9 Distribution of respondents by diet quality category and age groups (n=237)

Diet quality category	Age group, n (%)				x^2	*p-value*
	7-9	10-12	13-14	Total		
At risk of poor diet quality	26 (49.1)	55 (36.2)	15 (46.9)	96 (40.5)	3.325	0.190
Low risk of poor diet quality	27 (50.9)	97 (63.8)	17 (53.1)	141 (59.5)		

*Significant was at p<0.05

4.3 Parental feeding practices

Table 4.10 shows the distribution of respondents by the items in the Comprehensive Feeding Practice Questionnaire (CFPQ) and scores by subscales. The table shows that the mean score for monitoring subscale was 13.24 ±3.24. The item that showed the highest response for "always" (16.2%) and "mostly" (35.5%) was *"How much do you keep track of the sugary drinks (soda/pop, milk shake and sirap) that your child eats/drinks?"* while, the items that had the highest response for "never" (8.5%) and

"rarely" (22.0%) was *"How much do you keep track of the high-fat foods that your child eats?"*

The child control subscale had a mean score of 11.22±2.64. The item *"If this child does not like what is being served, do you make something else?"* showed the highest responded for "always" (22.4%); while the item *"At dinner, do you let this child choose the foods she/he wants from what is served?"* observed the highest responded for "never" (18.3%). For the emotional regulation subscale, the mean score was 6.32±2.62. The item with the highest answer for "never" (37.8%) was *"Do you give this child something to eat or drink if she/he is bored even if you think s/he is not hungry?"*

An encourage dietary balance and variety subscale had a mean score of 11.98±2.07. Majority of the respondents responded "mostly" (44.0%) for the item *"Do you encourage this child to eat healthy foods before unhealthy ones?"*. While the item *"I tell my child that healthy food tastes good"* had the highest response of "agree" (61.8%). For the environment subscale, most of the respondents agreed that *"Most of the food I keep in the house is healthy"* (45.6%) and *"A variety of healthy foods are available to my child at each meal served at home"* (38.2%) with the mean score was 8.14±1.58. Meanwhile, the mean score for the involvement subscale was 11.39±2.49. The item with the highest response for "agree" was *"I allow my child to help prepare family meals"* (48.3%); while the item with the highest response for "disagree" was *"I encourage my child to participate in grocery shopping"* (11.2%).

The mean score for the food as reward subscale was 6.37±2.13. Most of the respondents agreed (40.5%) for the item *"I offer my child his/her favourite foods in exchange for good behaviour"* while, 27.8% answered "disagreed" for item *"I offer*

sweets (candy, ice cream, cake, and kuih -muih) to my child as a reward for good behaviour". For the restriction for health subscale, the mean score was 7.68±2.26. Majority of the respondents agreed for items *"If I did not guide or regulate my child's eating, s/he would eat too much of his/her favourite foods"* (42.1%) and *"If I did not guide or regulate my child's eating, he/she would eat too many junk foods"* (49.4%). For the teaching about nutrition subscale, most of the respondents agreed for items *"I discuss with my child why it is important to eat healthy foods"* (49.4%) and *"I discuss with my child the nutritional value of foods"* (39.4%) with the mean score was 7.92±2.03.

For restriction for weight control subscale, the mean score was 23.61±7.09. Item with the highest response for "agree" was *"There are certain foods my child should not eat because they will make him/her fat"* (37.8%). Meanwhile, the items with highest responses for "disagree" were *"I do not allow my child to eat between meals because I do not want him/her to get fat*" and "*I often put my child on a diet to control his/her weight"*, 25.1% and 24.3%, respectively.

The mean score for pressure subscale was 8.71±3.23. The items *"When he/she says he/she finished eating, I try to get my child to eat one more (two more, etc.) bites of food"* had the highest responded for "disagree" (33.2%); while the item *"If my child eats only a small helping, I try to get him/her to eat more"* had the highest answered for "agree" (26.3%). For the modelling subscale, majority of them agreed for items *"I try to show enthusiasm about eating healthy foods"* (58.7%) and *"I show my child how much I enjoy eating healthy foods"* (54.8%) and the mean score for this subscale was 16.49±3.44

Table 4-10 Distribution of respondents by the items in the Comprehensive Feeding Practice Questionnaire (CFPQ) and scores by subscales (N=259)

Items		n (%)				
		Never	Rarely	Sometimes	Mostly	Always
Monitoring						
1.	How much do you keep track of the sweets (candy, ice cream, cake, and *kuih-muih*) that your child eats?	3 (1.2)	31 (12.0)	114 (44.0)	82 (31.7)	29 (11.2)
2.	How much do you keep track of the snack food (potato chips, *keropok leko*, Twisties, and Mamee) that your child eats?	7 (2.7)	36 (13.9)	102 (39.4)	84 (32.4)	30 (11.6)
3.	How much do you keep track of the high-fat foods that your child eats?	22 (8.5)	57 (22.0)	87 (33.6)	70 (27.0)	23 (8.9)
4.	How much do you keep track of the sugary drinks (soda/pop, milk shake and *sirap*) this child drinks?	10 (3.9)	48 (18.5)	67 (25.9)	92 (35.5)	42 (16.2)
	Mean ± SD			13.24 ±3.24		
	Min-Max			4-20		
Child control						
5.	Do you let your child eat whatever she/he wants?	23 (8.9)	74 (28.6)	98 (37.8)	41 (15.8)	23 (8.9)
6.	At dinner, do you let this child choose the foods s/he wants from what is served?	50 (19.3)	73 (28.2)	87 (33.6)	37 (14.3)	12 (4.6)
10.	If this child does not like what is being served, do you make something else?	31 (12.0)	57 (22.0)	95 (36.7)	58 (22.4)	18 (6.9)
11.	Do you allow this child to eat snacks whenever she/he wants?	12 (4.6)	71 (27.4)	121 (46.7)	48 (18.5)	7 (2.7)
	Mean ± SD			11.22±2.64		
	Min-Max			4-20		
Emotional regulation						
7.	When this child gets fussy, is giving him/her something to eat or drink the first thing you do?	75 (29.0)	88 (34.0)	70 (27.0)	17 (6.6)	9 (3.5)
8.	Do you give this child something to eat or drink if she/he is bored even if you think she/he is not hungry?	98 (37.8)	86 (33.2)	52 (20.1)	15 (5.8)	8 (3.1)

Table 4.10 Continued

Items		n (%)				
		Never	**Rarely**	**Sometimes**	**Mostly**	**Always**
9.	Do you give this child something to eat or drink if she/he is upset even if you thinks she/he is not hungry?	94 (36.3)	83 (32.0)	59 (22.8)	16 (6.2)	7 (2.7)
	Mean ± SD			6.32±2.62		
	Min-Max			3-15		
Encourage dietary balance and variety						
12.	Do you encourage this child to eat healthy foods before unhealthy ones?	4 (1.5)	25 (9.7)	57 (22.0)	114 (44.0)	59 (22.8)
Items		**Disagree**	**Slightly disagree**	**Neutral**	**Slightly agree**	**Agree**
20.	I encourage my child to try new foods	18 (6.9)	21 (8.1)	50 (19.3)	74 (28.0)	96 (37.1)
22.	I tell my child that healthy food tastes good	2 (0.8)	6 (2.3)	38 (14.7)	53 (20.5)	160 (61.8)
	Mean ± SD			11.98±2.07		
	Min-Max			6-15		
Environment						
13.	Most of the food I keep in the house is healthy	1 (0.4)	4 (1.5)	70 (27.0)	66 (25.5)	118 (45.6)
18.	A variety of healthy foods are available to my child at each meal served at home.	3 (1.2)	14 (5.4)	62 (23.9)	81 (31.3)	99 (38.2)
	Mean ± SD			8.14±1.58		
	Min-Max			4-10		
Involvement						
14.	I involve my child in planning family meals.	15 (5.8)	8 (3.1)	80 (30.9)	69 (26.6)	87 (33.6)
16.	I allow my child to help prepare family meals.	22 (8.5)	10 (3.9)	43 (16.6)	59 (22.8)	125 (48.3)
28.	I encourage my child to participate in grocery shopping	29 (11.2)	24 (9.3)	55 (21.2)	62 (23.9)	89 (34.4
	Mean ± SD			11.39±2.49		
	Min-Max			3-15		

Table 4.10 Continued

Items	n (%)				
	Disagree	**Slightly disagree**	**Neutral**	**Slightly agree**	**Agree**
Food as reward					
15. I offer my child his/her favourite foods in exchange for good behaviour	26 (10.0)	20 (7.7)	46 (17.8)	62 (23.9)	105 (40.5)
19. I offer sweets (candy, ice cream, cake, and *kuih -muih*) to my child as a reward for good behaviour.	72 (27.8)	59 (22.8)	49 (18.9)	60 (23.2)	19 (7.3)
Mean ± SD			6.37±2.13		
Min-Max			2-10		
Restriction for health					
17. If I did not guide or regulate my child's eating, she/he would eat too much of his/her favourite foods.	22 (8.5)	27 (10.4)	35 (13.5)	66 (25.5)	109 (42.1)
24. If I did not guide or regulate my child's eating, he/she would eat too many junk foods	30 (11.6)	23 (8.9)	29 (11.2)	49 (18.9)	128 (49.4)
Mean ± SD			7.68±2.26		
Min-Max			2-10		
Teaching about nutrition					
21. I discuss with my child why it is important to eat healthy foods	10 (3.9)	10 (3.9)	57 (22.0)	54 (20.8)	128 (49.4)
27. I discuss with my child the nutritional value of foods	10 (3.9)	16 (6.2)	81 (31.3)	50 (19.3)	102 (39.4)
Mean ± SD			7.92±2.03		
Min-Max			2-10		
Restriction for weight control					
23. I encourage my child to eat less so that he/she will not get fat	35 (13.5)	31 (12.0)	44 (17.0)	63 (24.3)	86 (33.2)
25. I give my child small helpings at meals to control his/her weight.	55 (21.2)	45 (17.4)	48 (18.5)	54 (20.8)	57 (22.0)
29. If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.	18 (6.9)	30 (11.6)	41 (15.8)	74 (28.6)	96 (37.1)
30. I restrict the food my child eats that might make him/her fat.	18 (6.9)	31 (12.0)	43 (16.6)	71 (27.4)	96 (37.1)
31. There are certain foods my child should not eat because they will make him/her fat	21 (8.1)	32 (12.4)	53 (20.5)	55 (21.2)	98 (37.8)

Table 4.10 Continued

Items		n (%)				
		Disagree	**Slightly disagree**	**Neutral**	**Slightly agree**	**Agree**
33.	I do not allow my child to eat between meals because I do not want him/her to get fat	65 (25.1)	48 (18.5)	47 (18.1)	48 (18.5)	51 (19.7)
35.	I often put my child on a diet to control his/her weight.	63 (24.3)	46 (17.8)	51 (19.7)	41 (15.8)	58 (22.4)
	Mean ± SD			23.61±7.09		
	Min-Max			7-35		
Pressure						
26.	If my child says"I'm not hungry," I try to get him/her to eat anyway.	81 (31.3)	40 (15.4)	49 (18.9)	46 (17.8)	43 (16.6)
32.	If my child eats only a small helping, I try to get him/her to eat more.	39 (15.1)	32 (12.4)	40 (15.4)	80 (30.9)	68 (26.3)
39.	When he/she says he/she finished eating, I try to get my child to eat one more (two more, etc.) bites of food	86 (33.2)	53 (20.5)	43 (16.6)	40 (15.4)	37 (14.3)
	Mean ± SD			8.71±3.23		
	Min-Max			3-15		
Modelling						
34.	I model healthy eating for my child by eating healthy foods myself.	10 (3.9)	12 (4.6)	67 (25.9)	48 (18.5)	122 (47.1)
36.	I try to eat healthy foods in front of my child, even if they are not my favourite	21 (8.1)	15 (5.8)	49 (18.9)	71 (27.4)	103 (39.8)
37.	I try to show enthusiasm about eating healthy foods.	5 (1.9)	3 (1.2)	38 (14.7)	61 (23.6)	152 (58.7)
38.	I show my child how much I enjoy eating healthy foods	5 (1.9)	5 (1.9)	45 (17.4)	62 (23.9)	142 (54.8)
	Mean ± SD			16.49±3.44		
	Min-Max			4-20		

4.4 Body weight status

As shown in Table 4.11, the mean weight of the respondents was 34.15 ± 13.22 kg while the mean height was 134.39 ± 12.09 cm. The mean BMI of the respondents was 18.38 ± 4.79 kg/m^2. There was a significant difference in BMI between males (M = 18.79 kg/m^2, SD = 4.76) and females (M = 17.52 kg/m^2, SD = 4.77, t = 2.003, p = 0.046). The overall prevalence of severely thinness, thinness, underweight, normal weight, overweight, obesity and severely obesity were 2.3%, 7.3%, 2.3%, 59.8%, 11.6%, 11.6% and 5.0%, respectively.

Table 4-11 Distribution of body weight status of children with learning disabilities by gender (N=259)

Anthropometric measurements	n%			t-value
	Male (n=176)	Female (n=83)	Total	
Weight (kg)				
Mean ± SD	35.07 ± 13.37	32.19 ± 12.75	34.15 ± 13.22	
Height (cm)				
Mean ± SD	134.81 ± 11.76	133.50 ± 12.81	134.39 ± 12.09	
BMI (kg/m^2)				
Mean ± SD	18.79 ± 4.76	17.52 ± 4.77	18.38 ± 4.79	2.003*
BMI classification				
Severely thinness[a]	5 (2.8)	1 (1.2)	6 (2.3)	
Thinness[a]	12 (6.8)	7 (8.4)	19 (7.3)	
Underweight[b]	2 (1.1)	4 (4.8)	6 (2.3)	
Normal[ab]	95 (54.0)	60 (72.3)	155 (59.8)	
Overweight[a]	26 (14.8)	4 (4.8)	30 (11.6)	
Obesity[ab]	24 (13.6)	6 (7.2)	30 (11.6)	
Severely obese[a]	12 (6.8)	1 (1.2)	13 (5.0)	

Noted: [a] WHO (2007), [b] Zemel et. al (2015)

*Significant was at p<0.05

4.5 Factors related with body mass index

4.5.1 Simple linear regression analysis between demographic factors, socio-economic factors, child factors and parental factors with body mass index

Referring to Table 4.12, a Spearman's rho correlation test was conducted to determine the correlation between monthly household income and BMI among children with LD. Monthly household income was found negatively correlated with BMI (r_s = - 0.156, p=0.012).

Table 4-12 Results of Spearman's rho correlation between monthly household income with body mass index among children with learning disabilities (N=259)

Variable	Body mass index	
	r_s	*p*-value
Socio-economic factors		
Monthly household income (n=255)	-0.156	0.012*

*Significant was at p<0.05

Meanwhile, a simple linear regression analysis (SLR) was conducted to determine the relationship between demographic and socio-economic factors, child factors and parental factors with BMI of children with LD; as shown in Table 4.13. Referring to Table 4.13, there was a negative relationship between household sizes and BMI (Beta= -0.131, p=0.036), while sex (Beta=0.124, p=0.046), age (Beta=0.262, p<0.001) and birth weight (Beta=0.175, p=0.006) of children were found to be positively related with BMI. This study found no significant relationship between other child factors which are gestational age at delivery, feeding problems, dietary intake, and diet quality.

As for parental factor which is parental feeding practices, this study found a significant relationship between encourage dietary balance and variety (Beta= -0.145, p=0.020), food as reward (Beta= -0.128, p=0.039), pressure (Beta= -0.315, p<0.001),

and restriction for weight control (Beta= 0.344, $p<0.001$) with BMI among children with LD. No significant relationship was found for the other subscales of parental feeding practices which were monitoring, child control, emotional regulation, environment, involvement, modelling, restriction for health and teaching about nutrition with BMI.

Table 4-13 Results of simple linear regression analysis between demographic and socio-economic factors, child factors and parental factors with body mass index of children with LD (n = 223)

Variables	Simple linear regression						
	Unstandardized coefficient		Standardized coefficient	t	95% CI		*p*-value
	B	Std. error	Beta		Lower bound	Upper bound	
Age	0.741	0.171	0.262	4.344	0.405	1.077	<0.001*
Sex							
Male	1.271	0.634	0.124	2.003	0.021	2.520	0.046*
Female	Reference						
Ethnicity							
Malay	Reference						
Non-malay	0.375	2.168	0.011	0.173	-3.895	4.645	0.863
Father's education level							
Tertiary education	Reference						
Secondary education	0.185	0.601	0.019	0.308	-0.998	1.369	0.758
No/ primary education	1.215	0.736	0.102	1.651	-0.234	2.663	0.100
Mother's education level							
Tertiary education	Reference						
Secondary education	0.497	0.600	0.052	0.828	-0.684	1.678	0.408
No/ primary education	0.958	0.815	0.073	1.175	-0.648	2.563	0.241
Monthly household income							
T20	Reference						
M40	1.188	0.990	0.075	1.200	-0.762	3.138	0.231
B40	-0.910	0.727	-0.78	-1.251	-2.342	0.523	0.212
Household size	-0.348	0.165	-0.131	-2.105	-0.674	-0.022	0.036*

Table 4.13 Continued

Variables	Simple linear regression						
	Unstandardized coefficient		Standardized coefficient	t	95% CI		*p*-value
	B	Std. error	Beta		Lower bound	Upper bound	
Birth weight	1.445	0.522	0.175	2.769	0.417	2.472	0.006*
Gestational age	-0.096	0.119	-0.053	-0.810	-0.330	0.138	0.419
Feeding problems							
Chewing problem	-0.027	0.765	-0.002	-0.036	-1.534	1.479	0.971
Rapid eating	0.576	0.679	0.053	0.848	-0.761	1.913	0.397
Food refusal	-0.720	0.661	-0.068	-1.088	-2.022	0.582	0.277
Food selectivity	-0.767	0.525	-0.091	-1.460	-1.801	0.268	0.146
Vomiting	0.303	0.681	0.028	0.445	-1.038	1.645	0.657
Stealing food	-0.226	0.602	-0.023	-0.376	-1.411	0.959	0.707
Dietary intake							
Energy intake	-0.001	0.001	-0.083	0.201	-0.002	0.000	0.201
Carbohydrate	-0.004	0.004	-0.060	-0.921	-0.012	0.004	0.358
Protein	-0.016	0.012	-0.085	-1.308	-0.040	0.008	0.192
Fat	-0.021	0.015	-0.092	-1.422	-0.050	0.008	0.156
Diet quality (HEI)	-0.012	0.034	-0.024	-0.364	-0.080	0.055	0.716
Parental feeding practice							
Monitoring	0.010	0.092	0.007	0.105	-0.172	0.191	0.916
Child control	-0.086	0.113	-0.047	-0.757	-0.308	0.137	0.450
Emotion regulation	-0.217	0.113	-0.119	-1.913	-0.441	0.006	0.057
Encourage dietary balance and variety	-0.334	0.143	-0.145	-2.343	-0.615	-0.053	0.020*

Table 4.13 Continued

Variables	Simple linear regression						
	Unstandardized coefficient		Standardized coefficient	t	95% CI		*p*-value
	B	Std. error	Beta		Lower bound	Upper bound	
Environment	0.088	0.189	0.029	0.466	-0.284	0.461	0.642
Food as reward	-0.289	0.139	-0.128	-2.072	-0.563	-0.014	0.039*
Involvement	-0.044	0.120	-0.023	-0.370	-0.280	0.192	0.712
Modeling	-0.102	0.087	-0.073	-1.175	-0.273	0.069	0.241
Pressure	-0.467	0.088	-0.315	-5.314	-0.640	-0.294	<0.001*
Restriction for health	0.016	0.132	0.007	0.119	-0.245	0.277	0.905
Restriction for weight control	0.232	0.040	0.344	5.867	0.154	0.310	<0.001*
Teaching about nutrition	-0.127	0.147	-0.054	-0.861	-0.417	0.163	0.390

Note: *p<0.05. Variables with a p < 0.25 in the simple linear regression model were included in the stepwise multiple linear regression analysis.

4.5.2 Multiple linear regression analysis to identify predictors variables for body mass index

Variables with a $p < 0.25$ in the simple linear regression model were included in the stepwise multiple linear regression analysis. Multiple linear regression (MLR) was conducted to investigate the best contributor of BMI for children with LD. The assumptions of MLR were checked and none were violated. As shown in Table 4.14, five variables have a statistically significant correlation for the MLR test. The unstandardized and standardised regression coefficients of the predictor and their correlation with BMI are shown in Table 4.14.

The results illustrated that age (Beta = 0.222, $p < 0.001$), child birth weight (Beta = 0.137, $p < 0.016$), modelling (Beta =-0.162, $p = 0.010$), pressure (Beta =-0.282, $p < 0.001$), and restriction for weight control (Beta = 0.351, $p = <0.001$) were found significantly contribute to BMI of children with LD. Restriction for weight control showed the largest beta coefficient indicating the greatest contributor in explaining BMI of children with LD, after controlling the effect of all other predictors in the model. The prediction model was statistically significant, $F (5, 217) = 19.972$, $p < 0.001$, and accounted for approximately 31.5% of the variance of BMI ($R^2 =0.315$, Adjusted $R^2 =0.297$).

The Unstandardized Coefficients (B) showed the predicted change in the dependent variable for every unit increase in that predictor. This means that for every one year increase in age, there will be an increase in BMI by 0.645 kg/m^2. While for birth weight, for every one kg increase in birth weight, it would predict an increment by 1.132 kg/m^2 in BMI. As for parental feeding practice, for every one unit increase of modelling scores, there is a decrease in BMI by 0.231 kg/m^2, while for every one unit increase of pressure score, there is a decrease in BMI by 0.439 kg/m^2. As for

restriction for weight control, every one unit increase in score is followed by a 0.242 kg/m^2 increase in BMI.

Table 4-14 Results of multiple linear regression analysis (stepwise method) to identify predictors variables for body mass index (n = 223)

Variable	Multiple linear regression						
	Unstandardized coefficient		Standardized coefficient	t	95% CI		*p*- value
	B	Std. error	Beta		Lower bound	Upper bound	
Constant	10.335	2.727		3.795	4.967	15.703	<0.001
Age	0.645	0.165	0.222	3.901	0.319	0.971	<0.001
Birth weight	1.132	0.468	0.137	2.418	0.209	2.054	0.016
Parental feeding practice							
Modeling	-0.231	0.090	-0.162	-2.583	-0.408	-0.055	0.010
Pressure	-0.439	0.090	-0.282	-4.847	-0.617	-0.260	<0.001
Restriction for weight control	0.242	0.043	0.351	5.672	0.158	0.326	<0.001

Multiple linear regression model: R= 0.561, R^2 =0.315, Adjusted R^2 =0.297; F (5, 217) = 19.972, $p < 0.001$; correlation are significant at $p < 0.05$.

CHAPTER 5

DISCUSSION

At the beginning of this study, the main objective is to determine the relationship between demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality) and parental factor (parental feeding practice) with body mass index (BMI) of children with learning disabilities (LD). Therefore, to achieve this objective, this study employed a cross-sectional study by using a set of Malay self-administered questionnaires to collect information from parents on demographic and socio-economic background, child factors (feeding problems, and dietary intakes) and parental feeding practice, while body height and weight of the children with LD was measured according to the standard protocol.

5.1 Body weight status

Body weight status (BWS) is an indicator of nutritional status as children with LD are vulnerable to malnutrition (under or over-nutrition). They have a higher probability of experiencing poor health status than those without ID due to their limited ability to comprehend and assess information about nutrition and health. Being underweight, overweight or obese during childhood would expose them to the risk of getting non-communicable diseases that could cause a problem in leading a healthy lifestyle.

The results of this study showed a higher prevalence of overweight and obesity (28.2%) as compared to a previous study by Chen et al. (2015) (22.1%) among LD children and adolescents aged 4 to 19 years at 32 CBR around Malaysia. Meanwhile,

for the prevalence of thinness and underweight, Chen et al. (2015) reported a higher percentage (22.5%) as compared to the current study (11.9%). A recent study in Malaysia among ASD children aged 3 to 7 years reported that 21.5% were overweight and obese, while only 4.0% were wasted and thin (Eow, Gan, & Awang, 2021). While comparing to the local studies, the different prevalence of BWS assessed might be due to different aged groups and other socio-demographic factors such as SES and geographical areas. Besides, it was suggested that children with LD faced an extra challenge in eating patterns due to incompetent cognitive capability, further predisposing them to unhealthy eating.

Previous studies in Asian countries, which were India, Indonesia, Hong Kong and Turkey, reported the prevalence of overweight and obesity among children with ID ranged from 22.1% to 40.0%, while the prevalence of underweight ranged between 8.0% to 18.4% (Sari et al., 2016; Sayin & Ilik, 2017; Tamin et al., 2014; Wang et al., 2018). The prevalence of underweight and overweight/obese of the current study could support the previous findings in Asian countries as it lay in between the estimated range. Possible reasons for the difference of prevalence in the various countries might be due to different reference standards used, socio-economic status and lifestyles. For example, some countries used their own reference standards for determining BMI; thus, a direct comparison between reference standards was invalid due to different cut-off points used. Besides, this current study investigated BWS involved a small sample size of children with LD in Kelantan and did not demographically reflect the overall population in Malaysia. Future research may need to apply a larger sample size of children and adolescents with ID at all states in Malaysia.

The higher prevalence of overweight and obesity observed in the current study suggested that more children with LD were having over-nutrition than under-nutrition.

The findings were consistent with other paediatric studies in Malaysia (Nurumal et al., 2020; Poh et al., 2019; Rahim et al., 2019) as well as recent national findings from the National Health and Morbidity Survey (NHMS) 2019 among the general population of children (IPH, 2020). Besides, the current study also highlighted that the double burden of malnutrition was not only happened among children with TD, but also prevalent among children with LD. Undernutrition may increase the risk of prolonged nutrient deficiency and other co-morbidities, while being obese also can lead to co-morbidities and other negative social consequences that can interrupt societal interaction, low self-esteem as well as mental health. Thus, future studies should further investigate the double burden of malnutrition and its risk factors among children with LD in Malaysia.

This study also observed that more females were thin and underweight than males, while more males were overweight and obese than females. There was a significant difference in BMI between males and females. The current study was similar to a recent study by Eow, Gan and Awang (2021) as they showed a higher BMI for males than females, yet no significant difference was found. In contrast, most of the previous studies reported that females had higher BMI compared to males. For example, a study among disabled children in Chile found that females had higher values of BMI compared with males (Barria et al., 2018); while another study in Korea among children with PDD also reported that females had higher BMI compared to males (Joo et al., 2019). However, a direct comparison should be cautiously done due to differences between the aged group, population, and socio-demographics. Moreover, this study only measured BMI and categorized it in different body weight status (e.g., overweight and obese), which could lead to unreliable data in terms of the accurate estimation of children's body composition and body fat percentage.

5.2 Demographic factors

The majority of children with LD who participated in this study are male and Malay, with a mean age of 10.54 ± 1.69 years. This could be explained due to the majority of the ethnicity in Kelantan is Bumiputera/Malays (94.1%) and only around 3.8% is another ethnicity which are Chinese and Indian; while Malay is the largest ethnicity living in Kelantan (DOSM, 2021b). This finding could support the other studies among Malaysian disabled children in which the majority of the respondents who participated is male and Malays (Chen et al., 2015; Eow, Gan, & Awang, 2021; Norazlin et al., 2019). Besides, DOSM also stated that Kelantan has a higher prevalence of males than females in 2021 (DOSM, 2021b).

Majority of them had a normal birth weight which was more than 2.50 kg during birth, similarly with other previous studies among disabled children in Malaysia (Chen et al., 2015; Eow, Gan, & Awang, 2021); while only 1 out of 5 children had low and very low birth weight which was less than 2.50 kg. As for gestational age, majority of them were delivered in full term. Meanwhile, 1 out of 5 children had comorbidities, with most of them were having epilepsy, asthma and cardiovascular diseases. These children only had mild comorbidities and did not follow any particular diet due to medical reasons.

5.2.1 Relationship between age and childbirth weight with body mass index

This study found a significant positive relationship between the age of children and BMI. The result of this study was parallel with the previous study in Malaysia (Norazlin et al., 2019) and other studies in India (Islam et al., 2020), United States (Must et al., 2017), Taiwan (Pan et al., 2016) and Indonesia (Tamin et al., 2014), which reported that the age of disabled children was positively associated with BMI. The

researchers suggested BMI increases simultaneously with the older age due to greater risk of weight gain during the transition from childhood to adolescence with increased body composition. Besides, they also explained that higher overweight and obesity could be due to low physical activity levels as they aged and spent more time in sedentary activities. The previous findings found that lower physical activity levels were associated with increased weight gain among disabled children due to poor social interaction and motor functioning limiting their daily activities (Balogun, 2016; Wouters et al., 2019). Thus, physical activity levels among children with LD warrants further investigation in future studies as the current study did not assess the relationship between these two variables. The present study focused more on dietary factors and parental factors and its association with BMI.

Besides, this study also found that the birth weight of children was significantly correlated with BMI, thus strengthening the finding from Chen et al. (2015), who examined similar factors among children and adolescents with LD aged 4 to 19 years old. The results from previous studies also reported consistent findings among children with TD in which the higher birth weight was associated with higher BMI when they were grown up (Baran et al., 2019; Deng et al., 2020; Kapral et al., 2018). The current finding also aligned with the suggestion from The Western Australian Pregnancy Cohort (Raine) Study as birth weight and infant weight gain were more important determinants of increasing obesity risk later in children's life than diet and nutrition (Meyerkort et al., 2012).

Contrary to a study by Chen et al. (2019), low birth weight was correlated with an increased risk of thinness and severe obesity, rather than overweight and obesity. The catch-up growth process might explain this finding. Children with low-birth-weight display catch-up growth in line with the genetic determinants before rapidly

increasing their body weight relatively with age (Baran et al., 2019). However, it should be noted that not all children with low birth weight have a consistent catch-up growth process since diverse growth patterns may exist (Chen et al., 2019). Thus, these differences should be considered when developing interventions to lower childhood overweight and obesity. However, there is still little evidence among children with LD and further prospective study warrants investigating the temporal relationships.

5.3 Socio-economic factors

As for socio-economic status, most parents completed secondary school, which was considered a low educational level. Only a small proportion of them have tertiary education. Most of them were categorised under B40 or had low household incomes. According to DOSM (2020a), Kelantan has the lowest median monthly household income in Malaysia which is RM3,079 in 2016 and increased to RM3,563 in 2019. Even though there is an increment from the past years, Kelantan maintains as the state with the lowest household income while having the second-highest incidence of poverty (12.9%) in Malaysia, after Sabah (19.5%). As for children with disabilities who were registered under the Department of Social Welfare, they will receive a monthly allowance from the government. This government assistance helps them meet their self needs such as medicine, learning tools, stationeries and food, and able to reduce the burden of their family.

Meanwhile, according to The Household Income and Basic Amenities Survey Report, in 2019, Kelantan had 4.4 people per household, which is the third-highest of household size between states in Malaysia (DOSM, 2020b). However, the current study reported that there was 5.58 people per household, higher than the national report. The national report was assessed among the general population of Malaysians

and did not differentiate between families with LD children or typically developing children. Thus, this study cannot be generalised to all families in Kelantan as it only assessed the family with LD children.

5.3.1 Relationship between socio-economic factors with body mass index

Referring to Table 4.12 and Table 4.13, socio-economic factors which are monthly household income and household sizes, had a significant negative relationship with BMI. This study found that the lower the household income, the higher BMI among children with LD. A similar pattern of the results found in the previous meta-analysis findings among the general population in the USA, UK and Canada in which lower-income families were more likely to develop obesity (Kim & Knesebeck, 2018). This correlation could be strengthened with the findings of household income categories as the majority were under the B40 category.

Low household income would influence their ability to purchase healthier food such as fruit and vegetables which were higher in cost. Inadequate money could lead to higher consumption of cheaper yet energy-dense food with low nutritional values. A previous study suggested that income factors and the cost of food items were perceived as barriers to food consumption among children (Haq et al., 2020). This could become a possible reason for higher BMI; aligned with a study in Taiwan which claimed that the children and adolescents with ID from low-income families were likely to consume less healthy food (Yen & Lin, 2010).

The current finding was contrary to previous studies among Malaysian children with TD in which higher household income was correlated with BMI (Izzah et al., 2019; Naidu et al., 2013). However, the current study focused on the relationship between household income and BMI among children with LD. Meanwhile, a study in

Kelantan reported no association between household income and BMI even though 50.0% of the caregivers of children with LD had low monthly household income (Chen et al., 2015). Hence, given that the finding in this study had a significant relationship between lower socio-economic status and BMI among the majority of the participants with the existence of higher prevalence of overweight and obese; thus, this problem warrants further attention, especially in rural communities. Low household income could cause higher consumption of cheaper food with lower nutrient quality and energy-dense that was correlated with higher BMI.

Another factor that was negatively correlated with BMI was household sizes. This study found that the lesser people in one household was related to higher BMI. The result of this study could contribute positively toward previous findings that studied similar variables (Ahmad et al., 2018; Raghi et al., 2016). The possible reason to explain this finding was that the food allocation to one person would be higher if fewer people were in one household, directly affecting their food consumption. This could support the suggestion that larger households (six or more members) had a higher chance for severe food insecurity and accessibility than smaller households as smaller households have better management of food demand and supply (Nyangasa et al., 2019). Children who live in smaller households have higher chances of consuming more food without any problem in food allocation, leading to overconsumption and unhealthy nutritional status.

This current study reported that mean household sizes were six people per household, which is considered a medium-sized household. The lesser people in a household could reduce the demand of food intake and at the same time be able to meet the food needs of family members. Haq et al. (2020) stated that the regular consumption of fruits, livestock, and dairy items was associated with small family size.

The consumption could be declined as the family size increased from small to large family size. Meanwhile, a study in Mexico stated that large household size is known as a risk factor for malnutrition, particularly for infants and young children. Children from larger households are significantly shorter and have growth faltering as they consume a poorer quality diet with a low intake of foods from animal sources (Pelto et al., 1991). Thus, the food resources available in larger households appeared inadequate to accommodate the family needs compared to lesser people in a household.

5.4 Diet quality

This study assessed the diet quality of children with LD to measure how well their diet conforms to dietary recommendations. It reflects sufficient nutrients and food groups' intake, diversified, balanced, and healthy diet, which provides energy and all essential nutrients required by the body to enhance growth and development. Thus, assessing diet quality is more relevant to track overall individual diet and adequate nutrition rather than focusing on a single nutrient or food group.

This study reported that the composite scores of diet quality among respondents assessed using HEI was 48.15± 9.23%, ranging from 19.67% to 72.11%. 40.5% were categorised at risk of poor diet quality, equivalent to 4 out of 10 children with LD. This indicates that compliance toward the dietary guidelines was still considered poor. The diet quality of the current study was higher than a study in Kuala Lumpur (Fara Wahida et al., 2015) while, lower than the studies in Terengganu, Negeri Sembilan, Melaka and Johor among children with TD (Appannah et al., 2020; Shan et al., 2018). However, this study portrayed the diet quality status of children with LD, while the previous studies in Malaysia were all studied among children with TD and adolescents.

Furthermore, a direct comparison could be biased as the inconsistencies observed in the dietary quality scores between these studies due to the differences in the age group of the respondents, study population, study location as well as dietary assessment method.

This study also found that poultry, meat and eggs components had the highest mean score based on recommendation. It was followed by cereals and grains and fish. It was suggested that consuming processed meat such as nuggets and sausages contributed to a higher serving of intake from poultry and meat groups. Legumes had the lowest mean score and followed by vegetables and fruit. A low score of the diet quality components indicated low consumption of legumes, vegetables and fruit. The previous local studies by Shan et al. (2018) among children aged 7 to 12 years reported that the components with low scores were vegetables, fruit and dairy component; while Appannah et al. (2020) reported that sodium, legumes and vegetables had low scores among adolescents aged 13 years, and Fara Wahida et al. (2015) found milk and milk product, fruit and legumes had low scores among adolescents aged 13 to 16 years. The current findings could support the previous findings as legumes, vegetables and fruit were listed as the top three food groups that are consumed least.

Low consumption of legumes could be explained due to lack of availability at home and poor knowledge of its health benefits. The other factors that hindered consumption of legumes were the taste, lack of skills and long-time taken to prepare legumes and family preferences (Figueira et al., 2019); while some people believed that the myths about legume consumption was associated with bloating and flatulence (Maphosa & Jideani, 2017). Legumes provide high protein, fibre with various vitamins and minerals that help to enhance growth and development. A study by Koo et al. (2016) among Malaysian children reported that Indians showed significantly higher

legumes consumption than other ethnicities. They further clarified that Indian cooking style and diet are always known to include legumes sources such as dhal, lentils, beans, and pulses, which were influenced by ethnic preferences, cultural context, or religious practices. Thus, the low consumption of legumes in this study might be due to the majority of the respondents are Malay with only an Indian child.

Meanwhile, the higher cost of fruit and vegetables in Malaysia over the past years could affect parents' purchasing power who came from low household incomes. This study observed that most of them were under the B40 category, known as having a low household income. Low household income could limit their ability to afford expensive food and they may prioritise purchasing essential food such as cereals and grains, poultry, meat and fish. Other possible reasons were availability or accessibility, food preference and attitude toward consumption of fruit and vegetables. Some children dislike the taste of vegetables (Shikeri, 2017) as well as low availability at home (Łuszczki et al., 2019), resulting in a poor composition of fruit and vegetables in the diet.

It was noted that majority of children with LD in this study consumed an adequate serving of milk and dairy products compared to a study by Fara Wahida et al. (2015) among children with TD as they found milk and milk products were the top three components with low dietary scores. This could be explained by the children who attend SEIP or special education classes in government schools are supplied with milk every day on school days. Thus, this initiative would help them meet the daily requirement for milk and dairy products.

5.4.1 Relationship between dietary intake and diet quality with body mass index

Due to the nutrition transition, dietary concern focuses on the adequacy, excess and inadequate nutrition directly affecting nutritional status. This study also assessed the dietary intake of children with LD. Dietary intake that were evaluated were energy intake, carbohydrate, protein and fat and found no correlation with BMI among children with LD. This study observed a higher percentage of children who did not meet and exceed RNI requirements for energy, carbohydrate, protein and fat intake. The inability to achieve the RNI requirement might be explained by a higher number of children who had food selectivity (eat selected types of foods and particular texture) and food refusal and only ate a small amount of food presented in the feeding problem assessment. This could support claims that disabled children exhibited food refusal (Alkazemi et al., 2016; Norazlin et al., 2019) and more selectivity for starchy foods (Cherif et al., 2018). Those who only eat selected foods such as protein and fat sources could lead to a higher intake of that particular macronutrient.

On the other hand, half of the respondents consumed energy more than recommended by RNI, while the prevalence of children who exceeded RNI requirement for the percentage of energy derived from carbohydrate, protein and fat were also relatively high. Despite the higher intake of energy, carbohydrate, protein and fat, and a higher prevalence of overweight and obesity, this study did not observe any significant correlation between these variables. A previous local study among children with TD showed a significant correlation between dietary intake and BWS (Yang et al., 2017) as well as other studies in Asia among disabled children (Sun et al., 2013; Wang et al., 2018). Even though the results of this study could not support the previous findings, to our knowledge, this is the first study that assessed this

correlation among children with LD in Malaysia, which could contribute a new insight for future research.

Besides, this study attempted to examine the relationship between diet quality and BMI among children with LD, yet no significant correlation was found. Although the major role of diet was related to health status, yet, the diet quality did not reflect the BMI of children in this study. It is indicated that underweight or overweight and obese children with LD do not mean having poor diet quality or inadequate nutrients, similar to those with normal BWS. The current finding was consistent with a finding among children with TD in Terengganu as they found no significant association between diet quality score and BMI (Shan et al., 2018). However, several previous paediatric population studies found that good diet quality was related to improved weight status (Bahadoor et al., 2016; El-kassas & Ziade, 2017; Jennings et al., 2011).

These contradicting findings could explain that even though the children have normal or high BMI, the diet quality score in this study only determines adherence to the recommended serving sizes of food groups, fat and sodium intake in the MDG. A person with normal or high BMI could be due to the high-calorie intake, but does not necessarily reflect the balanced and varied diet and macro and micronutrient adequacy were also better (Shan et al., 2018). Furthermore, the lack of correlation between these variables might be affected by other factors such as lifestyle, physical activity level, family, and environmental factors on children's BMI. Besides, this study assessed the diet quality among children with LD and the diet recall was reported by parents in which it could be subjected to dietary misreporting. Despite the lack of significant correlation between diet quality and BMI among this population, it should be noted that prolonged poor diet quality could result in insufficient nutrient intake and seriously affect their long term health status.

5.5 Feeding problems

Feeding problems consisted of six subscales which are chewing problems, rapid eating, food refusal, food selectivity, vomiting, and stealing food. This study found a high number of parents reported that their children frequently had rapid eating, food refusal, and food selectivity during the past six months. Similarly, a previous study by Leader et al. (2020) observed a high rate of feeding problems in which the most common were food selectivity, followed by food refusal and rapid eating. This study further stated that disabled children who experienced feeding problems such as rapid eating, food refusal, food selectivity, vomiting, and food stealing had significant gastrointestinal symptoms than those who did not. Those with gastrointestinal problems were susceptible to constipation, diarrhoea, and abdominal pain, which might lead to unhealthy body weight due to poor nutrient absorption (Eow, Gan, & Awang, 2021).

Meanwhile, a few parents in this study reported that their children had chewing problems, vomiting, and stealing food. This could be explained that most of the respondents were mild ID children who do not usually pose difficulty in chewing or swallowing as their muscle development are normal (Sari & Bahceci, 2012).

5.5.1 Relationship between feeding problem with body mass index

This study hypothesised a correlation between the feeding problems subscales with BMI of children with LD. Yet, no significant correlation was found between any feeding problem subscales and BMI. Despite the higher scores for rapid eating, food refusal and food selectivity during the past six months as well as a higher prevalence of overweight and obesity, this study did not observe any significant relationship

between these variables. It was contradicted with the previous study in Malaysia. They reported that less food refusal and high food selectivity due to limited food variety were the risk factors for high BMI due to caloric imbalance among ASD children (Norazlin et al., 2019). Higher food selectivity could relate to being a picky eater which would cause inadequate macro or micronutrients and influence health status.

The current study was also contrary to the findings that were eating duration and not needing food texture modification were significantly associated with BMI of LD children (Chen et al., 2015). Chen et al. (2015) assessed feeding difficulties by using dichotomous answers, which could limit the respondents' answers. However, the current study focus on the frequency of occurrence of chewing problems, rapid eating, food refusal, food selectivity, vomiting, and stealing food during meal times in the past six months that could give a wide range of answers compared to the other studies that used different instruments. Besides, a previous study by Seiverling et al. (2011) found that rapid eating was significantly associated with higher BMI scores among disabled children in the U.S. It is suggested that rapid eating could cause weight gain, as it happens when children consumed a large portion of food in a short period and continue to eat as long as the food is presented. Yet, the current study found no significant correlation between these variables.

5.6 Parental feeding practice

5.6.1 Relationship between parental feeding practice with body mass index

This study also assessed the relationship between the twelve subscales of parental feeding practice and BMI. This study found a significant negative relationship between encouraged dietary balance and variety, food as reward, pressure, and a positive

relationship between restriction for weight control and BMI among LD children. No significant correlation was found for the other subscales of parental feeding practices, which were monitoring, child control, emotional regulation, environment, involvement, modelling, restriction for health and teaching about nutrition with BMI. Besides, the results of multiple linear regression (MLR) also found that a lower mean score of modelling and pressure subscales and a higher mean score of restriction for weight control predicted higher BMI values of children with LD.

This study found that the lower score for encouraging dietary balance and variety subscale correlated with higher BMI of children with LD. This finding is in agreement with the evidence from a previous study in Korea, as they found that encouraging balance and variety was negatively related to BMI among children with a pervasive developmental disorder (PDD) (Joo et al., 2019). This could be explained by only one out of five parents in this study always encouraging their children to eat healthy foods before unhealthy.

Even though most parents agreed that they told their children that healthy food tastes good, only a number of them encouraged their children to try new foods. Parents who were less likely to encourage their children to eat a balanced and variety diet could increase children's body weight. The other possible reason for some parents who are less likely to encourage dietary balance and variety was low nutritional knowledge. A previous study reported that nutritional knowledge was related with BMI (Joo et al., 2019). Thus, further study is needed in order to investigate the relationship between encouraging dietary balance and variety, nutritional knowledge and BMI.

Interestingly, this study found that the lower score for food as a reward was correlated with higher BMI. Despite the fact that most parents offered favourite foods in exchange for children's good behaviour, most of them did not offer sweet food as a

reward. The possible explanation is that children can still consume unhealthy food such as snacks, sweets, pastries and sugary beverages without being rewarded by their parents. Although our study found a significant correlation, it was unclear how a lower score for food as a reward might influence higher BMI. The current finding was contradicted from previous studies. Some parents prefer to give high-calorie dense food such as chocolate, sweets, sugary drink, and cake to reward children's good behaviour or comfort them (Sari & Bahceci, 2012). Parents with lower education probably had poor nutrition knowledge and understanding of healthy food and did not know which food is suitable for children. Rewarding children with energy-dense foods was a concerning practice as this could contribute to a child's preference for unhealthy food selections, binge eating, limited variety in food choices as well as poor diet quality (Joo et al., 2019; Polfuss et al., 2016).

This study found that a higher score of restriction for weight control by parents was correlated with higher BMI among children with LD. Most of the parents in the current study encouraged their children to eat less, provide tiny portions at meals, refrain from eating at the next meal, and consume just particular foods because they perceive it would make them fat. Parents intentionally limit a child's food intake when they perceive the child as overweight or obese, which agreed with the idea that restrictive parental feeding behaviours were responsive to child weight status (Ek et al., 2016; Freitas et al., 2019; Nowicka et al., 2014; Polfuss et al., 2016).

Parents assume that a high level of restriction of food intake would change a child's eating behaviour. However, the higher restriction for weight control may have a negative effect, as it may cause children to become stressed and eat a lot of food to relieve stress, resulting in a higher BMI (Joo et al., 2019). Stress can promote negative eating behaviour, irregular food intake, eating in the absence of hunger and overeating

when the restricted foods become freely available. Ironically, Tang et al. (2018) highlighted that more significant restrictions on children's diets were linked to long-term weight gain. Thus, restrictive practices might not help promote moderation in consumption but stimulate the children to eat more and impair self-regulation.

Besides, this study found a significant negative correlation between household income and BMI in which most respondents were categorized as B40 or came from lower-income households. This finding could be another possible reason for parental feeding practice to be overly restricted for food intake due to money constraints. A study in Malaysia found that income was related to a parental feeding attitude among children (Nordin et al., 2018). Low-income families will influence the parental feeding practice as they tend to limit their children to eat a certain food, indirectly affecting dietary patterns. However, the current study did not assess the correlation between parental feeding practice and socio-economic factors.

Besides, higher restriction of weight control could explain the results of the pressure subscale, in which lower pressure to eat was correlated with higher BMI. Similarly, previous studies in Malaysia among disabled children also found that they were more likely to be overweight and obese when their parents practice less pressure to eat (Eow et al., 2021; Noor Azimah et al., 2012). The possible reason was that less pressure to eat was applied when parents realized their children were overweight or obese. Parents were aware that their children were gaining weight by looking at their different body sizes; thus, they did not pressurise their children to eat more when they were not hungry or complete their eating. This could suggest that parents in Malaysia are aware that their children have body weight problems and are concerned about their dietary intake. However, it should be noted that previous findings found that parents were more likely to underestimate their children's weight status with higher BMI as

some parents still have difficulty in determining the correct body weight status for children (Francescatto et al., 2014; Warkentin et al., 2018).

Meanwhile, previous studies found that parents with underweight children were more likely to pressure to eat more as they assumed that children with thinner body sizes consumed inadequate food (Warkentin et al., 2018). Eventually, this could lead to a long-term weight loss and a significant nutritional deficiency due to failure to meet appropriate nutritional and energy needs. Parents need to apply proper pressure to eat as inappropriate use of this practice would result in picky eater, food selectivity, dislike toward particular food, poor diet quality as well as negative eating behaviour among children (Ek et al., 2015; Joo et al., 2019; Leiu & Chin, 2019; Polfuss et al., 2016). Parents who are concerned about their children`s body weight could indicate their readiness to change their feeding practice. Although this study did not assess parents' readiness to change, the current findings could provide a baseline for future research.

CHAPTER 6

CONCLUSION

6.1 Conclusion

This study suggests that overweight and obesity was high among children with LD in Kelantan. Almost one-third of them (28.1%) were overweight and obese, while 11.9% were underweight, thin and severely thin. This study also highlighted the findings on feeding problems, dietary intakes, diet quality and parental feeding practice of the study population. This study identified that 4 out of 10 children with LD were at risk of poor diet quality and indicated that their compliance with the dietary guidelines was still considered poor. This study also found that half of the respondents consumed energy more than recommended by RNI, while the prevalence of children who exceeded the RNI requirement for the percentage of energy derived from carbohydrate, protein and fat were also relatively high. Poor diet quality and dietary intake raised important public health implications among this vulnerable group. Besides, a high number of parents reported that their children frequently had rapid eating, food refusal, and food selectivity during the past six months.

6.2 Strength

This study explored the relationship between demographic and socio-economic factors, child factors (feeding problems, dietary intakes, and diet quality) and parental factor (parental feeding practice) with BMI of LD children in Malaysia, which has not been previously reported. The strengths of the study include the opportunity to assess BMI and categorize the body weight status of children with LD from a sample of

children in Kelantan. This study provided a better understanding of BMI and its correlated factors among this vulnerable group.

The findings from this study also contributed important knowledge and new ideas related to diet quality which assessed both nutrients and food groups, unlike other studies, which only determined one single nutrient or food group (Graf-Myles et al., 2013; Joo et al., 2019; Meguid et al., 2015). To our knowledge, there is no published study on diet quality and its relationship with BWS among children with LD in Malaysia. In addition, this study evaluated feeding problems, dietary intakes, and diet quality and parental feeding practice by a continuous measure; instead of a dichotomous measure as it is preferable to minimize the probability of loss of information. Thus, it could provide a better understanding of these factors.

6.3 Limitation

There are several limitations noted in this study. Firstly, this study used a cross-sectional study design which was conducted at a single point in time. It only can examine the correlation between variables and could not establish a causal relationship between demographic and socio-economic factors, child factors (birth weight, gestational age at delivery, feeding problems, dietary intakes, and diet quality) and parental factor (parental feeding practice) with BMI of children LD.

Secondly, this study used a self-reported questionnaire to gather the information in which it has a high risk of being under- or over-reported. For example, the Semi-quantitative Food Frequency Questionnaire was used to estimate the dietary intake of children with LD. Parents may under- or overestimate their children's dietary intake as it relied on their memory to recall consumptions for the past month and was

not based on proper dietary intake. Besides, they could also be misreporting the portion size of foods as some had difficulties estimating their children's food intake.

Besides, the differences in findings of diet quality may be due to different definition, measurement and classification because there was limited standardised diet quality indices used in previous studies. The Malaysian Healthy Eating Index used to measure diet quality did not evaluate the excess energy, carbohydrate, and protein intake levels. In addition, the use of FFQ to measure diet quality could be questionable as M-HEI components only capture the adequacy of each food group, yet excess macronutrient intake was not adequately evaluated except for a total fat component. However, the use of FFQ is still reliable and valid because it can represent the usual dietary intake and assessed a specific food group. Nevertheless, to the best of our knowledge, this was the first study that attempted to assess diet quality using the M-HEI among children with LD in Malaysia, and this study also determined its relationship with BMI.

On the other hand, the instruments used to determine parental feeding practices were not yet validated among children with LD, even though it has been validated and commonly used in local studies on children with typical development, especially in Malaysia. Likewise, the instruments used to determine feeding problems which is STEP-CHILD, had been tested among children with disabilities. However, it does not show any significant results in the current study. It was believed to be influenced by a lack of standardised assessment to measure the feeding problems among children with LD. Therefore, future studies on children with LD should explore the validity and reliability of LD- specific questionnaires on feeding problems and parental feeding practices, as both questionnaires have not been validated in Malaysia.

In addition, the other limitation of this study was that the results could not be generalized to the rest of the Malaysian children with LD because this study only involved respondents in Kelantan that might have different demographic and socio-economic characteristics than other states. Lastly, it is important to note that several potential risk factors such as medication use, physical activity, sleep quality and maternal BMI could be associated with unhealthy weight status as these variables were not investigated in this study.

6.4 Recommendation

The current study found that older age, higher childbirth weight, negative modelling, lower pressure and higher restriction for weight control contributed to a higher BMI among children with LD. Given the possible long-term adverse health effects of being overweight and obese, it is crucial to ensure efforts to promote healthy body weight among children with LD. These findings highlighted the need to address obesity in children with LD as they may exhibit physiological and behavioural differences from children with typical development. It is recommended for future studies to produce reference growth charts for Malaysian disabled children as their growth pattern might be different from normal growth in a healthy population. Besides, future studies should investigate several potential risk factors such as physical activity, sleep quality and maternal factors and its association with BMI because these variables documented a significant relationship among children with TD.

This study points to the need for parents to practice a positive parental feeding practice, with the aim to ensure the healthy body weight of the children. The current findings suggested that early detection of nutrition issues in children with LD and

regular positive feeding practice by parents during mealtime is essential in order to address the problems that arise during meals. Parents play a significant role to engage in the diets and feeding of children. Therefore, future interventions may consider incorporating parents in promoting healthy eating behaviours among children with LD. Establishing nutrition and health-related intervention programmes with the parent's involvement may help to prevent the further rise of overweight and obesity in LD children.

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APPENDICES

Appendix A List of schools with SEIP in Kota Bharu, Tanah Merah and Kuala Krai

No	District	Location	School
1.	Kota Bharu	Luar Bandar	Sekolah Kebangsaan Che Latiff
2.	Kota Bharu	Bandar	Sekolah Kebangsaan Kampung Sireh
3.	Kota Bharu	Bandar	Sekolah Kebangsaan Kubang Kerian (1)
4.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Kok Lanas
5.	Kota Bharu	Bandar	Sekolah Kebangsaan Padang Garong 2
6.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Raja Abdullah
7.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Padang Kala
8.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Pasir Hor
9.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Pauh Lima
10.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Datu' Hashim
11.	Kota Bharu	Bandar	Sekolah Kebangsaan Ismail Petra (2)
12.	Kota Bharu	Bandar	Sekolah Kebangsaan Kubang Kerian 3
13.	Kota Bharu	Bandar	Sekolah Kebangsaan Tanjong Mas
14.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Demit (2)
15.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Seri Ketereh
16.	Kota Bharu	Luar bandar	Sekolah Kebangsaan Seri Kota
17.	Kota Bharu	Bandar	Sekolah Kebangsaan Tengku Indera Petra
18.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Batu Mengkebang
19.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Lata Rek
20.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Manek Urai Baru
21.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Chenulang
22.	Kuala Krai	Bandar	Sekolah Kebangsaan Kuala Krai
23.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Pahi
24.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Pasir Gajah
25.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Telkong
26.	Kuala Krai	Luar bandar	Sekolah Kebangsaan Sungai Embak
27.	Kuala Krai	Bandar	Sekolah Kebangsaan Sultan Yahya Petra (1)
28.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Batang Merbau
29.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Belimbing
30.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Bendang Nyior
31.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Bukit Panau
32.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Gual Jedok
33.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Ipoh
34.	Tanah Merah	Bandar	Sekolah Kebangsaan Tanah Merah (1)
35.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Ulu Kusial
36.	Tanah Merah	Luar bandar	Sekolah Kebangsaan Kemahang 2
37.	Tanah Merah	Bandar	Sekolah Kebangsaan Tanah Merah (2)

Appendix B Questionnaire

PROGRAM PEMAKANAN DAN DIETETIK

PUSAT PENGAJIAN SAINS KESIHATAN

UNIVERSITI SAINS MALAYSIA

BORANG SOAL SELIDIK

"SULIT"

TAJUK KAJIAN:

KUALITI DIET DAN FAKTOR YANG BERKAITAN DENGAN STATUS BERAT BADAN DALAM KALANGAN KANAK-KANAK YANG MEMPUNYAI MASALAH PEMBELAJARAN DI KELANTAN

Penyelidik :

Tarikh :

Arahan: Soalan dalam Borang Soal Selidik ini hanya untuk tujuan akademik sahaja. Semua maklumat yang dikumpul adalah dijamin sulit. Sila hantar kertas soalan ini selepas anda menjawab semua bahagian. Penglibatan dan kerjasama anda amat dihargai.

BAHAGIAN A: LATAR BELAKANG RESPONDEN

Arahan: Sila isi tempat kosong atau tandakan (√) pada ruangan yang disediakan di bawah.

No.	Maklumat	Pilihan
1.	**Jenis kurang upaya**	[ ] Autisme [ ] Hiperaktif (ADHD) [ ] Sindrom Down [ ] Kurang upaya intelektual [ ] Masalah pembelajaran spesifik (Disleksia) [ ] Lain-lain, nyatakan: ……
2.	**Tarikh lahir (anak)**	___ /___ / ____
3.	**Jantina (anak)**	[ ] Lelaki [ ] Perempuan
4.	**Etnik (anak)**	[ ] Melayu [ ] Cina [ ] India [ ] Lain-lain: ……
5.	**Tahap pendidikan tertinggi bapa**	[ ] PhD / Master / Bacelor [ ] STPM / Diploma / A-Level [ ] Sekolah Menengah (PMR/SPM/O-Level) [ ] Sekolah Rendah (UPSR) [ ] Tiada pendidikan formal
6.	**Tahap pendidikan tertinggi ibu**	[ ] PhD / Master / Bacelor [ ] STPM / Diploma / A-Level [ ] Sekolah Menengah (PMR/SPM/O-Level) [ ] Sekolah Rendah (UPSR) [ ] Tiada pendidikan formal
7.	**Pendapatan bulanan bapa**	RM ……
8.	**Pendapatan bulanan ibu**	RM ……
9.	**Bilangan isi rumah**	…….. orang
10.	**Berat anak semasa lahir**	……..kg
11.	**Usia kehamilan semasa melahirkan anak**	…….. minggu
12.	**Adakah anak anda mempunyai masalah kesihatan lain?**	[ ] Ya Jika Ya, nyatakan: …… [ ] Tidak

Bahagian B (MENGENAI IBUBAPA)

Sila jawab soalan yang berikut secara jujur yang mungkin merujuk kepada anak ini.

No	Soalan 1 hingga 12: Bulatkan satu nombor sebagai jawapan anda	Tidak pernah	Jarang	Kadang-kala	Selalu	Sentiasa
1.	Berapa kerapkah anda memantau makanan manis (gula-gula, aiskrim, kek, kuih-muih) yang dimakan oleh anak anda?	1	2	3	4	5
2.	Berapa kerapkah anda memantau snek (kerepek kentang, keropok leko, *Twisties, Mamee*) yang dimakan oleh anak anda?	1	2	3	4	5
3.	Berapa kerapkah anda memantau makanan berlemak tinggi yang dimakan oleh anak anda?	1	2	3	4	5
4.	Berapa kerapkah anda memantau minuman manis (minuman bergas, sirap, *milk shake*) yang diminum oleh anak anda?	1	2	3	4	5
5.	Adakah anda membenarkan anak anda makan apa-apa sahaja yang diinginginya?	1	2	3	4	5
6.	Semasa makan malam, adakah anda membenarkan anak anda ini memilih makanan yang diinginginya selain makanan yang disediakan?	1	2	3	4	5
7.	Apabila anak anda menunjukkan kerenah, adakah pemberian makanan/minuman perkara pertama yang anda lakukan?	1	2	3	4	5
8.	Adakah anda memberi anak anda makanan/minuman apabila dia berasa bosan walaupun anda berasa bahawa dia tidak lapar?	1	2	3	4	5
9.	Adakah anda memberi anak anda makanan/minuman apabila dia berasa susah hati walaupun anda berasa bahawa dia tidak lapar?	1	2	3	4	5
10.	Kalau anak anda tidak suka akan makanan yang disediakan, adakah anda membuat makanan yang lain?	1	2	3	4	5
11.	Adakah anda membenar anak anda makan snek apabila dia menginginginya?	1	2	3	4	5
12.	Adakah anda menggalakkan anak anda makan makanan berkhasiat	1	2	3	4	5

	sebelum makan makanan yang tidak berkhasiat?					
No	**Soalan 13 hingga 39: Bulatkan satu nombor sebagai jawapan anda.**	**Tidak setuju**	**Sedikit tidak setuju**	**Neutral**	**Sedikit setuju**	**Setuju**
13.	Kebanyakan makanan yang saya sediakan di rumah berkhasiat.	1	2	3	4	5
14.	Saya melibatkan anak saya dalam perancangan makanan keluarga.	1	2	3	4	5
15.	Saya memberi anak saya makanan kegemarannya sebagai ganjaran tingkah laku yang baik.	1	2	3	4	5
16.	Saya mengizinkan anak saya untuk menolong penyediaan makanan di rumah.	1	2	3	4	5
17.	Jika saya tidak memimpin atau mengaturkan pemakanan anak saya, dia akan makan makanan kegemarannya secara berlebihan.	1	2	3	4	5
18.	Pelbagai makanan yang berkhasiat senang diperoleh oleh anak saya pada setiap hidangan di rumah.	1	2	3	4	5
19.	Saya memberikan makanan manis (gula-gula, aiskrim, kek, kuih -muih) kepada anak saya sebagai ganjaran berkelakuan baik	1	2	3	4	5
20.	Saya menggalakkan anak saya mencuba makanan yang baharu.	1	2	3	4	5
21.	Saya berbincang dengan anak saya tentang kepentingan memakan makanan yang berkhasiat.	1	2	3	4	5
22.	Saya memberitahu anak saya bahawa makanan yang berkhasiat berasa sedap	1	2	3	4	5
23.	Saya menggalakkan anak saya supaya mengurangkan makanan supaya dia tidak menjadi gemuk	1	2	3	4	5
24.	Jika saya tidak memimpin atau mengaturkan pemakanan anak saya, dia akan makan makanan ringan secara berlebihan.	1	2	3	4	5
25.	Saya memberi anak saya sedikit makanan semasa makan untuk mengawal berat badannya.	1	2	3	4	5
26.	Jika anak saya berkata: “Saya tidak lapar,” saya tetap juga menyuruhnya makan.	1	2	3	4	5

No	Soalan 13 hingga 39: Bulatkan satu nombor sebagai jawapan anda.	Tidak setuju	Sedikit tidak setuju	Neutral	Sedikit setuju	Setuju
27.	Saya berbincang dengan anak saya tentang nilai nutrisi makanan.	1	2	3	4	5
28.	Saya menggalakkan anak saya turut serta dalam pembelian bahan makanan.	1	2	3	4	5
29.	Jika anak saya makan berlebihan dalam satu hidangan makanan, saya cuba menghadkan pemakanannya pada hidangan makanan yang berikutnya	1	2	3	4	5
30.	Saya menghadkan makanan anak saya jika makanan itu mungkin menjadikannya gemuk.	1	2	3	4	5
31.	Terdapat makanan tertentu yang tidak sepatutnya dimakan oleh anak saya kerana makanan itu akan menjadikannya gemuk.	1	2	3	4	5
32.	Jika anak saya makan sedikit makanan sahaja, saya menyuruhnya supaya makan lebih banyak.	1	2	3	4	5
33.	Saya tidak mengizinkan anak saya makan antara waktu makan utama kerana saya tidak mahu dia menjadi gemuk.	1	2	3	4	5
34.	Saya menjadi model pemakanan yang sihat kepada anak saya dengan sendiri makan makanan yang berkhasiat.	1	2	3	4	5
35.	Saya selalu menyuruh anak saya berdiet untuk mengawal berat badannya	1	2	3	4	5
36.	Saya cuba makan makanan yang berkhasiat di depan anak saya walaupun makanan tersebut bukan makanan kegemaran saya.	1	2	3	4	5
37.	Saya cuba menunjukkan minat dalam pemakanan yang berkhasiat	1	2	3	4	5
38.	Saya cuba menunjukkan betapa saya menikmati makanan yang berkhasiat	1	2	3	4	5
39.	Apabila anak saya sudah selesai makan, saya cuba menyuruhnya supaya makan lebih banyak sama ada satu suapan, dua atau seterusnya	1	2	3	4	5

BAHAGIAN C (MENGENAI ANAK ANDA)

Arahan: Sila isi tempat kosong atau tandakan (√) pada ruangan yang disediakan di bawah.

No	**Fikirkan tentang waktu makan dengan anak anda selama 6 bulan yang lalu.** **Sila tandakan kekerapan yang sesuai untuk menilai seberapa kerap tingkah laku berikut berlaku** **Tingkah laku anak-anak anda semasa waktu makan:**	**Kekerapan**		
		Tidak pernah berlaku	**Berlaku antara *1 ke 10 kali* dalam sebulan**	**Berlaku *lebih dari 10 kali* dalam sebulan**
1.	Tidak boleh makan secara sendiri	0	1	2
2.	Masalah tingkah laku meningkat semasa makan	0	1	2
3.	Tidak menunjukkan kebolehan untuk mengunyah	0	1	2
4.	Hanya makan makanan tertentu sahaja	0	1	2
5.	Mencuri atau cuba mencuri makanan semasa waktu makan	0	1	2
6.	Hanya makan sedikit makanan yang dihidangkan	0	1	2
7.	Akan terus makan selagi makanan dihidangkan	0	1	2
8.	Mencuri atau cuba mencuri makanan di luar waktu makan	0	1	2
9.	Makan dengan kuantiti yang banyak dalam masa yang singkat	0	1	2
10.	Menelan makanan tanpa mengunyah secukupnya	0	1	2
11.	Jeluak atau menelan semula makanan	0	1	2
12.	Menolak makanan atau cuba untuk meninggalkan kawasan makan	0	1	2
13.	Hanya makan makanan pada suhu tertentu	0	1	2
14.	Muntah semasa atau selepas makan	0	1	2
15.	Hanya makan makanan tekstur tertentu	0	1	2

Gambar di bawah adalah alat pengukuran rumah tangga. Rujuk gambar ini untuk mengambarkan <u>saiz sajian bagi kuantiti setiap kali anak anda makan</u> makanan di Bahagian D.


Sudu teh


Sudu makan


Senduk


Cawan


Gelas

CONTOH MENJAWAB bahagian d

*Sila tandakan **/** pada ruang pilihan **kekerapan pengambilan** untuk menunjukkan kekerapan **(berapa kali) anak anda** mengambil makanan yang dinyatakan dalam **satu bulan yang lepas**. Sila isikan **kuantiti makanan** yang biasa diambil untuk setiap kali makan.*

KOD	JENIS MAKANAN (A) BIJIRIN & PRODUK BIJIRIN	KEKERAPAN PENGAMBILAN: Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari	SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
A1	Nasi putih						/			senduk	1	
A2	Bubur nasi		/							mangkuk cina (sederhana)	$\frac{1}{2}$	
A3	Nasi goreng		/							pinggan	1	
A4	Nasi lemak	/								bungkus		
A5	Nasi ayam		/							pinggan	$\frac{1}{2}$	

BAHAGIAN D (MENGENAI ANAK ANDA)

*Sila tandakan **/** pada ruang pilihan **kekerapan pengambilan** untuk menunjukkan kekerapan **(berapa kali)** anak anda mengambil makanan yang dinyatakan dalam **satu bulan yang lepas**. Sila isikan **kuantiti makanan** yang biasa diambil untuk setiap kali makan.*

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(A) BIJIRIN & PRODUK BIJIRIN	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
A1	Nasi putih									senduk		
A2	Bubur nasi									mangkuk cina (sederhana)		
A3	Nasi goreng									pinggan		
A4	Nasi lemak									bungkus		
A5	Nasi ayam / nasi *char siew*									pinggan		
A6	Nasi minyak / nasi dagang									pinggan		
A7	Mee / beehoon / kuey teow goreng									pinggan		
A8	Mee / beehoon / kuey teow sup									mangkuk cina (sederhana)		
A9	Mee bandung / wanton mee									pinggan		
A10	Laksa / kari									mangkuk cina (sederhana)		

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(A) BIJIRIN & PRODUK BIJIRIN	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
A11	Spageti / pasta / lasagna									pinggan		
A12	Mee segera									bungkus		
A13	Roti putih / bijirin penuh									keping		
A14	Ban manis / berkrim / berinti									biji		
A15	Sandwich									keping		
A16	Roti canai / roti telur									keping		
A17	Capati / tosai									keping		
A18	Bijirin sarapan *(cth: Koko Krunch ®)*									cawan		
A19	Bijirin minuman *(cth: Nestum ®)*									sudu makan		
	Lain-lain, nyatakan:											
KOD	**(B) DAGING & PRODUK DAGING**	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari	**SAIZ SAJIAN**	**KUANTITI SAJIAN**	**CARA MASAKAN**
B20	Ayam goreng *(termasuk fast food)*									ketul		
B21	Ayam masak kicap									ketul		
B22	Ayam masak merah / sambal									ketul		
B23	Ayam kari / kurma									ketul		
B24	Ayam kukus / sup									ketul		
B25	Daging lembu									ketul		
B26	Daging kambing									ketul		
B27	Burger									biji		

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(B) DAGING & PRODUK DAGING	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
B28	Sosej / frankfurter									batang		
B29	Nugget									ketul		
B30	Daging khinzir									ketul		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(C) IKAN & MAKANAN LAUT	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
C31	Ikan goreng									ekor		
C32	Ikan masak kicap									ekor		
C33	Ikan kukus									ekor		
C34	Ikan kari / sambal / berlada									ekor		
C35	Ikan dalam tin *(termasuk sardin, tuna, makerel*)									sudu makan		
C36	Bebola ikan									biji		
C37	Ikan bilis (goreng / sambal)									sudu makan		
C38	Udang									ekor		
C39	Sotong									ekor		
C40	Kekerang									sudu makan		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(D) TELUR	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
D41	Telur mata kerbau / telur goreng / *omelet*									biji		
D42	Telur rebus									biji		
D43	Telur asin									biji		
	Lain-lain, nyatakan:											
KOD	**(E) KEKACANG & PRODUK KEKACANG**	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari	**SAIZ SAJIAN**	**KUANTITI SAJIAN**	**CARA MASAKAN**
E44	Dal kekacang									sudu makan		
E45	Kekacang									sudu makan		
E46	Tauhu / *tau kua*									keping		
E47	Tempe									keping		
E48	Susu kacang soya									gelas		
	Lain-lain, nyatakan:											
KOD	**(F) SUSU & PRODUK TENUSU**	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari	**SAIZ SAJIAN**	**KUANTITI SAJIAN**	**CARA MASAKAN**
F49	Susu tepung									sudu makan		
F50	Susu segar / UHT									gelas		
F51	Susu pekat manis									sudu makan		
F52	Susu kultur *(cth: Vitagen ® , Yakult ®)*									botol		
F53	Yogurt / dadih									cawan		
F54	Yogurt minuman									gelas		

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(F) SUSU & PRODUK TENUSU	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
F55	Keju									keping		
F56	Aiskrim bersusu									batang		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(G) SAYUR-SAYURAN	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
G57	Sayur berdaun hijau *(cth: sawi, bayam, kangkung)*									sudu makan		
G58	Sayur kacang *(cth: kacang panjang, bendi, taugeh)*									sudu makan		
G59	Sayur berubi *(cth: ubi kentang, keledek, labu)*									sudu makan		
G60	Sayur kobis *(cth: kobis, brokoli, kobis bunga)*									sudu makan		
G61	Lobak / timun / tomato									sudu makan		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(H) BUAH-BUAHAN	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
H62	Epal									biji		
H63	Oren									biji		
H64	Pisang									biji		
H65	Tembikai									potong		
H66	Betik									potong		
H67	Anggur									biji		
H68	Buah lai									biji		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN	CARA MASAKAN
	(I) KONFEKSI	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari		(Setiap kali makan)	
I69	Kuih-muih *(cth: kuih lapis, kuih talam)*									keping		
I70	Karipap									keping		
I71	Pisang goreng / cekodok									keping		
I72	Cucur udang									keping		
I73	Vadai									keping		
I74	Bar coklat									keping		
I75	Keropok / kerepek (*cth: Rota ® , Mamee ®*)									bungkus (kecil)		
I76	Keropok lekor									keping		

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(I) KONFEKSI	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
I77	Biskut berkrim									keping		
I78	Biskut tawar *(cth: marie, krim kraker)*									keping		
I79	Kek / mufin / *swiss roll*									keping		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(J) MINUMAN	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
J80	Teh / kopi									cawan		
J81	Sirap / jus kordial *(cth: Ribena ® , Sunquick ®)*									gelas		
J82	Minuman bermalt (*cth: Milo ® , Horlick ®*)									sudu makan		
J83	Jus buah-buahan segar									gelas		
J84	Minuman bergas / berkarbonat									tin		
J85	Air kosong									gelas		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(K) SAPUAN ROTI	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
K86	Mentega / marjerin									sudu teh		
K87	Mentega kacang									sudu teh		
K88	Jem									sudu teh		
K89	Kaya									sudu teh		
	Lain-lain, nyatakan:											

KOD	JENIS MAKANAN	KEKERAPAN PENGAMBILAN								SAIZ SAJIAN	KUANTITI SAJIAN (Setiap kali makan)	CARA MASAKAN
	(L) PERENCAH / PERASA	Tidak pernah	1 - 3 kali sebulan	1 kali seminggu	2 - 4 kali seminggu	5 - 6 kali seminggu	1 kali sehari	2 - 3 kali sehari	> 4 kali sehari			
L90	Kuah kari									sudu makan		
L91	Sambal belacan									sudu makan		
L92	Gula									sudu teh		
L93	Kicap cair / pekat									sudu makan		
L94	Sos tomato / cili									sudu makan		
	Lain-lain, nyatakan:											

BAHAGIAN G

Bahagian ini akan diisi oleh penyelidik.

Ukuran	**Bacaan 1**	**Bacaan 2**	**Purata**
Berat (kg)			
Tinggi (cm)			

Appendix C Consent form

JAWATANKUASA ETIKA PENYELIDIKAN (MANUSIA) – JEPeM USM
UNIVERSITI SAINS MALAYSIA

(PROJEK PENYELIDIKAN)

MAKLUMAT KAJIAN

Tajuk Kajian: **Kualiti diet dan faktor yang berkaitan dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran di Kelantan**

Nama Penyelidik dan penyelidik bersama [sila sertakan no. Pendaftaran badan profesional (contoh MMC) sekiranya berkaitan : Siti Fathiah Binti Mohamed, Dr. Soo Kah Leng, Dr. Divya Vanoh

PENGENALAN

Anda dan anak anda adalah dipelawa untuk menyertai satu kajian penyelidikan secara sukarela. Kajian ini adalah berkaitan dengan kualiti diet dan faktor yang berkaitan dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran di sekolah rendah di Kelantan.

Adalah penting bagi anda membaca dan memahami maklumat kajian sebelum anda bersetuju untuk menyertai kajian penyelidikan ini. Sekiranya anda menyertai kajian ini, anda akan menerima satu salinan borang ini untuk simpanan anda. Penyertaan anda di dalam kajian ini dijangka mengambil masa 40 minit untuk menjawab soalan kaji selidik. Seramai 248 orang dijangka akan menyertai kajian ini.

TUJUAN KAJIAN

Kajian ini bertujuan untuk mengkaji hubungan di antara faktor demografi dan sosio-demografi, faktor anak (berat anak ketika lahir, masalah anak ketika makan, pengambilan diet dan kualiti diet) dan faktor ibubapa/penjaga (amalan pemakanan ibubapa) dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran.

KELAYAKAN PENYERTAAN
Salah seorang kakitangan kajian akan membincangkan kelayakan untuk menyertai kajian ini. Adalah penting anda berterus terang dengan kakitangan tersebut termasuk sejarah kesihatan anda dan anak anda.

Kajian ini akan melibatkan individu yang:

- Berumur 7 hingga 12 tahun yang menghadiri Program Pendidikan Khas Integrasi di sekolah rendah
- Tanpa mengira punca masalah pembelajaran
- Dapat berdiri tegak dan tidak memerlukan bantuan semasa pengukuran antropometri
- Sukarela untuk mengambil bahagian, memberi kerjasama dan dapat mengikut arahan
- Ibubapa/penjaga yang sukarela mengambilan bahagian untuk menjawab soalan

Kajian ini tidak akan melibatkan individu yang:

- Tidak mahu menyertai kajian ini
- Mengikuti diet/pemakanan khas atas sebab-sebab perubatan
- Mengalami edema atau kecacatan fizikal anggota badan dan tulang belakang yang menyebabkan kesukaran dalam ukuran antropometri.

PROSEDUR-PROSEDUR KAJIAN

Penyelidik akan mendapat kebenaran daripada guru besar sekolah dan memaklumkan mengenai tarikh pengumpulan data. Penyelidik akan meminta bantuan daripada guru kelas untuk menghubungi ibu bapa / penjaga untuk menghadiri sesi pengumpulan data. Semasa pengumpulan data, penyelidik akan menerangkan objektif kajian dan borang maklumat dan keizinan akan diberikan kepada ibubapa/penjaga. Persetujuan bertulis akan diperoleh dari ibubapa/penjaga sebelum borang soal selidik diedarkan. Borang soal selidik mengandungi Bahagian A hingga Bahagian E. Bahagian A hingga Bahagian D iaitu mengenai latar belakang demografi dan sosioekonomi, amalan pemakanan ibubapa, masalah anak ketika makan dan pengambilan diet anak perlu diisi oleh ibubapa/penjaga. Penyelidik akan menerangkan secara terperinci bagi setiap bahagian soal selidik dan membimbing mereka untuk menjawab. Ia mengambil masa kira-kira 30 ke 40 minit untuk mengisi borang soal selidik dan akan dijalankan di kantin sekolah selepas ibubapa mengambil anak-anak pulang sekolah. Bagi ibubapa yang tidak boleh membaca tetapi berminat untuk menyertai, mereka akan ditemubual oleh penyelidik. Manakala, Bahagian E akan diisi oleh penyelidik dan penyelidik akan mengukur ketinggian dan berat badan anak. Ketinggian badan akan diukur dengan menggunakan *SECA Body Meter*, manakala berat badan akan diukur dengan menggunakan *TANITA Digital Weight Scale*. Pengukuran akan dilakukan pada kanak-kanak yang berpakaian ringan dan tanpa kasut. Setiap peserta akan menerima insentif untuk penyertaannya. Tidak ada prasyarat atau ujian IQ yang dilakukan sebelum pengumpulan data.

RISIKO

Kajian ini mempunyai risiko yang minima di mana ia hanya melibatkan pengukuran berat dan tinggi anak serta pengisian borang soal selidik oleh ibubapa/penjaga. Selain itu, anak anda mungkin akan berasa terganggu, letih, tidak selesa dan terbeban emosi sewaktu sesi pengumpulan data dijalankan.

Sila maklumkan kepada kakitangan kajian sekiranya anda menghadapi sebarang masalah atau mempunyai sebarang maklumat penting yang mungkin mengubah persetujuan anda untuk terus menyertai kajian ini.

PENYERTAAN DALAM KAJIAN

Penyertaan anda dalam kajian ini adalah secara sukarela. Anda berhak menolak untuk menyertai kajian ini atau menamatkan penyertaan anda pada bila-bila masa, tanpa sebarang kehilangan manfaat yang sepatutnya anda perolehi.

Penyertaan anda juga mungkin boleh diberhentikan oleh kakitangan kajian ini tanpa persetujuan anda sekiranya anda didapati tidak sesuai untuk meneruskan kajian ini berdasarkan protokol kajian. Kakitangan kajian akan memaklumkan anda sekiranya anda perlu diberhentikan dari menyertai kajian ini.

MANFAAT YANG MUNGKIN [Manfaat terhadap Individu, Masyarakat, Universiti]

Prosedur kajian ini akan diberikan kepada anda tanpa kos. Anda boleh menerima maklumat tentang berat, tinggi dan status pemakanan anak.

Hasil kajian ini diharapkan dapat memberi manfaat kepada masyarakat umum untuk mengetahui tentang hubungan di antara faktor demografi dan sosio-demografi, faktor anak (berat anak ketika lahir, masalah anak ketika makan, pengambilan diet dan kualiti diet) dan faktor ibubapa/penjaga (amalan pemakanan) dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran di sekolah rendah di Kelatan. Selain itu, maklumat yang diperolehi akan digunakan oleh pihak terlibat untuk menyediakan program promosi kesihatan yang efektif bagi menangani masalah kesihatan dan pemakanan anak-anak.

PERSOALAN

Sekiranya anda mempunyai sebarang soalan mengenai prosedur kajian ini atau hak-hak anda, sila hubungi;

Siti Fathiah Binti Mohamed
Program Pemakanan dan Dietetik
Pusat Pengajian Sains Kesihatan
Universiti Sains Malaysia.
16150 Kubang Kerian, Kelantan

Dr. Soo Kah Leng
Program Pemakanan dan Dietetik
Pusat Pengajian Sains Kesihatan
Universiti Sains Malaysia.
16150 Kubang Kerian, Kelantan

Sekiranya anda mempunyai sebarang soalan berkaitan kelulusan Etika atau sebarang pertanyaan dan masalah berkaitan kajian ini, sila hubungi;

En. Mohd Bazlan Hafidz Mukrim
Setiausaha Jawatankuasa Etika Penyelidikan (Manusia) USM
Bahagian Penyelidikan dan Inovasi (P&I)
USM Kampus Kesihatan.

ATAU

Cik Nor Amira Khurshid Ahmed
Sekretariat Jawatankuasa Etika Penyelidikan (Manusia) USM
Pejabat Pengurusan dan Kreativiti Penyelidikan (RCMO)
USM Kampus Induk, Pulau Pinang.

KERAHSIAAN

Maklumat yang anda berikan akan dirahsiakan oleh kakitangan kajian. Ianya tidak akan dedahkan secara umum melainkan jika ia dikehendaki oleh undang-undang.

Data yang diperolehi dari kajian ini tidak akan mengenalpasti anda secara perseorangan. Hasil kajian mungkin akan diterbitkan untuk tujuan perkongsian ilmu.

Semua borang kajian dan data yang anda berikan termasuk rekod perubatan anda [JIKA BERKAITAN] yang asal mungkin akan disemak oleh pihak penyelidik, Lembaga Etika kajian ini dan pihak berkuasa regulatori bagi tujuan mengesahkan prosedur dan/atau data kajian klinikal. Maklumat anda akan disimpan dalam komputer dan hanya kakitangan kajian yang dibolehkan sahaja dibenarkan untuk mendapatkan dan memproses data tersebut.

Dengan menandatangani borang persetujuan ini, anda membenarkan penelitian rekod, penyimpanan maklumat dan pemprosesan data seperti yang dihuraikan di atas.

TANDATANGAN

Untuk dimasukkan ke dalam kajian ini, anda atau wakil sah anda mesti menandatangani serta mencatatkan tarikh halaman tandatangan bagi **LAMPIRAN S** dan **LAMPIRAN P**.

LAMPIRAN S

Borang Keizinan Peserta
(Halaman Tandatangan)

Tajuk Kajian: ***Kualiti diet dan faktor yang berkaitan dengan dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran di Kelantan***

Nama Penyelidik: ***Siti Fathiah Binti Mohamed***

Untuk menyertai kajian ini, anda atau wakil sah anda mesti menandatangani mukasurat ini. Dengan menandatangani mukasurat ini, saya mengesahkan yang berikut:

- Saya telah membaca semua maklumat dalam Borang Maklumat dan Keizinan Pesakit ini **termasuk apa-apa maklumat berkaitan risiko yang ada dalam kajian** dan saya telah pun diberi masa yang mencukupi untuk mempertimbangkan maklumat tersebut.
- Semua soalan-soalan saya telah dijawab dengan memuaskan.
- Saya, secara sukarela, bersetuju menyertai kajian penyelidikan ini, mematuhi segala prosedur kajian dan memberi maklumat yang diperlukan kepada doktor, para jururawat dan juga kakitangan lain yang berkaitan apabila diminta.
- Saya boleh menamatkan penyertaan saya dalam kajian ini pada bila-bila masa.
- Saya telah pun menerima satu salinan Borang Maklumat dan Keizinan Peserta untuk simpanan peribadi saya.

_____

Nama Peserta

_____

No. Kad Pengenalan Peserta

_____ _____

Tandatangan Peserta atau Wakil Sah **Tarikh** (dd/MM/yy)
(Masa jika perlu)

_____ _____

Nama & Tandatangan Individu yang Mengendalikan Perbincangan Keizinan **Tarikh** (dd/MM/yy)

_____ _____

Nama Saksi dan Tandatangan **Tarikh** (dd/MM/yy)

Nota: i) Semua peserta yang mengambil bahagian dalam projek penyelidikan ini tidak dilindungi insuran.

LAMPIRAN P

Borang Keizinan bagi Penerbitan Bahan yang berkaitan dengan Peserta Kajian
(Halaman Tandatangan)

Tajuk Kajian: ***Kualiti diet dan faktor yang berkaitan dengan status berat badan dalam kalangan kanak-kanak yang mempunyai masalah pembelajaran di Kelantan***

Nama Penyelidik: ***Siti Fathiah Binti Mohamed***

Untuk menyertai kajian ini, anda atau wakil sah anda mesti menandatangani mukasurat ini.

Dengan menandatangani mukasurat ini, saya memahami yang berikut:

- Bahan yang akan diterbitkan tanpa dilampirkan dengan nama saya dan setiap percubaan yang akan dibuat untuk memastikan ketanpanamaan saya. Saya memahami, walaubagaimanapun, ketanpanamaan yang sempurna tidak dapat dijamin. Kemungkinan sesiapa yang menjaga saya di hospital atau saudara dapat mengenali saya.
- Bahan yang akan diterbitkan dalam penerbitan mingguan/bulanan/dwibulanan/suku tahunan/dwi tahunan merupakan satu penyebaran yang luas dan tersebar ke seluruh dunia. Kebanyakan penerbitan ini akan tersebar kepada doktor-doktor dan juga bukan doktor termasuk ahli sains dan ahli jurnal.
- Bahan tersebut juga akan dilampirkan pada laman web jurnal di seluruh dunia. Sesetengah laman web ini bebas dikunjungi oleh semua orang.
- Bahan tersebut juga akan digunakan sebagai penerbitan tempatan dan disampaikan oleh ramai doktor dan ahli sains di seluruh dunia.
- Bahan tersebut juga akan digunakan sebagai penerbitan buku oleh penerbit jurnal.
- Bahan tersebut tidak akan digunakan untuk pengiklanan ataupun bahan untuk membungkus.

Saya juga memberi keizinan bahawa bahan tersebut boleh digunakan sebagai penerbitan lain yang diminta oleh penerbit dengan kriteria berikut:

- Bahan tersebut tidak akan digunakan untuk pengiklanan atau bahan untuk membungkus.
- Bahan tersebut tidak akan digunakan di luar konteks – contohnya: Gambar tidak akan digunakan untuk menggambarkan sesuatu artikel yang tidak berkaitan dengan subjek dalam foto tersebut.

_____

Nama Peserta

_____ _____ _____

No. Kad Pengenalan Peserta T/tangan Peserta **Tarikh** (dd/MM/yy)

Nama & Tandatangan Individu yang Mengendalikan Perbincangan Keizinan

Tarikh (dd/MM/yy)

Nota: i) Semua peserta yang mengambil bahagian dalam projek penyelidikan ini tidak dilindungi insuran.

Appendix D JPEM approval

Jawatankuasa Etika
Penyelidikan Manusia USM (JEPeM)

Human Research Ethics Committee USM (HREC)

Universiti Sains Malaysia
Kampus Kesihatan
16150 Kubang Kerian, Kelantan, Malaysia.
Tel. : +609 - 767 3000/2354/2362
Fax. : +609 - 767 2351
Email : jepem@usm.my
Laman Web : www.jepem.kk.usm.my
www.usm.my

13th July 2020

Miss Siti Fathiah Mohamed
School of Health Sciences
Universiti Sains Malaysia
16150 Kubang Kerian, Kelantan.

JEPeM Code : USM/JEPeM/19110827
Protocol Title : Diet Quality and Factors Associated with Body Weight Status among Children with Learning Disabilities in Kelantan.

Dear Miss.,

We wish to inform you that your study protocol has been reviewed and is hereby granted approval for implementation by the Jawatankuasa Etika Penyelidikan Manusia Universiti Sains Malaysia (JEPeM-USM). Your study has been assigned study protocol code **USM/JEPeM/19110827**, which should be used for all communications to JEPeM-USM in relation to this study. This ethical approval is valid from **13th July 2020** until **12th July 2021**.

Study Site: Selected Primary Schools in Kelantan.

The following researchers are also involved in this study:

1. Dr. Soo Kah Leng
2. Dr. Divya Vanoh

The following documents have been approved for use in the study.

1. Research Proposal

In addition to the abovementioned documents, the following technical documents were included in the review on which this approval was based:

1. Parental Information Sheet and Consent Form (Malay version)
2. Questionnaire (Malay version)

The list of JEPeM-USM members present during the full board meeting reviewing your protocol is attached.

While the study is in progress, we request you to submit to us the following documents:

1. Application for renewal of ethical approval 60 days before the expiration date of this approval through submission of **JEPeM-USM FORM 3(B) 2019: Continuing Review Application Form.**
2. Any changes in the protocol, especially those that may adversely affect the safety of the participants during the conduct of the trial including changes in personnel, must be submitted or reported using **JEPeM-USM FORM 3(A) 2019: Study Protocol Amendment Submission Form.**
3. Revisions in the informed consent form using the **JEPeM-USM FORM 3(A) 2019: Study Protocol Amendment Submission Form.**
4. Reports of adverse events including from other study sites (national, international) using the **JEPeM-USM FORM 3(G) 2019: Adverse Events Report.**
5. Notice of early termination of the study and reasons for such using **JEPeM-USM FORM 3(E) 2019.**

6. Any event which may have ethical significance.
7. Any information which is needed by the JEPeM-USM to do ongoing review.
8. Notice of time of completion of the study using **JEPeM-USM FORM 3(C) 2019: Final Report Form.**

Please note that forms may be downloaded from the JEPeM-USM website: www.jepem.kk.usm.my

JEPeM-USM is in compliance with the Declaration of Helsinki, International Conference on Harmonization (ICH) Guidelines, Good Clinical Practice (GCP) Standards, Council for International Organizations of Medical Sciences (CIOMS) Guidelines, World Health Organization (WHO) Standards and Operational Guidance for Ethics Review of Health-Related Research and Surveying and Evaluating Ethical Review Practices, EC/IRB Standard Operating Procedures (SOPs), and Local Regulations and Standards in Ethical Review.

Thank you.

PROF. DR. HANS AMIN VAN ROSTENBERGHE
Chairperson
Jawatankuasa Etika Penyelidikan (Manusia) JEPeM
Universiti Sains Malaysia

Appendix E Ministry of Education approval

KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
ARAS 1-4, BLOK E8
KOMPLEKS KERAJAAN PARCEL E
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62604 PUTRAJAYA

TEL : 0388846591
FAKS : 0388846579

Ruj. Kami : KPM.600-3/2/3-eras(7626)
Tarikh : 11 Julai 2020

SITI FATHIAH BINTI MOHAMED
NO. KP : 950818036384

LOT 432, KAMPUNG PADANG MALA, KEMUNING
MACHANG 18500 MACHANG
KELANTAN

Tuan,

KELULUSAN BERSYARAT UNTUK MENJALANKAN KAJIAN :
DIET QUALITY AND FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG CHILDREN WITH LEARNING DISABILITIES IN KELANTAN

Perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan bahawa permohonan tuan untuk menjalankan kajian seperti di bawah telah diluluskan dengan syarat :

" KELULUSAN INI BERGANTUNG KEPADA PERTIMBANGAN PENTADBIR SEKOLAH. PENYELIDIK MESTI MENDAPATKAN KEBENARAN BERTULIS DARIPADA IBU BAPA /PENJAGA MURID YANG DILIBATKAN DALAM KAJIAN INI. PENGUTIPAN DATA TIDAK BOLEH MENGGANGGU AKTIVITI PENGAJARAN DAN PEMBELAJARAN MURID. PENGUTIPAN DATA MELIBATKAN KETINGGIAN DAN BERAT MURID DI SEKOLAH TIDAK DIBENARKAN. "

3. Kelulusan adalah berdasarkan kepada kertas cadangan penyelidikan dan instrumen kajian yang dikemukakan oleh tuan kepada bahagian ini. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Jabatan Pendidikan Negeri dan Pengetua / Guru Besar yang berkenaan.

4. Surat kelulusan ini sah digunakan bermula dari **12 Julai 2020** hingga **7 Januari 2021**

5. Tuan dikehendaki menyerahkan senaskhah laporan akhir kajian dalam bentuk *hardcopy* bersama salinan *softcopy* berformat pdf dalam CD kepada Bahagian ini.Tuan juga diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak diterbitkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Ketua Penolong Pengarah Kanan
Sektor Penyelidikan dan Penilaian Dasar
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia

salinan kepada:-

JABATAN PENDIDIKAN KELANTAN

* SURAT INI DIJANA OLEH KOMPUTER DAN TIADA TANDATANGAN DIPERLUKAN *

Appendix F Kelantan State Education Department approval

KEMENTERIAN PENDIDIKAN MALAYSIA
Jabatan Pendidikan Negeri Kelantan
Bandar Baru Tunjong,
16010 Kota Bharu, Kelantan.

Tel : 09-741 8000
Fax : 09-748 2554
Website : jpnkelantan.moe.gov.my

Ruj. Kami : JPKn/SPS/UPP.500/3/3/7Jld 1 (40)
Tarikh : 27 JULAI 2020

SITI FATHIAH BINTI MOHAMED
LOT 432, KAMPUNG PADANG MALA, KEMUNING
18500 MACHANG
KELANTAN

Tuan,

KEBENARAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH, INSTITUSI PENDIDIKAN GURU, JABATAN PENDIDIKAN NEGERI DAN BAHAGIAN KEMENTERIAN PENDIDIKAN MALAYSIA

Adalah saya dengan hormatnya merujuk surat permohonan tuan/puan mengenai perkara di atas.

2. Surat kebenaran dari Pengarah Bahagian Perancangan & Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia, Rujukan : KPM.600-3/2/3-eras (7626) bertarikh 11 JULAI 2020 berkaitan.

3. Jabatan Pendidikan Negeri Kelantan tiada halangan bagi tuan/puan menjalankan kajian/penyelidikan seperti tajuk:

" DIET QUALITY AND FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG CHILDREN WITH LEARNING DISABILITIES IN KELANTAN" diluluskan.

4. Kelulusan ini adalah dihadkan berdasarkan kepada tajuk kajian / penyelidikan yang dikemukakan ke Jabatan ini bagi tempoh sehingga **07 Januari 2021.**

5. Sekolah-sekolah yang terlibat adalah: **Sekolah-Sekolah di Negeri Kelantan.**

6. Tuan / Puan dinasihatkan supaya terlebih dahulu berbincang dengan Pengetua / Guru Besar sekolah-sekolah berkenaan sebelum kajian /penyelidikan dijalankan.

Sekian, terima kasih.

"RAJA BERDAULAT, RAKYAT MUAFAKAT, NEGERI BERKAT"
"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

i. Pengarah Pendidikan Kelantan.
ii. Pengarah, Bahagian Perancangan & Penyelidikan Dasar Pendidikan. Kementerian Pendidikan Malaysia.
iii. Pegawai Pendidikan Daerah: PPD berkenaan.
iv. Pengetua / Guru Besar Sekolah berkenaan

LIST OF PUBLICATIONS

Original article

Authors: Siti Fathiah Mohamed, Soo Kah Leng & Divya Vanoh
Title: Malnutrition and its risk factors among children and adolescents with intellectual disability (ID) in Asian countries: A scoping review.
Journal: Malaysian Journal of Nutrition
Year: 2021
Status: Published

Conference presentation

1. International Postgraduate eSymposium (IPeS 2021) (1-2 August 2021)

Poster presentation: Evaluation of diet quality and factors associated with body weight status of children with learning disabilities in Kelantan, Malaysia. (Top 8 Poster Presenter)

2. 36th Conference of Nutrition Society Of Malaysia (7-8 September 2021)

Poster presentation: Diet quality and factors associated with body mass index of children with learning disabilities in Kelantan, Malaysia