NUTRITIONAL STATUS OF INTELLECTUALLY DISABLED STUDENTS OF INTELLECTUALLY DISABLED SCHOOL IN DHARAN SUB-METROPOLITAN CITY

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Nutritional Status of Intellectually Disabled Students of Intellectually Disabled School in Dharan sub-metropolitan city

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Approval Letter

This *dissertation* entitled *"Nutritional status of Intellectually Disabled Students of Intellectually Disabled School in Dharan sub-metropolitan city"* presented by Urja Shrestha has been accepted as the partial fulfilment of the requirements for Bachelor Degree in Nutrition and Dietetics.

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Abstract

A cross-sectional descriptive study was carried out to assess nutritional status of intellectually disabled students at Intellectually Disabled School in Dharan. The study was carried out in 40 students. A structured questionnaire was administered to the mothers and care-takers for demographic, socio-economic, behavioral characteristics and dietary intake information. Anthropometric measurements were used to determine, BMI, BMI z-scores and height for age. The Z-score data was analysed using WHO Anthroplus v1.0.4, SPSS 20 and Microsoft Excel. T-test, Chi-square test and fisher's exact test were used for necessary analysis.

The study revealed that, the prevalence of stunting was found to be 17.5%. Stunting was more prevalent in the age group 13 to 15 years particularly among females with 10% compare to males of 7.5%. The prevalence of thinness was found to be 5% out of which 2.5% were moderately thin and 2.5% were severely thin. Thinness was most prevalent in the age group 13-15 years and 16-19years affecting both male and female equally with 2.5%. The prevalence of underweight was found to be 17.5% affecting more females 12.5% than male 5%. The prevalence of overweight and obesity was found to be 27.5% where females were more prevalent with 20% than males with 7.5%. The study also revealed inadequate calorie and calcium intake but sufficient consumption of protein and fats among the students. Factors such as the consumption of green leafy vegetables (GLV), eggs, and other vegetables were associated with stunted growth in adolescents with intellectual disabilities (ID), while significant correlations were found between nutritional status and various factors including parental education levels, father's occupation, mother's occupation, family income, refusal to eat, excessive appetite, poor appetite, tendency to spit out food, pickiness with food, and consumption of fast food, all of which were linked to underweight, overweight, and obesity among students with Intellectual Disability.Thus, malnutrition should be viewed as a serious issue and awareness should be generated.

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List of Abbreviations

Abbreviation	Full form
ADHD	Attention Deficit Hyperactive
AWMR	Association for the Welfare of Mentally Retarded
AAMR	American Association of Mental Retardation
BMIZ	Body mass index z-score
CDC	Centres for Disease Control
CBS	Corticobasal Syndrome
CRN	Census Report of Nepal
DSM	Diagnostic and Statistical Manual of Mental Disorder
DS	Down Syndrome
FXS	Fragile X Syndrome
GERD	Gastroesophageal Reflux Disease
HWZ	Height for weight z-score
IDD	Intellectual and Developmental Disabilities
IACAPAP	International Association for Child and Adolescent Psychiatry and Allied Professions
IQ	Intelligence Quotient
ID	Intellectually Disabled
ICMR	Indian Council of Medical Research
MR	Mentally Retarded
NAID	National Association on Intellectual Disability

NG	Normal Group
PEM	Protein Energy Malnutrition
RDA	Recommended Dietary Allowances
UNICEF	United Nation International Children Education Fund.
WHO	World Health Organization
USAID	United States Agency for International Development

Part I

Introduction

1.1. Background

Nutrition status has been defined as the nutritional state of an individual, or a population or community, and assessing the nutritional status is an essential part of monitoring the health of a community (WHO, 2021a). Adequate Nutrition is the fundamental right of every human being. Poor nutrition is cited as the major factor in more than half of all child deaths in Nepal, a significantly higher proportion than those claimed by other infectious diseases. Malnutrition is not just a stark manifestation of poverty; it is also the non-income face of poverty 'and it helps perpetuate poverty (Commission, 2012).

Intellectual Disability is usually an outcome of metabolic errors, and nutrition and a special diet are needed to restore and maintain a normal metabolism. In contrast, nutrition research has documented that many persons with ID, especially individuals with mild and moderate ID, become overweight with age and suffer from several different comorbidities (Sandberg *et al.*,2017). On the contrary, there is a high level of under- or malnutrition in persons with profound or serious ID (Robertson *et al.*, 2018).

Nutritional measures and diet must be adjusted to the different syndromes and their inherent implications, which requires knowledge of ID in general, and of specific diagnosis groups in particular. Such knowledge is generally limited, both in health services and in the municipalities that provide daily care and other services (Kolset, 2020).

The prevalence of ID varies from 1% to 3% globally. The prevalence of intellectual disability in developing countries is estimated to range from 10 to 15 per 1000 children, of those, about 85% have a mild intellectual disability. From 1 to 3% of the Western population is estimated to have an intellectual disability. Incidence is challenging to accurately calculate as mild disabilities may be under-recognized until later in childhood. Intellectual disability is reported to peak at the ages of 10 to 14 years and is 1.5 times more prevalent in males than females Intellectual Disability had the highest prevalence in India (South Asia), Afghanistan and Yamen (middle East) (Maulik *et al.*, 2020).

The 2011 Census Report of Nepal (CRN) has classified disability into seven distinct groups: They are: 1) Physical disability 2) Blind and Low Vision 3) Deaf and Hard of hearing 4) Deaf Blind 5) Vocal and Speech related disability 6) Mental disability: a) Intellectual disability b) Mental illness c) autism and 7) Multiple disabilities. The total number of Intellectually Disabled people in Nepal was found to be 14,888 respectively. (CBS,2011)

Nirmal Child Development Centre (the first Special School) was established during the International Year of Disabled Persons in 1981, for providing services to the mentally retarded. This resulted in heavy demands from different districts for opening special schools. Thereafter, National Association on Intellectual Disabilities – Nepal (NAID-Nepal), formerly known as Association for the Welfare of Mentally Retarded (AWMR), a non-profitable, non-religious, voluntary national organization was established in 1984 and registered with District Administration Office, Kathmandu and Social Welfare Council in 1985 with an objective of providing comprehensive services to children and persons with intellectual disability and their families. The services include care, education, vocational training, sheltered workshop, home based rehabilitation, parents counselling, home visit, physio- and speech therapy as well as regular sports for children with intellectual disability (AWMR, 2021)

On February 18, 1988, the Intellectually Disabled School was established in Dharan. It is the only school catering to individuals with intellectual disabilities in Dharan. Located in Dharan 16, the school provides care and education for people with intellectual disabilities, currently serving a total of 40 students.

1.2 Statement of the problem

People with intellectual disabilities (ID) are dependent on nutritional policies that have so far not been addressed in a systematic and health-promoting manner in Nepal and other nations with a high socioeconomic standard. In many poor countries, such issues have not even been raised nor addressed (Kolset *et al*., 2018).

Nutritional issues facing people with ID include the risk of both underweight and overweight. Deficiency in energy, vitamins, essential fatty acids and micronutrients can increase the risk of additional health burdens in already highly vulnerable individuals (Kolset *et al*., 2018). According to the World Health Organization, the obesity rates have tripled worldwide the last decades, and recent studies suggest that the prevalence of obesity is even higher for persons with ID than in the general population (Flygare *et al.,* 2018). According to

the Diagnostic and Statistical Manual of Mental Disorders (DSM)-5, this group is characterized by intellectual difficulties as well as difficulties in conceptual, social, and practical areas of living. Their reduced intellectual capacity implies that they often have difficulties in making good dietary choices. As a group, they are dependent upon help and guidance to promote a healthy life style. To improve their health, there is a need for improved national services and for more research on lifestyle and nutritional issues in people with ID. (Nuckols, 2013).

ID is characterized by intellectual difficulties as well as difficulties in conceptual, social, and practical areas of living. Their reduced intellectual capacity implies that they often have difficulties in making good dietary choices. As a group, they are dependent upon help and guidance to promote a healthy life style with a balanced dietary intake, increasing energy expenditure and sufficient dietary advice (Nuckols, 2013)

1.3 Conceptual framework

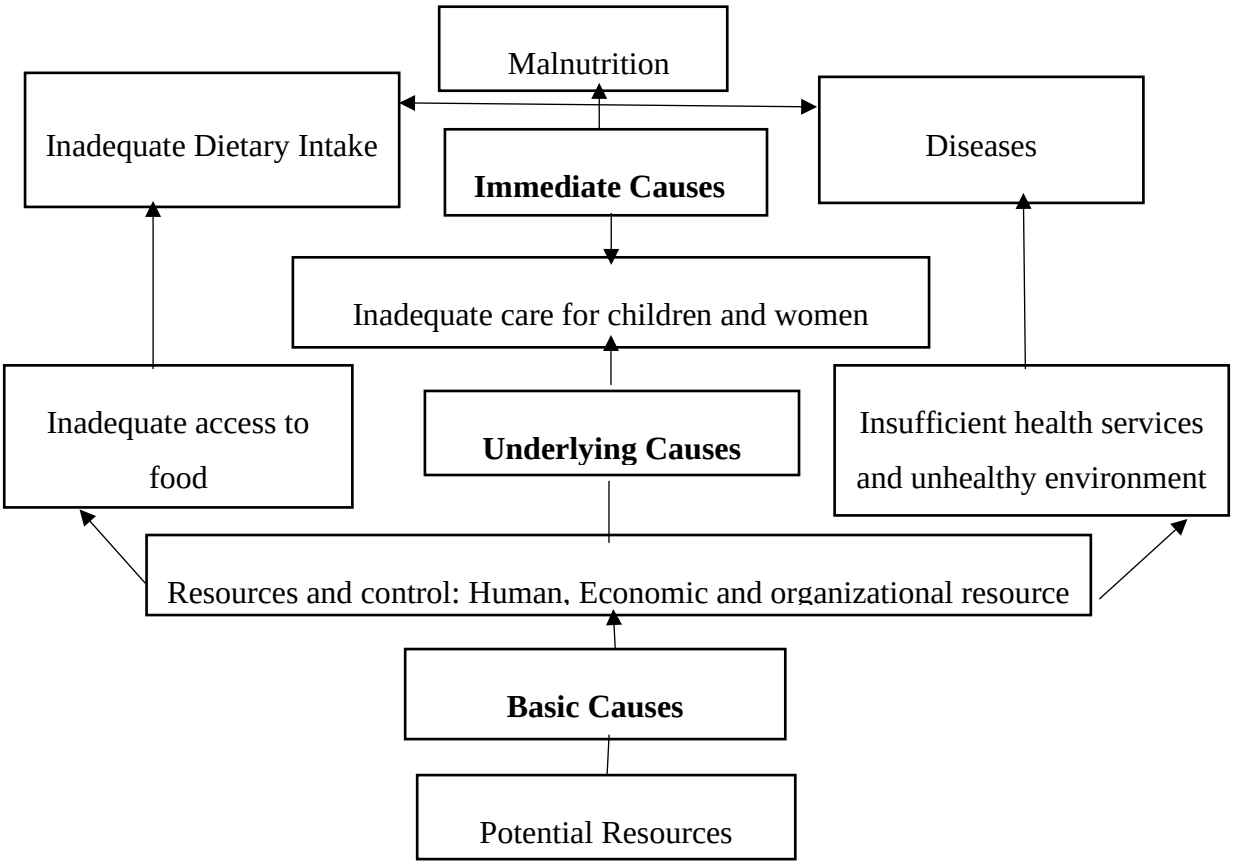

Figure.1: UNICEF conceptual framework (UNICEF, 2015)

1.4 Objectives

1.4.1 General objective

To assess the nutritional status of intellectually disabled students at Intellectually disabled school in Dharan.

1.4.2 Specific objectives

1. To assess nutritional status using anthropometric measurement.
2. To find out the socioeconomic characteristics, behavioural characteristics and their dietary intake with the help of questionnaire.
3. To study factors associated with nutritional status of students with Intellectual Disability.

1.5 Research question

1. What is the existing nutritional status of intellectually disabled students in Dharan?
2. What is the Dietary intake and Nutrient adequacy of Intellectually Disabled students?
3. What are factors associated with the nutritional status?

1.6 Significance of the study

The significance of the study is to:

1. The study will be helpful in highlighting the extent of undernutrition, overweight and obesity burden and their contributing factors.
2. The findings will be helpful to provide the information to the voluntary organizations as well as government to resolve the problems face by ID individuals.
3. The result could be helpful for educating general population about statistics and trends of nutritional status in the study area.

1.7 Limitations of the study

This study was conducted with limited resources due to which other important assessment like biochemical and clinical assessment could not be done.

Part II

Literature review

2.1. Malnutrition

"Malnutrition is a state in which a prolonged lack of one or more nutrients retards physical development or causes specific clinical disorders" (Joshi, 2015). Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients (WHO 2021b)

2.2. Forms of Malnutrition

According to WHO (2021b) malnutrition is of three major types: undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age).

Micronutrient related malnutrition, which includes micronutrient deficiencies (lack of important vitamins and minerals) or micronutrient excess results in overweight, obesity and diet related communicable disease such as heart disease, stroke, diabetes and some cancers.

2.3. Disability

The World Health Organization (WHO) defines disability as an umbrella term, that provided a threefold medical model definition which included impairment, disability and handicap. It says that impairment (loss or abnormality of psychological, physiological or anatomical structure or function) is a problem in body function or structure, disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she live. It results from an impairment and is a restriction or lack of ability to perform an activity within a range, considered normal (WHO, 2021).

The 2011 Census Report of Nepal (CRN) has classified disabilities into seven distinct groups:

a) Physical Disability: This includes partial or total loss of physical operational abilities, issues with the use and movement of nerves or muscles, and complications with the structure or function of bones and joints. Conditions such as amputation, arthritis, and cerebral palsy fall under this category.

b) Vision-related Disability: This refers to impaired eyesight that cannot be corrected. An individual is considered blind if they are unable to see clearly from both eyes at a distance of 10 feet. If an individual cannot see clearly from both eyes at a distance of 20 feet, they are considered to have ‘low vision’.
c) Hearing-related Disability: This condition is characterized by an inability to hear sound and detect changes in sound levels. An individual who cannot hear sound above 80 decibels is considered deaf. Someone who can hear sound between 65-80 decibels is classified as hard of hearing.
d) Deaf-Blind: This classification applies to individuals who have both vision and hearing impairments.
e) Voice and Speech-related Disability: This includes conditions characterized by unclear speech and unnecessary repetition of words and letters.
f) Mental Disability: This is characterized by abnormal brain function and includes three classifications: intellectual and developmental disabilities.
g) Complex Disabilities: This category includes individuals who have one or more types of disabilities.

2.4 Intellectual Disability

Intellectual disability is the contemporary term that describes the phenomenon known as learning disabilities, mental retardation, mental handicap, sub normality. There is always a group of people in every society who have lower than average intellectual capacity and poor adaptive skills. On the basis intellectual and adaptive capacity alone, some people are marked different from others. This group is generally labelled as having intellectual disability. Intellectual disability includes both intellectual impairment and disability (Schlock *et al*., 2022).

The International Statistical and Classification of Diseases and Related Health Problems (AAMR 2002) states by using the now redundant term mental retardation as a condition or incomplete development of mind which especially characterized by impairments of skills manifested during the developmental period, skills which contribute to overall level of intelligence i.e., cognitive, language, motor, and social abilities. Retardation can occur without any special condition. The intellectual disability is concerned with the relationship between intellectual impairment and society (Bigby & Frawley, 2010).

The 1992 and 2002 AAMR definitions of mental retardation emphasizes on the role of supports in conceptualizing the nature and degree of intellectual disability. Intellectual disability is a complex and multifaceted concept and has undergone many changes in name, but has always referred to the developmental period. The expression developmental disability is much broader than intellectual disability, and may include people with epilepsy, cerebral palsy, autism or other disorders that occur in the developmental period (Phillip, 2003).

According to the World Health Organization (WHO, 1992) Intellectual disability (mental retardation) is defined as a condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the developmental period, skills which contribute to the overall level of intelligence, i.e., cognitive, language, motor and social abilities. Retardation can occur with or without any other mental or physical condition. Intellectual disability is defined as significantly sub average general intellectual functioning on standard psychometric tests together with significantly limitation in adaptive functioning in, at least two of the following skill areas —communication, self-care, home living, social/ interpersonal skills, leisure, use of community resources, self-direction, functional academic skills, work, health, and safety (American Academy of Paediatrics, 2001).

Children with intellectual disability can be subclassified according to severity, as mild intellectual disability (intelligence quotient (IQ) 50–70), moderate intellectual disability (IQ 35–49), severe intellectual disability (IQ 20–34), and profound disability (IQ < 20) (Shevell et al., 2003). Apart from this, for children less than 5 years of age the term global developmental delay is used and the term intellectual disability is usually applied to older children when IQ testing is valid and reliable (American Psychiatric Association, 2000).

2.4.1 Associated Comorbidities

These are the additional disabilities found in Children with Intellectual disability:

a) Attention deficit hyperactivity disorder (ADHD): It is one of the most commonly diagnosed behavioural disorders of childhood. The core symptoms of AD/HD are developmentally inappropriate levels of inattention, hyperactivity and impulsivity. There are three sub types, predominantly inattentive, predominantly hyperactive impulsive, Combined Type i.e., inattention, hyperactivity-impulsivity (Fowler, 2004).
b) Vision Problems: Children may have range of visual problems from short sightedness to partial or total blindness. Some other problems include, drifting of one inward or

outward, frequent blinking, seeing double or not seeing clearly, low vision. It also includes squint that is the misalignment of the two eyes as observed or diagnosed may also be there.

c) Hearing Problems: It includes the degree of hearing of loss and the age of onset i.e., when the loss manifested itself. Hearing impairment may lead to speech development, communication, language deficit, poor academic performance.

d) Autism: It is a mental disorder characterized by a sever condition of uneven skill development primarily affecting communication and social abilities of a person marked by repetitive and ritualistic behaviours. Autistic individuals have difficulty in communicating and socializing. A child with autism typically develops communication problems too. Speech is normally delayed and if it does develop it may be peculiar or echolalic (Towbin *et al.,* 2002). It is a lifelong developmental delay often associated with mental retardation.

e) Down's Syndrome: Down's Syndrome or mongolism occurs in one out of every 700 births. It accounts for about 10% of moderate to severe mentally retarded children. It is the common identifiable cause of intellectual disability. It occurs due to the presence to an extra chromosome 21 which leads to delayed developmental milestones. (Roizen, 2002) Down Syndrome (DS) and Fragile X Syndrome (FXS)These two syndromes are analysed in detail in our country, since they are reported as the most frequent genetic causes of mental retardation worldwide (Araceli, 2008).

f) Cerebral Palsy: It is characterized by chronic disorders of movement and posture. The orthopaedic problems include discrepancy in skeleton growth, deformities of hand, feet, pelvic, dislocated or sub located joints, contractures at joints. Other combination of characteristics that can be seen are: motor disorder, medical conditions, hearing disabilities, attention, language and perceptual deficits behavioural problems, mental retardation. It is a heterogeneous condition in its causation and manifestation and be put under a group of disorders caused by injury in developing brain, malformation of brain and blood vessels, neurological damage. The peri natal causes, such as birth asphyxia, sepsis (meningitis, encephalitis), intracranial bleeding, multiple births. Causes after birth include, infections, traumatic brain injury, post-surgical vascular complications (Veugelers *et al.,* 2010)

g) Constipation: Constipation was defined as follows: scybalous, pebble-like, hard stools in over a quarter of defecations in combination with a defecation frequency of less than

three times per week during a 2-week period; large stools palpable on abdominal examination; or laxative use or manual disimpaction of faeces (Beguilers *et al.*, 2010).

h) Drooling: Drooling was diagnosed when excessive intermittent or continuous salivation for over last six months was complained of by the guardian of the child.
i) Epilepsy: Epilepsy was diagnosed if two or more unprovoked seizures 24 h apart after the neonatal period were present (Enjel and Jerom, 2001).
j) Feeding difficulty: Feeding difficulty was defined as persistent inability to properly take food appropriate for his or her age over last 6 months.
k) Behaviour problems: A child with intellectual disabilities may develop behavioural problems. A behaviour disorder implies a child causing to trouble for others and harm to themselves. This includes tantrums, damage to public property, exhibit inappropriate sexual behaviour etc.
l) Spina Bifida: Some children with spins bifida may also lead to intellectual disability. It means spinal cord has been damaged before birth. However, malformation depends upon extent of damage. It can also lead to paralysis in both legs.

2.4.2 Causes of Intellectual Disability (The National Trust, 2000)

a) Before Pregnancy: These include conceiving a child at a very young or old age, Poor nutrition of girl child and young women, Family history of mental retardation.
b) During Pregnancy: These cover malnutrition or lack of specific minerals during pregnancy, medication during pregnancy, radiation during first trimester, infectious diseases like German measles, repeated fits and high BP in pregnant women, accidents during pregnancy overexertion, addiction smoking, alcohol intake
c) During Delivery: These are premature birth, prolonged labour, difficult labour, complication of forceps
d) After Birth: Poor nutrition, accidents such as head injury, illness and head Injury.

2.4.3 Symptoms of Intellectual Disability (IACAPAP, 2012)

a) Children with ID usually have delayed language development and difficulties speaking and expressing themselves. The degree of severity varies with the level of impairment of intellectual ability.
b) Children with ID are slow in reacting and perceiving environmental stimuli. They have difficulties distinguishing small differences in the shape, size and colour.

c) Capacity to analyse, reason, comprehend and calculate, and for abstract thinking is often impaired to a greater or lesser extent according to severity.
d) Ability to concentrate is low and narrow.
e) Emotions are often naive and immature but may improve with age. Capacity for self-control is poor and impulsive and aggressive behaviour is not uncommon. Some are timid, withdrawn and shy.
f) Children with ID often lack coordination, may be clumsy or show excessive movement. Meaningless or stereotyped movements (e.g., rocking, head-banging, teeth-biting, shouting, tearing clothes, pulling hair, playing with the genitals) are frequent in severe ID.

2.4.4 Diagnostic Criteria of Intellectual Disability

American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V), 2013

a) Deficits in intellectual functions, such as reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience, confirmed by both clinical assessment and individualized, standardized intelligence testing.
b) Deficits in adaptive functioning that result in failure to meet developmental and socio-cultural standards for personal independence and social responsibility. Without ongoing support, the adaptive deficits limit functioning in one or more activities of daily life, such as communication, social participation, and independent living, across multiple environments, such as home, school, work, and community.
c) Onset of intellectual and adaptive deficits during the developmental period.

2.5 Prevalence of Intellectual Disability

There have been many surveys to ascertain the prevalence of ID across the world with estimates ranging from 1% to 3% (Harris, 2006). A recent meta-analysis concluded that the average prevalence of intellectual disability across all the studies is 1%. Prevalence is higher in males in both adult and child and adolescent populations. Among adults, the female-to-male ratio varies between 0.7:1 and 0.9:1, while in children and adolescents it ranges between 0.4:1 and 1:1. Rates vary according to income; the highest prevalence occurs in low- and middle-income countries where rates are almost twice those in high income countries (Maulik *et al.*, 2011).

Another meta-analysis, which considered studies published between 1980 and 2009 in European countries, found overall estimates ranging from 0.4% and 1.4% (Wittchen et al, 2011). The prevalence of ID across Asia is broadly consistent with estimates in western countries: 0.06%-1.3% (Jeevanandam, 2009). The most recent Chinese national survey on disability, conducted in 2006, estimated a prevalence of ID of 0.75%. Prevalence in urban areas was lower (0.4%) than in rural areas (1.02%) (Kwok *et al.*, 2011).

According to a 2016 report on disability in Nepal, there are 14,888 individuals coping with intellectual disabilities out of a total of 513,321 disabled people. The report also indicates that among the disabled population, 58,855 individuals experienced speech disabilities, 79,307 had hearing impairments, 94,765 were visually impaired, and 9,436 were deaf (Thapaliya, 2016).

2.6 Nutrition of Intellectual Disability

In these rarer diseases, ID is usually an outcome of metabolic errors, and nutrition and a special diet are needed to restore and maintain a normal metabolism. In contrast, nutrition research has documented that many persons with ID, especially individuals with mild and moderate ID, become overweight with age and suffer from several different comorbidities. Here, the aim is to prevent the onset of obesity or malnutrition in persons with ID through promoting a healthy diet—which is also recommended for the general population. This poses various challenges for nutritionists and care givers (Sandberg *et al.*, 2017).

On the contrary, there is a high level of under- or malnutrition in persons with profound or serious ID. This has also been reported in persons with ASD with rigorous or "picky eater" patterns, and children with cerebral palsy or eating and swallowing problems (Robertson *et al*,2018). Nutritional measures and diet must be adjusted to the different syndromes and their inherent implications, which requires knowledge of ID in general, and of specific diagnosis groups in particular. From our experience, such knowledge is generally limited, both in health services and in the municipalities that provide daily care and other services (Kolset *et al.*, 2018).

Addressing the nutritional challenges of individuals with mild ID also requires collaboration between physicians, clinical nutritionists, psychologists, special-education teachers, and physiotherapists. Challenging behaviours, lower cognitive functions, and capacity in daily-life activities translate into nutritional problems such as shopping, cooking and eating patterns, including snacking, that require systematic professional support. When working with persons

with ID, it is important to recognize their need for life-long assistance, a factor that is often underestimated.

2.7 Nutritional requirements

According to ICMR 2020 the table 2.2 outlines recommended nutritional guidelines for school children and adolescents categorized by age and gender. It provides specific values for body weight, energy intake (in kilocalories), protein consumption (in grams), visible fat intake (in grams), and calcium intake (in milligrams) across various age groups—school children aged 7-9 years and adolescents aged 10-12 years, 13-15 years, and 16-18 years. The progression across age groups reveals changing nutritional needs, with increasing requirements for energy, protein, and calcium as individuals transition from childhood to adolescence.

Table 2.2. Nutritional Requirements of Children and Adolescents

Nutrients	School Children			Adolescents			
	7-9 Yrs.	10-12 Yrs.		13-15 Yrs.		16-18 Yrs.	
	Both	Girls	Boys	Girls	Boys	Girls	Boys
Body weight (kg)	25.3	36.4	34.9	49.6	50.5	55.7	64.4
Energy(kcal)	1700	2060	2220	2400	2860	2500	3320
Protein(g)	19.0	26.6	26.2	34.7	36.4	37.3	45.1
Visible fat (g)	30	45	35	35	50	35	40
Calcium(mg)	500	650	650	800	800	850	850

Source: RDA 2020 ICMR

The table 2.3 presents recommended daily nutritional guidelines for adults, categorized by gender, weight (65kg for men and 55kg for women), and activity levels (sedentary, moderate, and heavy). The provided values include the suggested energy intake in kilocalories, protein consumption in grams, visible fat intake in grams, and calcium intake in milligrams for each category. For instance, sedentary men with a weight of 65kg are advised to consume 2110 kcal of energy, 25g of protein, 42.9g of visible fat, and 800mg of calcium daily. The table accounts for variations in nutritional needs based on both gender and activity level, emphasizing the importance of tailored dietary recommendations for maintaining health and well-being.

Table 2.3. Nutrition Requirements for Adults

FOR ADULTS						
Nutrient	**Man wt.(65kg)**			**Woman wt. (55kg)**		
	Sedentary	**Moderate**	**Heavy**	**Sedentary**	**Moderate**	**Heavy**
Energy(kcal)	2110	2710	3470	1660	2130	2720
Protein(g)		42.9			36.3	
Visible Fat(g)	25	30	40	20	25	30
Calcium(mg)		800			800	

Source: RDA 2020 ICMR

2.8 Factors affecting nutrition status of Intellectual Disability

2.8.1 Nutritional insufficiency

Dietary insufficiency in individuals with intellectual disabilities refers to an insufficient or imbalanced intake of nutrients needed for optimal health and well-being. Several factors may contribute to dietary inadequacy in this population, requiring careful attention and tailored interventions. Key considerations include (Kolset, 2020).

a) Communication Challenges**:** Individuals with intellectual disabilities may have difficulties expressing their dietary preferences or needs, leading to challenges in understanding and meeting their nutritional requirements. Limited communication skills can hinder their ability to convey hunger, preferences, or discomfort related to food.
b) Limited Food Choices**:** Preferences for specific textures, flavors, or limited tolerance for certain foods due to sensory sensitivities can result in a restricted range of food choices. This can lead to inadequate nutrient variety and potential deficiencies.
c) Dependency on Caregivers**:** Many individuals with intellectual disabilities rely on caregivers for meal preparation and feeding. If caregivers are not adequately informed or trained in nutrition, there may be a risk of providing meals that lack the necessary nutrients for overall health.
d) Chewing and Swallowing Difficulties**:** Physical limitations, including difficulties with chewing and swallowing, can impact the types of foods that individuals can

comfortably consume. This may lead to dietary inadequacy, especially if the texture and consistency of foods are not adjusted to their needs.

e) Lack of Nutritional Education**:** Limited access to nutritional education and guidance for both individuals and their caregivers may contribute to a lack of awareness about balanced diets and the importance of meeting specific nutritional needs.
f) Medication Side Effects**:** Individuals with intellectual disabilities may be prescribed medications that have side effects affecting appetite, taste perception, or nutrient absorption. This can contribute to dietary inadequacy if not addressed.
g) Socioeconomic Factors**:** Socioeconomic factors, including limited access to diverse and nutritious foods, can impact the overall quality of the diet. Financial constraints may lead to reliance on less nutritious, processed foods.
h) Lack of Independence: Limited independence in food-related activities, such as meal planning and preparation, can result in a lack of control over dietary choices. Encouraging independence, to the extent possible, can positively impact dietary adequacy.

2.8.2 Socioeconomic condition

In developing countries, trends in socioeconomic status and rates of obesity are the inverse of what is observed in developed countries (Sobal and Stunkard, 1989). Various studies have shown that higher socio-economic status is positively associated with overweight and obesity in developing countries, particularly among women but negatively associated among the population of developed countries (Bhurosy and Jeewon, 2014). Studies also have shown that in middle and low-income countries have shown that there is a strong and direct relationship between socioeconomic status and overweight/obesity, both among men and among women. This implies that the higher the socioeconomic status is, the more frequent obesity increases (Ruiz *et al.,* 2009). It may be that in lower-income countries, higher SES leads to consuming high-calorie food and avoiding physically tough tasks. But in higher-income countries, individuals with higher SES may respond with healthy eating and regular exercise (Popkin, Adair et al. 2012). But a study done in Serbian adults (middle income country) aged 20 years and over, suggest that low socioeconomic status, as measured according to education, employment and wealth index, was associated with obesity (Maksimović *et al.,* 2018).

Developmental disability appears to be more common in low-income countries than in wealthier countries, despite the probability of higher mortality among children with disabilities in low-income countries. Most studies of severe mental retardation in low-income countries report prevalences greater than 5 per 1,000 children, while prevalence estimates from industrialized countries are consistently below this. Major risk factors for developmental disabilities in some low-income countries include specific genetic diseases, a higher frequency of births to older mothers, consanguinity, and specific micronutrient deficiencies and infections (Durkin and Maureen, 2011).

2.8.3 Behavioural Condition

People with intellectual disabilities seem to be vulnerable for developing behaviour problems. Studies have reported that 7–15% of individuals with "administrative" intellectual disability (that is, individuals with intellectual disability who receive services from the authorities) have severe behaviour problems (Emerson *et al*., 2001). Severe behaviour problems among people with intellectual disability are often termed "challenging behaviour" and aggression towards others, temper tantrums, screaming or shouting, and self-injury are examples of behaviours that may be challenging to relate to for family, support staff and others. Such behaviours may be excessively controlled by people in the environment and may result in social isolation and restricted opportunities for taking part in ordinary social and societal activities, and it may be very difficult to establish a dignified life situation for people with severe behaviour problems (Emerson, 2001).

The presence of behaviour problems increased the probability of almost all psychiatric conditions, and Laud and Matson (2006) found that individuals who exhibited manic symptoms were more likely than controls to show aggression and other problem behaviours during mealtime resulting in poor nutrition (Laud and Matson, 2006).

Matson and Kuhn (2001) developed the STEP (Screening Tools of Feeding Problems) to assess the presence of feeding problems with Intellectual Disability. It has 23 items based on literature on the assessment and treatment of feeding problems among people with ID. Questions regarding feeding include swallowing ability, ability to chew properly, ability to feed independently, refusal to eat, fussiness about food etc (Laura Seiverling, 2011).

2.8.4 Education

Educational background serves as a reliable indicator for assessing socio-economic status and occupational outcomes. Generally, a higher level of education is associated with an elevated socio-economic status, contributing to an improved living standard. A critical issue arises with the widespread low educational attainment among both men and women, leading to a heightened incidence of malnutrition, particularly under-nutrition. The intersection of low education and poverty often results in premature marriages for underweight individuals, impacting not only their own health but also the physical growth and development of subsequent generations. This cycle of low education, poverty, and early marriages poses a significant challenge to overall well-being. It is noteworthy that individuals with higher educational status demonstrate a heightened prevalence of obesity, contrasting with those with lower education levels (Setorglo *et al*., 2013)

Research suggests that parental education significantly influences the nutrition status of intellectually disabled individuals. Informed parents are better equipped to make educated dietary choices, plan and prepare nutritionally balanced meals tailored to their child's specific needs, and address sensory sensitivities that may affect food preferences. By promoting healthy eating habits, understanding emotional and behavioural aspects, and actively engaging in community resources, educated parents contribute to the overall well-being of their intellectually disabled children.

2.8.5 Income

Income can significantly impact the nutrition status of intellectually disabled individuals. Economic resources play a crucial role in determining access to nutritious food, healthcare, and support services. Higher income levels often provide families with the financial means to afford a well-balanced and varied diet, essential for maintaining optimal nutrition. Adequate income can also facilitate access to specialized dietary interventions, nutritional supplements, and medical care tailored to the specific needs of intellectually disabled individuals. Research conducted in India reveals that income inequality exerts a comparable influence on the likelihood of individuals being either underweight or overweight. A study demonstrates that a 19% increase in the odds of being underweight is accompanied by a 21% increase in the odds of being obese as a result of income disparities (Subramanian *et al.,* 2007).

The wealthier populations possess the means to acquire a diverse range of foods surpassing their daily caloric needs, economically disadvantaged populations struggle to meet recommended caloric intake. Paradoxically, a rising trend of overweight individuals is observed among poorer populations in various nations, attributed to the consumption of affordable yet highly caloric options such as fast food and processed foods, as highlighted by (Burchi *et al.,* 2011).

2.8.6 Food Security

Food security is necessary to maintain an optimal nutritional status, and core to its definition is the requirement for nutritious food, which refers not only to sufficient quantities of food (in terms of calories), but also to sufficient quality (in terms of variety and micronutrient content). The absence of any component of the above, including cultural acceptability of food, and stability of food availability, access or utilization results in food insecurity. Food security is essential to ensure adequate nutrition and prevent hunger, the concepts of food security, optimal nutrition and lack of hunger and undernutrition are interlinked but not synonymous (Ghattas, 2014).

In order to achieve nutrition security, one needs to have access to appropriate care giving practices and to hygienic environments and adequate health care services, in addition to a diet that meets nutritional needs for a healthy and active life. Undernutrition in children for example, may not only result from insufficient food intake but can result from an unsanitary environment that exposes children to repeated infections leading to poor absorption or utilization of the nutrients consumed (Ghattas, 2014).

2.8.7 Dietary Habits

Dietary habits encompass the regular eating patterns and food choices individuals or communities make, influenced by cultural, social, economic, and personal factors. These habits significantly impact overall health, emphasizing the importance of maintaining a well-balanced diet that includes a variety of nutrients. Cultural and regional influences shape dietary traditions, while individual preferences, social dynamics, and environmental factors contribute to food choices. Awareness of nutrition, access to affordable and nutritious food, and consideration of special dietary needs further shape these habits (WHO, 2018).

A recent study of dietary intake among people with mild and moderate ID who live in 3 different kinds of housing in North America was conducted using screening questionnaires and interviews with subjects assisted by their care providers. Results showed low intake of fruits and vegetables and high intake of dietary fat among subject in all housing types, and the authors fear increased risks of chronic diseases among people with ID (Paivi, 2008).

2.9 Nutritional Assessment

Assessment of nutritional status of community is one of the first steps in the formulation of any public health strategy to combat malnutrition. The principle aim of such an assessment is to determine the type, magnitude and distribution of malnutrition in different geographic areas to identify population at risk groups and to determine the contributory factors in addition, fractural evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians to obtain allocation of materials and human resources and to plan appropriately (Srilakshimi, 2002).

Assessment of nutritional status involves two methods (Joshi, 2015).

a) Direct Method

- Anthropometric method
- Biochemical method
- Clinical Method
- Dietary Procedures

b) Indirect Method

- Vital Statistics
- Ecological Factors

2.9.1 Direct Method

Direct method includes four types that can be used in collaboration or unilaterally according to purpose.

i.) Anthropometric measurement: Anthropometric measurements include height, weight, skin-fold thickness, and circumference etc., could detect the change of body composition to assess the nutritional status in specific population groups, including newborn, children under age of five and adults (Shrivastava *et al.*, 2014).

Advantages of anthropometry (Benjamin, 2014):

-To get information about growth patterns.

-To get information about fat composition and lean body mass.

-To predict index of morbidity and mortality concerning malnutrition.

-To evaluate the effect of nutrition therapy.

Table 2.4 Anthropometric indicators of nutritional status for adolescents (WHO, 2022a)

	Cut-offs	**Indicators**	
		Height for Age	BMI for Age
Z-score range	Below -3 SD	Severely stunted	Severely thin
	-3 SD to -2 SD	Moderately Stunted	Moderately thin
	-2 SD to 1 SD	Normal	Normal
	+1 SD to +2 SD	Normal	Overweight
	+2 SD to +3 SD	Normal	Obese
	Above +3 SD	May be abnormal	Severely Obese

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adult. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²) (WHO 2018).

The "Asian criteria" for Body Mass Index (BMI) cut-offs, designed to better reflect health risks specific to the Asian population, categorizes individuals into different weight classes. According to these criteria, individuals with a BMI below 18.5 are considered underweight, while the normal weight range is defined between 18.5 and 23. Overweight is identified for BMIs ranging from 23 to 27.5, and obesity is classified for individuals with a BMI equal to or greater than 27.5. This classification system acknowledges the potential health risks associated with lower BMI values in the Asian population, aiming to provide more accurate assessments of weight-related health concerns for individuals of Asian descent. It's crucial to consider population-specific criteria for a more nuanced evaluation of body weight and associated health risks (WHO, 2004). The table below 2.5 shows classification of Asian Criteria value of BMI

Table 2.5 Classification of 'Asian Criteria' value of BMI.

Class	"Asian criteria" BMI cut- off
Underweight	<18.5 kg/m²
Normal	18.5-23 kg/m²
Overweight	23-27.5 kg/m²
Obese	≥27.5 kg/m²

Source: (WHO 2004)

ii) Biochemical assessment: Biochemical assessment involves measurement of status of bodily secretions, fluids etc. against certain standard parameter. For instance, measurement of albumin, creatinine, immune function tests etc. (Benjamin, 2014).

iii) Clinical appraisal: Clinical appraisal try to seek out the symptoms of specific nutritional deficiency. Presence of two or more clinical signs increases the diagnostic significance (Shrivastava *et al.*, 2014).

iv) Dietary intake assessment: Dietary intake assessment is done to assess the nutritional intake, questionnaire, recall or record method can be implied for performing intake assessment (Shrivastava *et al.*, 2014).

2.9.2 Indirect Method

Vital statistics: Vitals statistics such as records related to birth and death of infants, death of mother etc. might be used to evaluate the prevalence rate, sort out the risk groups and has higher public health importance (Shrivastava *et al.*, 2014).

Ecological factors: Ecological factors like socio-economic factors, health care facilities etc. are related to the occurrence of malnutrition. It is necessary assessment to find out which factor is affecting the nutritional status of the society (Shrivastava *et al.*, 2014).

2.10 Dietary Assessment

Dietary assessment is a systematic process used to evaluate an individual's dietary intake, nutritional status, and eating habits. It plays a crucial role in various fields such as nutrition research, clinical practice, and public health (Thompson *et al*., 2008). Method like, food balance sheet is used for dietary survey at national/regional levels, inventory method is used for dietary surveys at institutional level or when there is homogenous population, and weighment method, 24hr dietary recall, food frequency questionnaires are used at individual levels (Shrivastava *et al.*, 2014).

2.10.1 Methods for dietary assessment

Dietary assessment methods encompass various approaches, including food diaries, 24-hour dietary recalls, food frequency questionnaires, dietary recall interviews, dietary history, biomarkers, and technology-based methods. Each method serves to evaluate individuals' food intake, nutritional habits, and dietary patterns (Thompson and Subar, 2017).

24-Hour Dietary Recalls: Another approach is the use of 24-hour dietary recalls, where participants recall all foods and beverages consumed in the past 24 hours with the guidance of an interviewer.

Food Frequency Questionnaires (FFQ): Food frequency questionnaires involve participants reporting the frequency and portion sizes of specific foods consumed over a defined period. This method is efficient for assessing long-term dietary patterns, making it suitable for large-scale studies. However, accuracy depends on the participant's ability to recall and estimate portion sizes.

Dietary History: Dietary history involves in-depth interviews conducted by to gather a comprehensive dietary history, including usual eating patterns and cultural practices. While providing a holistic view of dietary habits, this method is time-consuming and requires trained interviewers.

Food Records: One commonly used method involves individuals maintaining detailed records of all foods and beverages consumed over a specified period. This includes information on portion sizes and preparation methods. However, the accuracy of this method relies heavily on the participant's diligence and consistency in recording their intake.

Part III

Material and Methods

3.1 Research Design

A cross-sectional survey was conducted in Intellectually Disabled School, Dharan 16 to assess the nutritional status of students attending the school. Total of 40 students participated in the survey which consisted of:

a) Household Survey with help of questionnaire.
b) Anthropometric Measurement
c) The 24-hour Dietary Recall and Food Frequency Questionnaire.

3.2. Research Area

Study was carried out in Dharan which lies in Eastern Terai of Nepal. The study was executed at Intellectually Disabled School at Janpath Road, Dharan. Intellectually Disabled School was established in 2045 which is the only special school in Dharan for people with ID.

3.3. Research Instruments

Instruments that were used during survey were:

a) Weighing Machine (1 Piece)
b) Stadiometer (1Piece)
c) Well-designed set of questionnaires.
d) Standard cups used for dietary recall.

3.4. Study variables

1. Dependent variables: Anthropometric indices, BMI, height for age, BMI for age.
2. Independent variables:
   a) Demographic and socio-economic factors: Ethnicity, family size, family income, parent's occupation, education, number of family members, family's education.
   b) Respondents characteristics: Age, sex, timing of disability.
   c) Behavioral characteristics: Refusal to eat, swallowing difficulty, fussy about food, tendency to spit out, tendency to vomit, regurgitation, able to indicate when hungry or not.
   d) Dietary habit: Food frequency, food habit related variables, nutrient intake

3.5. Target Population

The students of the ID school as well as their caretakers and parents were regarded as the target population of the study.

Inclusion Criteria

a) Students who were studying at ID School.

Exclusion Criteria

a) Students that were seriously ill during the study.

3.6. Sampling

The study was carried out by the Census Method. Census Method is a method of statistical enumeration where all members of the population are studied. Therefore, total number of students happened to be 40 of the age group 10-35.

3.7. Pre-Testing

The study was pretested among the students with ID by using prepared sets of questionnaire and anthropometric instruments. Pretesting was carried out to identify potential problems with the instrument and to reduce sources of measurement error. Pretesting can help to regulate the strengths and weakness of a survey concerning question format, wording and order with addition of accuracy and clarity and consistency of the study. Considering that, no fault was found and was confirmed for the actual survey.

3.8. Validity and Reliability

Reliability serves as a benchmark for ensuring the accuracy of the gathered data. The study instruments underwent a thorough validation process at the Central Campus of Technology, specifically within the Central Department of Nutrition and Dietetics. To establish the validity of the stadiometer, a meticulous comparison was conducted between measurements obtained from our stadiometer and those from the USAID stadiometer. Additionally, the questionnaire underwent a rigorous validation procedure by extensively reviewing relevant literature. Daily assessments were carried out to ensure completeness, consistency, and clarity, further reinforcing the instrument's validity.

3.9. Data collection Techniques

Data collection was outspread into two parts, primarily the contact with the school coordinator, caretakers and parents for completion of semi structured questionnaire followed by anthropometric measurement of the students.

The final part involved the parents answering the socio-demographic and economic variables such as income, education, occupation etc.

Information of the other variable and data on anthropometric measurements were obtained by following methods:

a) Height measurement: To measure height for anthropometric assessment of nutrition status, adhere to the CDC guidelines (CDC, 2021). A calibrated stadiometer was placed on a flat, stable surface, instructing the individual to stand barefoot with their back straight against the backboard. Proper alignment of the head, shoulders, buttocks, and heels, while maintaining the Frankfurt plane position and having the person look straight ahead was ensured. Gently the headpiece was lowered to make contact with the crown of the head, recording the measurement to the nearest millimetres at eye level and the height was taken (Lee and Nieman, 2013)
b) Weight measurement: A calibrated scale was placed on a level and stable surface. The individual was instructed to stand on the scale without shoes and heavy clothing, ensuring an even weight distribution on both feet. The weight was then recorded to the nearest 0.1 kilogram (Lee *et al.*, 2013)
c) Dietary intake: A meticulously designed food frequency table, coupled with a 24-hour dietary recall sheet, was employed to investigate the food consumption patterns and nutrient intake among students. The food frequency questionnaire facilitated gathering information on the types of foods typically consumed by respondents and the frequency of consumption. During the detailed 24-hour dietary recall, participants were assisted and provided ample time to recall their food and beverage intake from the previous day, emphasizing accurate estimation of portion sizes. To enhance precision, household utensils and measuring cups used in data collection were compared, ensuring consistency and aiding respondents in recalling with accuracy. Gram equivalents of foods consumed were calculated from the dietary recall data and subsequently converted into nutrient intake values, including carbohydrate, protein, fat, calcium, and

total calories. Standardized cups were employed for estimations, contributing to a comprehensive evaluation of the adolescents' dietary habits and nutritional adequacy (NIN, 2020).

3.10. Data analysis

First the data was checked for completeness and consistency. Then it was coded and entered in the computer using statistical software. Likewise, qualitative data was transcribed and coded by assigning labels to various categories. Data was entered and z-score generated with statistical software. Microsoft Excel 2016, SPSS version 20 and WHO Anthroplus (v1.0.4) were used to analyse data. Descriptive analysis was used to describe the percentage and distribution of respondents by socio-demographic variables, and dietary pattern of respondents. T-test and chi square test was used to analyze necessary analysis.

3.11. Logistical and Ethical Consideration

The study was interfaced to the students and the involvement of the parents and caretakers were entirely wilful. Prior consent to conduct the research was obtained from the school and parents of respective children. In addition, the consent form was signed by the caretakers and the parents of the students with ID. The information obtained from the participants was not be divulged and was held in confidence. Privacy and confidentiality of collected information was ensured at all level. Permission was sought from all the relevant authorities: Central Campus of Technology and the coordinators of Intellectually Disabled school Dharan Sub-Metropolitan city.

Part IV

Results and Discussion

The study was carried out at Intellectually Disabled School which provides education to Intellectually Disabled students. The participants in the study were children, adolescents and adults from 10-35 years of age. The results of the survey are presented in the following heading:

4.1. Student's characteristics

The following Table no 4.1 shows that there were total of 19 males (47.5%) and 21 females (52.5%). The mean age of the students was 21.12 years. Minimum age of the student happened to be 10 and maximum age was 35. Majority age was in age group, 20-29yrs (45.0%), 10-19yrs (42.5%) and 30-35yrs (12.5%). The study found that 29(72.5%) were Intellectually Disabled since birth and 12(27.5%) were Intellectually Disabled later after birth.

Table 4.1. Students Characteristics

Variables	Frequency	Percentage
Gender		
Male	19	47.5
Female	21	52.5
Age Groups		
10-19	17	42.5
20-29	18	45.0
30-35	5	12.5
Timing of Disability		
Since Birth	29	72.5
Later After Birth	12	27.5

4.2 Demographic and socio-economic characteristics

The table 4.2 shows that out of 40 students, 67.5% were Hindu, 5% were Buddhist, 5% were Christian and 22.5% happened to be Kirat. As shown in Table.4.2, 40% were Brahmin, 5% were Chettri, 5% were Dalit and 50% were Janajati respectively.

Table 4.2: Religion distribution of study population (n=40)

Variables	Frequency	Percentage
Religion		
Hindu	27	67.5
Buddhist	2	5
Christian	2	5
Kirat	9	22.5
Caste		
Brahmin	16	40
Chhetri	2	5
Dalit	2	5
Janjati	20	50

The Table 4.3 shows that 85% were from nuclear family whereas 15% were from joint family. The breakdown in the family size of student's household are as follows, household with 5-10 members had a highest percentage 62.5% while below 5 had 37.5%. The majority of the students were from permanent household type i.e., 77.5% and 20% of the students were living in temporary household.

Table 4.3: Socio-demographic characteristics of study population (n=40)

Variables	Frequency	Percentage
Type of Family		
Nuclear	34	85
Joint	6	15
Family Size		
1-4	15	37.5
5-10	25	62.5
Household Type		
Permanent	31	77.5
Temporary	9	20

The Table 4.4 below shows that major occupation of the fathers was Labor 45%, followed by business 25%, agriculture 10% and others occupations were 20%. Similarly, the major occupation of the mothers of the students were labour 75. %, followed by agriculture and business 12.5% and 7.5% and other occupation were 5%.

The table 4.4 below also represents the Education of both Father and Mother. The highest level of education most of the student's parents had been of Primary 85% of the Father and Primary level 60% of the mother. The illiteracy rate of the parents of the students were 2.5% of Father whereas 40% of mother. Considering the monthly income of the family depicted on the table 4.4 where 92.5% student's family had the monthly income less than 30,000 and 7.5% students had the monthly income greater than 30,000 which were enough income to feed the family of all these three students.

Table 4.4: Economic characteristics of population. (n=40)

Father Occupation	**Frequency**	**Percentage**
Business	10	25
Agriculture	4	10
Labor	18	45
Others	8	20
Mother's Occupation		
Business	3	7.5
Agriculture	5	12.5
Labor	30	75.0
Others	2	5.0
Father's Education		
Primary	34	85
secondary	5	12.5
Illiterate	1	2.5
Mother's Education		
Primary	24	60
Illiterate	16	40
Family Income Per Month		
<30,000	37	92.5
>30,000	3	7.5

4.3. Intellectual Disability among the Students

The Table 4.5 represents the total sample of which 2 (5.0%) students had history of ID among the family members while 38 (95.0%) had no any family history of ID. As shown in table 4.5

below also shows students having other problems than Intellectual disability. The study found that students with seizures were 5 (12.5%), down syndrome 5 (12.5%), hearing disability 2 (5.0%) whereas 28 (70%) students didn't have any other conditions than ID. The results revealed that 32(80.0%) of students had communication disorder whereas 8(20.0%) had normal communication. Students with medical condition with ID were very low that happened to be Meningitis 1(2.5%), epilepsy 1(2.5%) and thyroid 1(2.5%) whereas 37(92.5%) of the students didn't have any medical condition with ID.

Table 4.5: Family history and disorders associated with study population(n=40)

Variables	Frequency	Percentage
Family History Of ID		
With ID	2	5.0
Without ID	38	95.0
Other condition than ID		
Seizures	5	12.5
Down Syndrome	5	12.5
Hearing Disability	2	5.0
None	28	70.0
Other Disorder		
Communication	32	80.0
None	8	20.0
Other Medical Condition		
Meningitis	1	2.5
Epilepsy	1	2.5
Thyroid	1	2.5
None	37	92.5

4.4. Behavioural characteristics during feeding

In the study as shown in table 4.6 it was found that majority of the students that 35(87.5%) were able to indicate their hunger and 5(12.5%) were able to indicate when full. The table 4.6. shows that 38(95.0%) of the students were able to consume their food on their own whereas 2(5.0%) of them had difficulty consuming their own food. The table also represents that 30(75.0%) were fussy about food while 10 (25.0%) of the students ate whatever they had on their plate. The study further showed that 18(45.0%) of the students had the tendency to spit out food. It also shows that 6(15.0%) of the students had tendency to vomit whereas 20(50%)

of the students had normal consumption. It also showed that 23(57.5%) of them were not able to chew properly which also resulted in Gastroesophageal Reflux Disease. 19(47.5%) of the students took normal time to finish their food whereas 21(52.5%) of them took more time to finish their food. The study further showed that 13(32.5%) of them liked eating solid better while 25(62.5%) like consuming liquid food. Lastly the table showed that 20(50%) of the overall student's consumption was normal whereas 20(50.0%) of them consumed more or less than normal.

In a survey of 71 participants (37 men and 34 women) with a mean age of 22.5 ± 7 years (range 18–60 years) of six rehabilitation centres of East Asia. Participants with severe ID had significantly higher Screening Tool of Feeding Problems 'nutrition-related behaviour' and 'eating and drinking skill deficit problem' that affected their dietary intake (Ozturk *et al*., 2021).

In a study of 117 intellectually disabled people of age 10-19 years of age in North Western India with the STEP screening test found out that the intellectually disabled people had difficulty chewing the food and also had the greater tendency to spit out. The study also found that the ID people had significantly greater prevalence of liquid foods high prevalence in fussiness about the foods (Mathur, 2007).

Table 4.6: Behavioural Characteristics

Variable	Frequency	Percentage
Able to indicate when hungry		
Yes	35	87.5
No	5	12.5
Able to indicate when full		
Yes	31	77.5
No	9	22.5
Able to consume food on its own		
Yes	38	95.0
No	2	5.0

Tendency to spit out		
Yes	18	45.0
No	22	55.0
Tendency to vomit		
Yes	6	15.0
No	34	85.0
Fussy about food		
Yes	30	75.0
No	10	25.0
Chew properly		
Yes	23	57.5
No	17	42.5
Takes normal time to finish food		
Yes	19	47.5
No	21	52.5
Likes consuming liquids food		
Yes	25	62.5
No	15	37.5
Likes eating solid better		
Yes	13	32.5
No	27	67.5
Is consumption normal		
Yes	20	50.0
No	20	50.0

4.5. Consumption of foods.

The provided table 4.7 presents the frequency and percentage distribution of food consumption across various categories, offering insights into dietary patterns. Each column represents a specific food item, and the row indicate the frequency of consumption categorized as "Regular "if consumed regularly, "Frequent" if consumed once or twice a week and "Rare" if consumed once or twice a month with the corresponding percentages.

For instance, the majority of participants 97.5% reported consuming rice, with a preference for regular consumption. Wheat was another staple, with 60% and 40% reporting regular and frequent consumption. For maize consumption, the data reveals a balanced split, with 40% of respondents consuming it frequently and the other 60% opting for rare consumption. This indicates that maize is not as widely consumed as wheat flour among this group. When it comes to pulses, the majority 90% of the respondents regularly incorporate them into their diet. Only a small percentage consume pulses frequently 7.5%, and even fewer do so rarely 2.5%.

In the case of legumes, 67.5%,10% and 22.5% of the respondents consume them frequently, regularly, and rarely. This indicates a relatively high preference for frequent legume consumption. Green leafy vegetables (GLV) are consumed regularly by 70% of the respondents, with 22.5% consuming them frequently and 7.5% rarely. This suggests a considerable emphasis on the regular intake of GLVs. Other vegetables are consumed regularly by 62.5% of the respondents, while 32.5% consume them frequently, and 5% consume them rarely. Fruits are consumed fairly evenly, with 40% of the respondents opting for both frequent and rare consumption. A smaller group 20% consumes fruits regularly, reflecting a balanced distribution in fruit consumption habits.

In terms of dairy products, 55% of respondents consume milk regularly, 27.5% consume it frequently, and 17.5% consume it rarely. This suggests a significant number of individuals include milk as a part of their regular diet. Curd is primarily consumed frequently (70%) among the respondents, with a minor percentage consuming it regularly (2.5%) and rarely (27.5%).

The data on meat consumption reveals that red meat is consumed frequently by 72.5% of the respondents and rarely by 27.5%. White meat is consumed frequently by 67.5% and rarely by 30%, with regular consumption being relatively low. Egg consumption is varied, with 50% of respondents consuming them rarely, 37.5% frequently, and 12.5% regularly. Lastly, processed

food is consumed frequently by 75% of the respondents and rarely by 25%. This indicates a notable preference for fast food consumption among a significant portion of the group.

A cross-sectional study was conducted in five hospitals: University of Tokyo Hospital, National Rehabilitation Center for Children with Disabilities, St. Luke's International Hospital, Ashikaga Hospital, and the National Center for Child Health and Development. The study focused on children aged 6 to 17 years. It found that cereals were the largest source of energy intake, contributing 30.2% of the total. This was followed by dairy products, which made up 13.5% of the energy intake, and meat, which accounted for 11.3%. (Toshiko *et al*., 2021).

Table.4.7: Consumption of foods.

Variables	**Regular**	**Frequent**	**Rare**
	Frequency (%)	Frequency (%)	Frequency (%)
Rice	39 (97.5%)	1 (2.5%)	-
Wheat	24 (60%)	16 (40%)	-
Maize	16 (40%)	24 (60%)	-
Pulses	36 (90%)	3 (7.5%)	1 (2.5%)
Legumes	4 (10%)	27 (67.5%)	9 (22%)
GLV	28 (70%)	9 (22.5%)	3 (7.5%)
Other Veg	25 (62.5%)	13(32.5%)	2 (5%)
Fruits	8 (20%)	16 (40%)	16 (40%)
Milk	22 (55%)	11 (27.5%)	7 (17.5%)
Curd	1(2.5%)	28 (70%)	11 (27.5%)
Red Meat	-	29 (72.5%)	11 (27.5%)
White Meat	1(2.5%)	27 (67.5%)	12 (30%)
Egg	5 (12.5%)	15 (37.5%)	20 (50%)
Processed Food	-	30 (75%)	10 (25%)

4.6 Dietary Intake

The Table 4.8 shows the adequacy of the nutrients among study population. It was observed that most of the study population of 90% had inadequate calories and 87.5% had inadequate calcium intake whereas 80% had adequate consumption of protein and 97.5% had adequate fat consumption compared with RDA 2020 ICMR.

Table 4.8 Adequacy of nutrient intake in study population

Nutrient	Adequate	Inadequate
Calories	4(10%)	36(90%)
Protein	32(80%)	8(20%)
Fat	39(97.5%)	1(2.5%)
Calcium	5(12.5%)	35(87.5%)

A study was conducted in special children with intellectual disability of sample size 100 and 53 parents from Mangala Jyothi Integrated School, Mangalore. The study found that the calorie intake was found to be inadequate due to lower socioeconomic strata. The protein consumption was found to be 40% than that of the RDA whereas the fat consumption was also found to be low 60% than that of RDA resulting in 86% being underweight (Amitha M Hegde, 2019).

A study was conducted as part of the Disability Support Program at eight special education, practice, and rehabilitation centres in Turkey. The study included 384 participants with disabilities, of which 42.2% were female and 57.8% were male. Among the participants, 83.3% were children and adolescents, and 16.7% were adults aged between 1 and 41 years. The study found that the energy intake from carbohydrates was low, the protein intake was within the appropriate range, and the fat intake was high. Additionally, fibre intake was found to be low. (Cakir *et al*., 2022).

Table 4.9 shows that the boys of age 10-12 years in this study are consuming an average of 1095 calories, which is approximately 49% of the recommended daily allowance. Similarly average protein (28.5±0.70 g/day), total fat (36.0±1.41 g/day), calcium (150±212mg/day) intake were 108%%, 102% and 23% of RDA respectively of students 10-12 years. Average total fat intake showed positive association with estimated RDA. Difference between mean protein and mean calcium with their respective RDA were statistically not significant while

mean calorie and fat with respect to RDA was statistically significant. The result indicates that intake of nutrient by children (10-12years) have lower probability of calorie adequacy and calcium adequacy while, total fat and protein intake are adequate. The p-values, marked with asterisks, indicate the statistical significance of the observed differences, emphasizing that the dietary habits of the study participants deviate significantly from the recommended norms across these nutritional categories.

Table 4.9. Nutrient Intake by 10-12years of study population (n=2)

Nutrient	Gender	Intake	RDA	%RDA	P-value
Calories (kcal/day)	Boys Girl	1095±53.45	2220	49%	0.022*
Protein (g/day)	Boys Girl	28.5±0.70	26.2	108%	0.12
Fat (g/day)	Boys girls	36.0±1.41	35	102%	0.019*
Calcium(mg/day)	Boys Girls	150±212	650	23%	0.430

'*' indicates the value with significant difference

In 2020, a cross-sectional study was carried out in Eskatan, Bangladesh, focusing on children aged 7 to 12 years. The study revealed that children with intellectual disabilities were consuming 47% fewer calories and had lower levels of micronutrient intake compared to their peers. However, their protein and fat intake were found to be within the normal range (Harun *et al.,* 2021).

Table 4.10 shows average calorie intake per day to be (1344±186.8kcal) of boys whereas (1382±272) of girls of 13-15years which was less than that of RDA. The average intake of protein was 38.75±11.8 of boys where as 42.25±10.34 of girls and total intake of fat were found to be 44.7±6.1of boys whereas 45.7±8.84 of girls respectively showing positive association with estimated RDA. The mean protein intake with respective RDA was not statistically significant. The mean calcium daily intake by Boys (425±150) and girls (412±131) was significantly less than estimated RDA.

In 2021, a cross-sectional study was conducted at the University of Tokyo Hospital, the National Rehabilitation Centre for Children with Disabilities, St. Luke's International Hospital, Ashikaga Hospital, and the National Centre for Child Health and Development. The study focused on children aged 6 to 17 years. It found that the mean daily intake levels of protein and

fat exceeded their Recommended Dietary Allowance (RDA) by 76% and 60%, respectively. However, the daily intake of dietary fiber and calcium was found to be lower than recommended levels (Takezoe *et al.*, 2021).

Table 4.10. Nutrient Intake by 13-15years of study population (n=8)

Nutrient	Gender	Mean Intake±SD	RDA	%RDA	P-value
Calories (kcal/day)	Boys	1344±186.8	2860	46%	0.001*
	Girls	1382±272	2400	57%	0.002*
Protein (g/day)	Boys	38.75±11.8	36.4	106%	0.10
	Girls	42.25±10.34	34.7	122%	0.005*
Fat (g/day)	Boys	44.7±6.1	50	89.4%	0.001*
	Girls	45.7±8.84	35	130%	0.003*
Calcium (mg/day)	Boys	425±150	800	53%	0.011*
	Girls	412±131	800	51%	0.008*

'*' indicates the value with significant difference

The Table 4.11 shows that the calorie intake of boys and girls of age 16-18yrs were found to be 1700±141.4 and 1632±181.01 were less than that of RDA. Similarly, the consumption of protein was found to be 53±1.14 of boys and 51±0.84 of girls whereas the fat intake was found to be 56.5±4.94 of boys and 54.35±6.01 of girls. The protein and fat mean adequacy are positively significant to the estimated RDA of girls. The calcium intake of boys was found to be 250±70.7 and 450±212 of girls which was significantly less than estimated RDA.

A case design for 117 ID subjects between 7-18 years matched for age In the ID group the diet of 10-18 years old boys was deficient in energy (25%) and protein (15%-29%) while the diet of 10–15-year-old. ID subjects (all age groups, both sexes) consumed significantly less calcium, Intellectually Disabled boys in the age group of 10-15 years consumed significantly less protein, carbohydrate and fat than corresponding normal subjects. Intellectually Disabled girls in the 13–15-year age group consumed significantly less protein in comparison to the relevant controls girls was deficient in proteins (15%-25%) (Manju *et al*., 2007).

Table 4.11. Nutrient Intake by 16-18 years of study population (n=4)

Nutrient	Gender	Mean Intake±SD	RDA	%RDA	P-value
Calories (kcal/day)	Boy	1700±141.4	3320	51%	0.037*
	Girl	1632±181.01	2500	65%	0.050
Protein (g/day)	Boy	53±1.41	45.1	117%	0.12
	Girl	51±0.84	37.3	136%	0.008*
Fat (g/day)	Boy	56.5±4.94	40	141%	0.41
	Girl	54.35±6.01	35	155%	0.000*
Calcium (mg/day)	Boy	250±70.7	850	29%	0.007*
	girl	450±212	850	52.9%	0.042*

'*' indicates the value with significant difference

The table 4.12 presents calories of both male (1515±316) and female (1399±0.66) are consuming significantly lower amounts than the recommended values, with percentages of 71% and 84%, respectively. Protein intake male (44.5±9.96), female (46.12±9.78) exceeds RDAs for both genders, showing statistically positive significant differences. Fat consumption male (50.4±10.49), female (46.6±11.2) is notably higher than the recommended values, with positive significant differences observed. Calcium intake male (345±175) female (413±159) is below the recommended levels for both groups, and statistically significant differences are noted.

A study aimed to evaluate the nutritional intake, including carotenoids, among intellectually disabled individuals in Korea, with the goal of identifying potential solutions for nutritional enhancement. A total of 72 participants with intellectual disabilities took part in the study. Results indicated that these individuals had lower intake levels of calories, Vitamin B1, calcium, and carotenoids when compared to the recommended nutrient intake guidelines. This research sheds light on the nutritional deficiencies faced by intellectually disabled people in

Korea and underscores the importance of finding strategies to improve their dietary intake for better health outcomes (MiYeon *et al.,* 2010).

Table 4.12. Nutrient intake by 19-35 years of study population (n=26)

Nutrient	Gender	Mean Intake±SD	RDA	%RDA	P value
Calories (kcal/day)	Boy	1515±316	2110	71%	0.000*
	Girl	1399±0.66	1660	84%	0.000*
Protein (g/day)	Boy	44.5±9.96	42.9	103%	0.000*
	Girl	46.12±9.78	36.3	127%	0.000*
Fat (g/day)	Boy	50.4±10.49	25	200%	0.000*
	Girl	46.6±11.2	20	233%	0.000*
Calcium (mg/day)	Boy	345±175	800	43.1%	0.000*
	girl	413±159	800	51%	0.000*

'*' indicates the value with significant difference

The study focused on 37 patients with intellectual disabilities in Italy, comprising 12 females and 25 males, aged between 17 and 54. Analysis of their dietary intake revealed an imbalance, with 16% of total daily energy intake derived from protein, 31% from lipid, and 50% from carbohydrate. Additionally, inadequate intake of fibre, iron, and calcium was observed, leading to deficiencies in dietary patterns. (Bertoli *et al.,* 2006)

4.7 Prevalence and distribution of malnutrition of Intellectual Disability. (n=40)

Out of total sample the study found that 17.5% were stunted with 5% severely stunted and 12% were moderately stunted. In terms of thinness and underweight, 22.5%were affected where 5% were suffering from thinness whereas 17.5% were underweight. The study also revealed that 17.5% were overweight and 10% were obese. Therefore 67.5% of Intellectually Disabled students were affected whereas 32.5% had normal height and weight. The prevalence of malnutrition of the total sample is shown in fig 4.1.

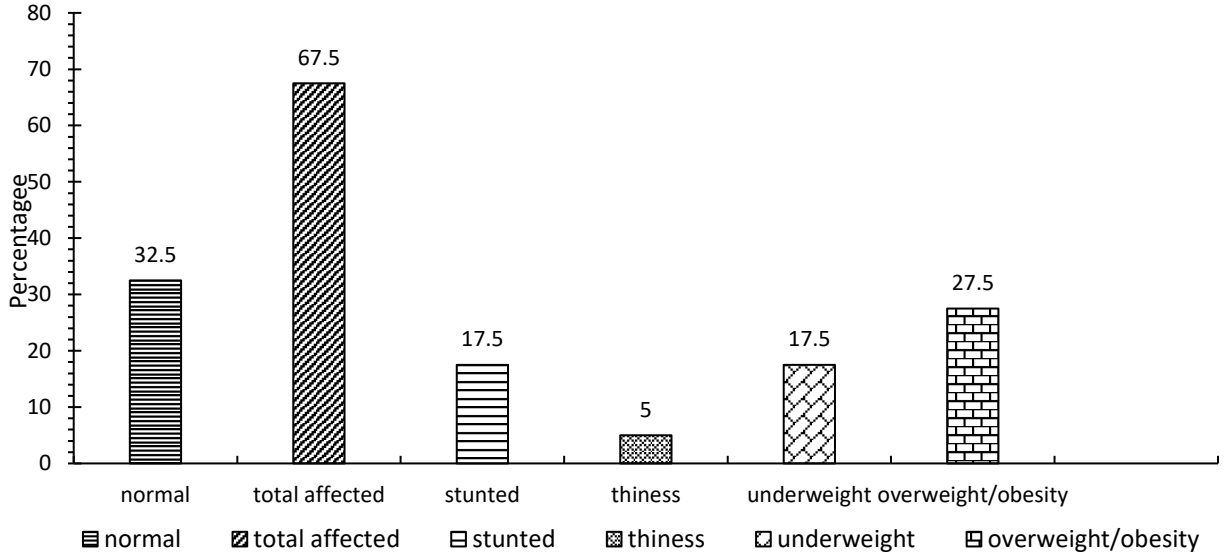

Figure 4.1: Prevalence of malnutrition of students of Intellectual Disability.

4.7.1 Prevalence of stunting based on Age

The Figure 4.2 shows the percentage distribution of stunting of adolescent across age group. The Figure shows that students in the age group 10-12 years had normal height and were not stunted. Stunting was most prevalent in 13-15years where 12.5% were stunted while 7.5% had normal height whereas students of age group 16-19years 5% were stunted and 12.5%had normal height.

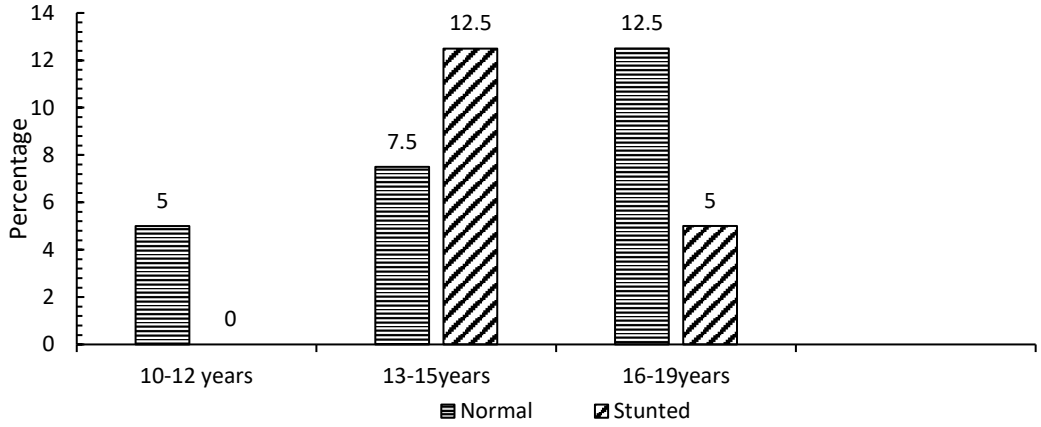

Figure 4.2: Prevalence of stunting in adolescents of Intellectual Disability according to age.

A cross-sectional study was undertaken involving 639 mentally disabled children aged between 6 and 14 years, comprising 422 males and 217 females, in Turkey. The study aimed to assess stunting prevalence within this population. Results indicated that approximately 33.5% of the children were estimated to be stunted, with a notably higher prevalence observed among older children aged 13 to 18 years (Khairy *et al.*, 2007).

4.7.2 Prevalence of stunting based on Gender

The Fig 4.3 represents the prevalence of stunting based on gender where total male who were stunted was found to be 7.5% where all 7.5% were found to be moderately stunted and total female was found to be 10% where 5% of them were found to be moderately stunted and the remaining 5% were found to be severely stunted.

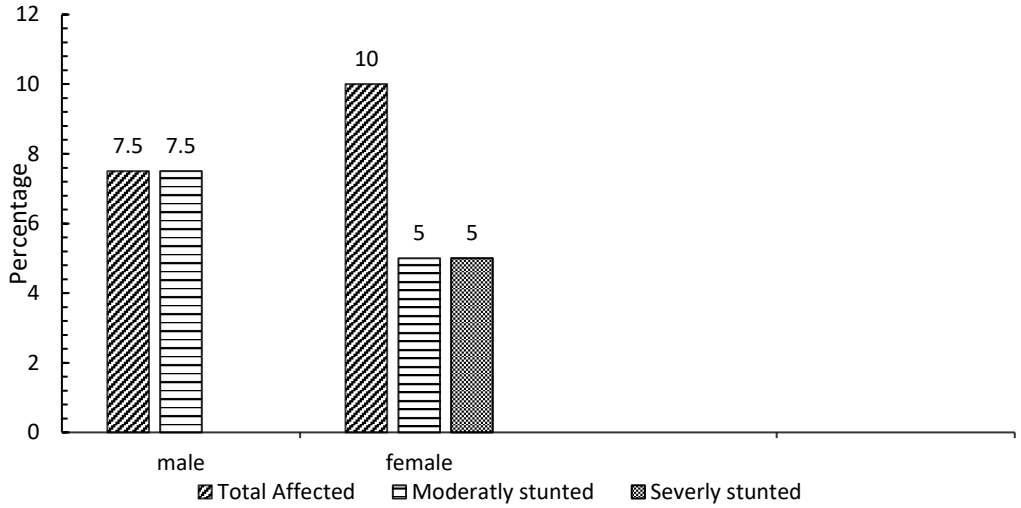

Figure 4.3. Prevalence of stunting based on Gender

A study conducted in eight special schools and rehabilitation centres in Kirikkale City involved 612 disabled children and adolescents. The aim was to assess obesity, stunting, and nutritional habits among this population. Findings indicated that the prevalence of stunting was 24.5%, with a lower rate observed in males (20.4%) compared to females (30.8%) (Fatma *et al.,* 2018).

4.7.3 Prevalence of Thinness, Underweight, Overweight and Obesity based on Age

Distribution of thinness/underweight, overweight and obesity across age groups are displayed in figure 4.4. Thinness was prevalent in the age 13-15 years and 16-19 years with 2.5% while prevalence of overweight was seen in the age group of 10-12 years with 2.5% prevalence and obese in 16-19 years of age of 2.5%.

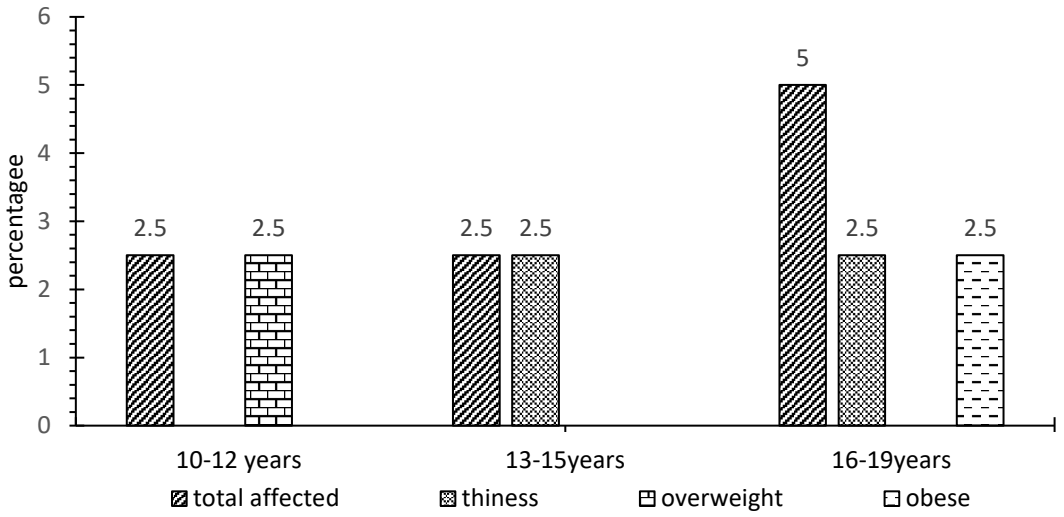

Figure 4.4: Prevalence of thinness, overweight and obesity of Intellectual Disability according to age.

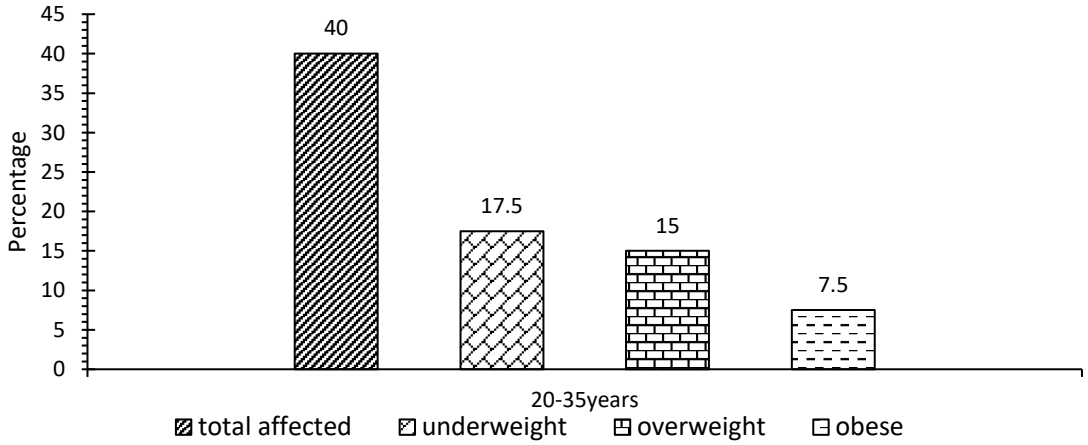

Figure 4.5: Prevalence of underweight, overweight/obesity of Intellectually Disabled according to the age.

The study also found that the prevalence of underweight of 17.5%, overweight 15% and obese 7.5% were seen in the age 20-35 years of age of intellectual disability as shown in the figure 4.5

In a study conducted in Turkey, a sample of 77 mentally disabled children aged between 10 and 18 years was examined based on anthropometric indicators and dietary intake. The analysis revealed that the younger age group (aged 10-14 years) had a thinner prevalence of 15.4% compared to the older age group (aged 15-18 years) with a prevalence of 12.0%. Interestingly,

the prevalence of obesity was found to be higher in the older age group compared to the younger age group (Nogay, 2013).

A study conducted in the US across age groups 18 to 29, 30-39, and 40-49 years and above revealed that BMI and weight increased between the ages of 18 to 29 years, remained relatively stable until the age of fifty, and then decreased thereafter (Jin *et al.,* 2020). Meanwhile, in a cross-sectional study involving 2,510 welfare facilities for persons with intellectual disabilities in Japan, out of 1,543 responses, 61.3% were deemed valid for analysis for those aged 18 years and above. The study found that 16.9% of residents were underweight, 14.5% were obese, and 29% had a normal weight. Additionally, issues related to eating behaviours were prevalent in 15.2% of residents, while 76.2% had an unbalanced diet intake. These findings underscore the importance of addressing nutritional challenges and eating behaviours among individuals with intellectual disabilities in welfare facilities in Japan. (Ohwada *et al.,* 2022).

4.7.4. Prevalence of Thinness, Underweight, Overweight and Obesity based on Gender.

The fig 4.6. represents the prevalence of thinness, underweight, overweight and obese. It represents the total male of 15% affected out of which 2.5%were found to be suffering from thinness 5% were found to be underweight ,5% were found to be overweight and 2.5% was found to be obese whereas the total female of 35% affected out of which 2.5% were found to be suffering from thinness,12.5%were found to be underweight, 12.5% were found to be overweight and 7.5% were obese.

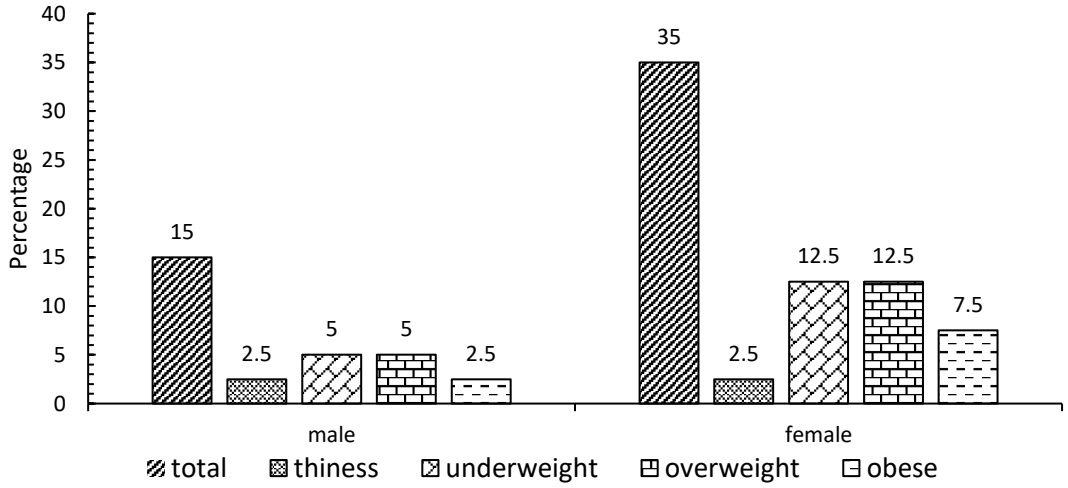

Fig:4.6. Prevalence of Thinness, Overweight and Obesity based on Gender.

In a cross-sectional study of 954 adults with intellectual disabilities in South East Asia, 39.3% of women and 27.8% of men were obese, compared to 25.1% of women and 22.7% of men in

the general population. Women had a significantly higher mean BMI than men with intellectual disabilities and were more likely to be obese. Regression analyses indicated that as the severity of intellectual disabilities increased, the risk of overweight and obesity decreased for both women and men (Melville *et al.,* 2008).

4.8. Factors associated with Stunting in Intellectually Disabled Students

Factors seen to be statistically related to stunting in adolescents with ID are shown in table 4.13. Factors like Consumption of GLV (p=0.043), Consumption of Egg (p=0.040) and consumption of Other Vegetables(p=0.040) intake were found to be related with stunting in adolescents with ID.

Table 4.13 Factors associated with Stunting in adolescent with Intellectual Disability

Factors	Stunted	Normal	χ^2value	P value
Consumption of GLV				
Regular	2(5%)	8(20%)		
Frequent	3(7.5%)	2(5%)	5.44	0.043
Rare	2(5%)	0(0%)		
Consumption of Egg				
Regular	1(2.5)	1(2.5%)		
Frequent	5(12.5%)	2(5%)	5.42	0.040
Rare	1(2.5%)	7(17.5%)		
Consumption of Other Vegetable				
Regular	2(5%)	8(20%)		
Frequent	3(7.5%)	2(5%)	5.44	0.043
Rare	2(5%)	0(0%)		

A community-based study conducted in rural southern India, specifically Tamil Nadu, aimed to assess the nutritional status of individuals aged 10 to 18 years. The findings indicated high levels of stunting, suggesting poor socioeconomic conditions within the community. Additionally, the study highlighted low consumption levels of protein and micronutrients among the population, indicating potential nutritional deficiencies. These results underscore

the importance of addressing socioeconomic factors and improving dietary intake to promote better health outcomes among adolescents in rural areas of southern India. (Sam *et al.,* 2016).

A study in sub-Saharan Africa, exploring determinants of stunting found that stunting is influenced by household factors, such as maternal height, age, and education, large household size, and lower socioeconomic status (Keino *et al*., 2014).

4.9 Factors associated with thinness, underweight and overweight/obesity in Intellectually Disabled students

The table 4.14 The presented data highlights several significant associations between socio-economic factors, parental characteristics, and eating behaviours with the weight status. People of ID of illiterate mothers, are notably more likely to be suffering from thinness/underweight which is of 37.5%, compared to those with parents who have received at least a primary or secondary education where as parents who received primary education have higher prevalence of overweight/Obesity of 20 % and 25% as compared to lower. Unemployed mother's showed higher prevalence of thinness/underweight of 32.5% and overweight/obesity of 22.5% whereas Father's who had the occupation of labour had higher prevalence of thinness/underweight of 17.5%. Family income emerges as a pivotal determinant, with children from lower-income households exhibiting a higher prevalence of thinness/underweight of 42.5% compared to their counterparts from higher-income families. This association is underscored by a p-value of 0.006, indicating a statistically significant relationship.

Notably, people of ID who exhibit a tendency to refuse food and poor appetite have higher prevalence of thinness/underweight of about 22.5% and 32.5%. whereas those with excessive appetites demonstrate a higher likelihood of overweight/obesity of 17.5%. Additionally, certain food-related behaviours such as being fussy about food or consuming processed foods also contribute significantly to the weight status of ID people with 35% of thinness/underweight and 12.5% of overweight/obesity.

For instance, people who are fussy about their food choices exhibit a higher prevalence of thinness/underweight of 35%, with a p-value of 0.048. Similarly, the consumption of processed foods is associated with a higher likelihood of thinness/underweight among children of about 30%, as evidenced by a p-value of 0.040 whereas prevalence of overweight/obesity was found to be 22.5%. The calorie inadequacy also exhibits higher prevalence of thinness/underweight with 42.5%.

Table 4.14 Factors associated with thinness/Underweight and overweight/obesity with ID

Factors	Thinness/ Underweight	Normal	Overweight/ Obesity	χ^2Value	P value
Mothers Education					
Primary	2 (5%)	12 (30%)	10 (25%)	28.80	0.000
Illiterate	15 (37.5%)	1 (2.5%)	0 (0%)		
Father's Education					
Primary	16 (40%)	10 (25%)	8 (20%)	10.65	0.042
Secondary	1 (2.5%)	3 (7.5%)	1 (2.5%)		
Illiterate	0 (0%)	0 (0%)	1 (2.5%)		
Mothers Occupation					
Agriculture	3 (7.5%)	0 (0%)	0 (0%)	14.733	0.048
Labor	1 (2.5%)	4 (10%)	0 (0%)		
Unemployed	13 (32.5%)	8 (20%)	9 (22.5%)		
Others	0 (0%)	1 (2.5%)	1 (2.5%)		
Father's Occupation					
Business	4 (10%)	4 (10%)	2 (5%)	3.301	0.033
Agriculture	3 (7.5%)	1 (2.5%)	0 (0%)		
Labor	7 (17.5%)	6 (15%)	5 (12.5%)		
Others	3 (7.5%)	2 (5%)	3 (7.5%)		
Family Income					
<30,000	17 (42.5%)	10 (25%)	7 (17.5%)	17.946	0.006
>30,000	0 (0%)	3 (7.5%)	0 (0%)		

Refusal to eat					
Yes	9 (22.5)	1 (2.5%)	2 (5%)	9.087	0.028
No	8 (20%)	12 (30%)	8 (20%)		
Excessive Appetite					
Yes	0 (0%)	2 (5%)	7 (17.5%)	21.693	0.000
No	17 (42.5)	11 (27.5)	3 (7.5%)		
Poor Appetite					
Yes	13 (32.5)	1 (2.5%)	1 (2.5%)	19.455	0.004
No	4 (10%)	12 (30%)	9 (22.5%)		
Tendency to spit out					
Yes	13 (32.5%)	4 (10%)	1 (2.5%)	13.085	0.002
No	4 (10%)	9 (22.5%)	9 (22.5%)		
Fussy about food					
Yes	14 (35%)	2 (5%)	5 (12.5%)	14.952	0.0480
No	3 (7.5%)	11(27.5%)	5 (12.5%)		
Consumption of Processed Food					
Yes	12 (30%)	9 (22.5%)	9 (22.5%)	1.963	0.040
No	5 (12.5%)	4 (10%)	1 (2.5%)		
Calorie Adequacy					
Adequate	0(0%)	0(0%)	4(10%)	39.55	0.003
Inadequate	17(42.5%)	13(32.5%)	6(15%)		

In a study conducted by Chowdhury *et al.* in 2018, it was discovered that several factors contribute to undernutrition among children in South Asian countries, including lower socio-economic status, poor dietary intakes, food insecurity, and parental education levels.

Additionally, behavioural factors were identified as risk factors for overweight and obesity among intellectually disabled (ID) children and adolescents in Hong Kong. These factors include engaging in longer sedentary activities and consuming higher quantities of energy-dense foods, meats, fish, and eggs. These findings emphasize the complex interplay of socio-economic, dietary, and behavioural factors in shaping nutritional outcomes among children and adolescents, both in South Asian countries and in specific regions like Hong Kong. (Wang et al., 2018).

Koritsas and Lacono (2016) found that more than half of their study subjects with intellectual disabilities had limited choices not only in the type of food they consumed but also in the timing of their meals. Furthermore, external factors such as a low economic background are associated with being underweight, as indicated. (Bhaumik et al., 2008).

Part V

Conclusions and recommendations

5.1. Conclusion

In the study, nutritional status of adolescents and adults of Intellectual Disability was assessed. The conclusions that can be drawn from the study are:

a) Out of total sample the study found that 17.5% were stunted with 5% severely stunted and 12% were moderately stunted. In terms of thinness and underweight 22.5% out of which 5% were found to be affected from thinness whereas 17.5 % were underweight and 50% had normal weight. The study also found that 17.5% were overweight and 10% were obese.
b) The dietary intake of study population revealed that most of the study population had inadequate calories and calcium intake whereas protein and fat consumption were found to be adequate.
c) Factors like Consumption of GLV, Consumption of Egg and consumption of Other Vegetables intake were found to be related with stunting in adolescents with ID.
d) Significant associations are noted between nutritional status and variables such as father's education, mother's education, father's occupation (specifically in agriculture), mother's occupation, mother's occupation, family income, refusal to eat, excessive appetite, poor appetite, tendency to spit out food, fussiness about food, and consumption of fast food with thinness, underweight overweight and obesity among ID.

5.2. Recommendation

a) Conducting similar cross-sectional, descriptive, or longitudinal surveys in the future would contribute to a more comprehensive understanding of malnutrition and its underlying causes in people with intellectual and developmental disease.
b) Finally, beyond anthropometric indices, the inclusion of other relevant measures is encouraged to accurately assess and address malnutrition in Intellectually Disabled people. Overall, these recommendations aim to inform future research and intervention strategies to improve the nutritional outcomes of intellectually disabled in the surveyed area.

Part VI

Summary

The nutritional condition of an individual serves as a multifaceted determinant of their well-being, extending beyond a mere health indicator. Adequate nutrition is essential for the proper development and functioning of individuals body and immune system. When an individual lack essential nutrients, their overall health becomes compromised, making them more susceptible to a range of diseases.

The study was conducted to assess the nutritional status of Intellectually Disabled students of Intellectually Disabled School in, Dharan. The study included 40 students taken under study in basis of census method of sample collection. Cross-sectional descriptive survey using measurements of weight, height and 24 hours dietary recall was carried out to determine the nutritional status and structured questionnaire was administered to the parent children to study socio-demographic condition and their behavioral characteristics. The prevalence of malnutrition among survey students based on gender age and WHO reference. Data collected was analyzed using MS Excel 2016, WHO AnthroPlus v1.0.4 and SPSS version 20.2. t-test and chi square test was used to analyze necessary analysis.

The study discovered that among the sampled population, 17.5% were stunted, with 5% severely stunted and 12% moderately stunted. The total of 22.5% were suffering from thinness and underweight with 5% suffering from thinness and 17.5% being underweight, while 17.5% were overweight, with 10% being obese. Stunting was more common among 13 to 15-year-olds, particularly in females 10% compared to males 7.5%. Thinness was most prevalent in the age group of 13-15 years and 16-19 years with 2.5% in both the age group. Underweight, overweight, and obesity were most prevalent among those aged 20 to 25, especially affecting females 32.5% compared to males 17.5%. The study highlighted insufficient calorie and calcium intake but sufficient protein and fat consumption. Factors such as eating green leafy vegetables (GLV), eggs, and other vegetables were linked to stunting in adolescents with intellectual disabilities (ID) while significant associations were observed between nutritional status and variables including father's and mother’s education, father's occupation (particularly in agriculture), mother's occupation, family income, refusal to eat, excessive appetite, poor appetite, tendency to spit out food, fussiness about food, and consumption of fast food with thinness, overweight, and obesity among individuals with ID.

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Appendices

Appendix A

Consent Form

Namaste!

I, Miss Urja Shrestha, a graduate student of Nutrition and Dietetics in Central Campus of Technology, Dharan; am going to conduct dissertation work in Dharan Sub-Metropolitan city for the award of bachelor's degree in Nutrition and Dietetics.

The topic for the study is **"ASSESSMENT OF NUTRIONAL STATUS OF INTELLECTUALLY DISABLED PEOPLE IN INTELLECTUALLY DISABLED SCHOOL, DHARAN**

Under this study, nutritional status will be surveyed among the students of intellectually disabled school of Dharan sub-metropolitan city. This study will provide information about the nutritional status of intellectually disabled people attending the school. During the study height and weight of the participants will be measured and socio demographic and economic factors, behavioral factors, dietary factors and health related factors will be assessed.

You have been selected for the study, you will be asked some questions and some physical measurements will be taken. This study will make you known about your nutritional status. Some questions may be personal, all information you provide will be important and the privacy of information will be maintained and they will not be misused. Your participation in this study will be voluntary. You may not answer some or all questions if you feel them personal or sensitive. But I hope you will be participated in this study.

Do you want to get participated in this study? Yes, I want to be participated in the study and permit to take all measurements and ask the questions required for the study.

Signature of participant: _____ *Signature of surveyor:* _____

Date: Date:

Appendix B **Survey questionnaire**

Participant's Code: ☐ Date of Interview (B.S.): ☐

A. GENERAL INFORMATION

1. Name:
2. Date of birth: _____yrs./_____Mon/_____Day
3. Age: _____yrs.
4. Gender:
5. Timing of disability
   a) Since birth b) Later after birth
6. Religion:
   a) Hindu b) Buddhist c) Christian d) Muslim e) Others
7. Caste/Ethnicity:
   a) Brahmin b) Chhetri c) Dalit d) Kirat e) Others

8. Address: …….
9. Marital status: (if married go to no. 10)
   a) Married b) Unmarried
10. No. of children: _____
11. Ward no:
12. Household Type:
    a) Permanent b) Temporary
13. Source of water (if purify need to mention):

A. FAMILY INFORMATION

1. Type of family:
   a) Nuclear b) Joint
2. Total Family members:
3. Family History of Intellectual Disability:
4. Father's Occupation:
   a) Business b) Agriculture c) Labor d) Unemployed e) Others
5. Mother's Occupation:
   a) Business b) Agriculture c) Labor d) Unemployed e) Others
6. Father's Education:
   a) Primary b) Secondary c) Graduate d) Illiterate
7. Mother's Education:

a) Primary b) Secondary c) Graduate d) Illiterate

8. Head of the household:

   a) Father b) Mother c) Other specify

9. Total family income per month

   a) <30,000 b) >30,000

10. Is your annual income enough to eat?

    a) Yes b) No

C. ANTHROPOMETRIC MEASUREMENTS

Measurement	Reading 1	Reading 2	Reading 3	Mean reading
Weight (kg)				
Height (cm)				

D. HEALTH BACKGROUND INFORMATION:

1.Health checkup:

a) annual b) emergency c) rare

2. Medications: a) No b) Yes _____

3.OtherDisorders:

a) Communication b) Mobility c) Auditory d) Visual e) None

4. Other neurological/ developmental/genetic conditions other than Intellectual disability

a) Seizures b) down syndrome c) Hearing disability d) others please specify_____

5. Does the individual have any other medical conditions

a) Yes (specify)_____ b) No

Nutrition related health problems:

PROBLEMS	YES	NO
Overweight		
Refusal to eat food		
Constipation		
Swallowing Difficulties		
Excessive Appetite		
Poor Appetite		
Requires Soft Pureed Food		
Reflux/Regurgitation		
Underweight		
Diarrhea		
Allergies		
Diabetes		
Others		

E. DIETARY INFORMATION:

Dietary habits of Intellectually Disabled

DIETARY PATTERN	**YES**	**NO**
Able to indicate when hungry		
Able to indicate when full		
Able to consume food on his own		
Tendency to spit out food		
Tendency to vomit food		

In General, fussy about foods		
Does he/she chew properly		
Takes normal time to finish meals		
Likes consuming liquid/soft foods		
Likes eating solids better		

FFQ:

S. N	Type of food	Regular (at least once a day)	Frequent (3\4 times in a week)	Rare (once in a week or less)
1	Fiber rich foods			
	Rice\brown rice			
	Wheat			
	Maize/millet/barley			
2	Pulses/Legumes			
	Whole daal			
	Polished daal			
	Grams/beans/peas			
3	GLV			
4	Other vegetables			
5	Fruits			
6	Dairy Products			

	Milk/Curd			
	Ghee/Butter			
	Paneer/cheese			
7	Meat			
	White meat (chicken /Fish)			
	Red meat (mutton/ Goat/beef/pork)			
	Egg			
8	Processed Packaged foods/ fast foods			

Dietary recall:

Time	**Description of food**	**Serving**	**Amount**
Breakfast			
Lunch			

Snacks			
Dinner			
Bed time			

Appendix D

Photo Gallery

Appendix E **Survey Area**