**Study on Socioeconomic, Demographic Status and Anthropometric Measurements of Preschool Children in Nagram (Lucknow)**

**Abstract:**

Anthropometric measurements are crucial indicators of the health and nutritional status of preschool children. Understanding the influence of socioeconomic and demographic factors on these measurements can help identify at-risk populations and inform public health interventions. Preschool children experience steady physical growth, although at a slower pace compared to infancy and early childhood. They typically gain weight and height steadily and develop coordination and fine motor skills necessary for tasks like drawing, writing, and self-care activities. Preschool age is a critical period for socialization and learning social skills. Children begin to interact more with peers and adults, develop friendships, and learn to cooperate, share, and take turns. Preschool programs and early childhood education play a crucial role in promoting social development and school readiness. They become increasingly curious, ask questions, and engage in pretend play and imaginative activities. They may experience a range of emotions, from joy and excitement to frustration and anger, and require guidance and support from caregivers to navigate these emotions in socially appropriate ways. Objectives: (a) Evaluate Anthropometric Measurements: Assess height, weight, head circumference, mid-upper arm circumference waist circumference and Body Mass Index (BMI) of preschool children. (b)Analyze Socioeconomic and Demographic. (c) Factors: Examine the impact of variables such as family income, parental education, and household size on children's growth metrics. (d)Identify Disparities: Detect patterns and disparities in growth and nutrition among different socioeconomic and demographic groups. Methods: Study Design: Cross-sectional study. Sample Population: Preschool children aged 3-5 years from diverse socioeconomic backgrounds. Data Collection: Anthropometric Measurements: Height, weight, head circumference, mid-upper arm circumference waist circumference and BMI recorded using standardized procedures. Questionnaires: Gather information on family income, parental education levels, household size, and other demographic factors. Statistical Analysis: Use of regression analysis and other statistical tools to assess relationships between socioeconomic, demographic variables, and anthropometric outcomes.

***Keywords:***Socioeconomic, Demographic, Anthropometric Measurements, Pre-school children, Questionnaire, Nagram.

**Introduction**:

Preschoolers are a susceptible and significant population for nutritional and health assessments because the formative years of a child's life are crucial for their growth and development. Anthropometric parameters including height, weight, and BMI are important measures of a child's general health and nutritional status. These metrics not only show the state of health today, but they also forecast health outcomes in the future and possible problems with development. It is crucial to comprehend the variables influencing these anthropometric measurements in order to create public health interventions that are successful. Preschoolers’ health and nutritional condition are greatly influenced by socioeconomic and demographic characteristics, such as family income, parental education, and size of the household. These elements frequently lead to differences in a child's growth and development, with children from lower socioeconomic backgrounds typically having worse health outcomes.

A child's growth and development are influenced by a variety of factors, including their socioeconomic status (SES), which can impact their access to resources like wholesome food, healthcare, and educational opportunities. A superior anthropometric outcome is generally linked to a higher family income and better access to healthcare services and a balanced diet. On the other hand, a child's development may be adversely affected by reduced economic levels, which may lead to food insecurity and restricted access to healthcare.

A further important factor influencing a child's health is parental education. Higher educated parents are typically more informed about nutrition and health practices, which can help their kids make healthier food choices and lifestyle choices. Parents with higher levels of education are also more likely to take preventative health care and make use of healthcare resources.

The size of a household affects a child's nutrition as well. Larger homes could have more people sharing limited food and attention due to resource constraints. This may result in inadequate nutrient intake and stunted growth in kids. The purpose of this study is to investigate the association between preschoolers' anthropometric measurements and socioeconomic and demographic characteristics. The research aims to inform public health initiatives and interventions focused at improving the nutritional quality and general health of preschool children, especially those from poor homes, by detecting patterns and discrepancies in growth measures. The results of the study will shed important information on the ways that children's growth and development are influenced by socioeconomic and demographic factors, emphasizing the need for focused policies and initiatives to close these gaps. Ultimately, this research will contribute to the broader goal of ensuring all children have the opportunity to achieve optimal growth and health, regardless of their socioeconomic or demographic background.

**Methodology:**

1. Area of the Study:

Current estimated population of Lucknow in 2024 is approximately 5,870,000. The Nagram Nagar Panchayat has population of 10,648 of which 5,534 are males while 5,114 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 1551 which is 14.57 % of total population of Nagram (NP)

1. Study Subject:

According to WHO and NIN (National Institute of Nutrition), 3–5 years-old age group of children is considered as preschool children. The sample taken was 3-5 years old children as they are at the age of play-school and primary school going children.

1. Sample Size:

The sample size for descriptive purposes is approximately 385. So, a sample size of approximately 385 would be needed for descriptive analysis with a population of 28,000, a confidence level of 95%, and a margin of error of 5%.

Purposive random sampling method was used to collect the sample for this study.

Mohanlalganj Sub-district

Nagram (Sector)

(Primary School)

Nagram

Sekhanapur

Katra Nagram

130

130

125

N=385

**Figure 1: Flow chart of sampling size**

1. Inclusion Criteria

* Age: Preschool children aged between 3 to 5 years.
* Location: Children residing in a specific geographical area or community.
* Socioeconomic Status: Children from diverse socioeconomic backgrounds to capture a range of dietary habits.

1. Exclusion Criteria

* Age: Children outside the specified age range (e.g., below 3 years or above 5 years).
* Residency**:** Children residing outside the designated study area.
* Unwillingness to Participate: Families or caregivers unwilling to participate in the study or provide necessary information.

1. Anthropometric Measurements

Anthropometric measurements are non-invasive quantitative measurements of the body. The core elements of anthropometry are height, weight, head circumference, body mass index (BMI), body circumferences to assess for adiposity (waist, hip, and limbs), and skinfold thickness.

1. Height: **-**For children who can stand, a stadiometer should be used.

Table 1: Height (cm) of preschool children (3-5 years) reported from NIN datasets: -

|  |  |  |
| --- | --- | --- |
| Age (Years) | Boys | Girls |
| 3 | 94.9 | 93.9 |
| 4 | 102.9 | 101.6 |
| 5 | 109.9 | 108.4 |

1. Weight: - For children less than two years of age, use a calibrated beam or a digital infant scale.

Table 2: Body weight (kg) of preschool children (3-5 years) reported from NIN growth standards:

|  |  |  |
| --- | --- | --- |
| Age (Years) | Boys | Girls |
| 3 | 15.3 | 15.0 |
| 4 | 16.5 | 16.0 |
| 5 | 18.5 | 18.3 |

1. Mid- Upper Arm Circumference: - MUAC is an accurate way to measure fat- free mass. This factor helps determine the development of muscles that is a good tool for screen and determining the risk of mortality in children.
2. Head circumference: Head circumference was taken by round of head. The child was asked to stand stately.
3. Waist Circumference: - To measure waist circumference, patients should stand with their arms crossed on the contralateral shoulders.
4. Body Mass Index (BMI): - BMI is a calculation based on the height and weight of the child and is recommended by the CHDP guidelines for all children older than two years of age. The formulas for the calculation of BMI in children are as follows:

BMI = Weight (kg) / Height (m2)

BMI = weight in pounds / [height in inches x height in inches] x 703

**Results and Discussion:**

The analysis and interpretation of the data of the study are based on the collected through self-structured questionnaire on (A) demographic and socioeconomic status and (B) Anthropometric measurements of preschool children (3-5 years).

1. **Demographic and socio-economic status of preschool children**

This section of the present study discusses the demographic profile under various parameters such as age, gender, family size, educational status of the family etc. further socioeconomic status of the study subject was assessed on the kuppuswamy scale that contains aspects such as family income, working members of family etc.

1. **Age**

Table 3: Distribution of the respondent according to Age

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Age of Preschool Child** | | | | |
| Years | Frequency N=385 | Percent | Valid Percent | Cumulative Percent |
| 3 | 81 | 21 | 21 | 21 |
| 4 | 185 | 48.1 | 48.1 | 69.1 |
| 5 | 119 | 30.9 | 30.9 | 100 |
| Total | 385 | 100 | 100 |  |

The furnished in the table (3) indicated that 21.0 % of the children were belonging to the age of 3 years old, 48.1 % of the children were belonging to the age of 4 years old and 30.9 % of the children were belonging to the age of 5 years old. Thus, it was found that the majority (48.1%) of respondent were in the age group of 4 years old. This information is crucial for accurate and meaningful analyses, allowing researchers to identify demographic trends, target specific age groups for interventions or marketing strategies, and explore age-related factors influencing outcomes within the dataset. The observed distribution emphasizes the importance of considering age as a relevant demographic variable in research studies, as different age groups may exhibit distinct behaviors, preferences, or responses to stimuli, necessitating tailored approaches in data interpretation and decision-making. In conclusion, the frequency and cumulative frequency distribution provide valuable insights into the age composition of the participant sample, enabling researchers to draw meaningful conclusions and formulate targeted strategies based on age-related trends within the data set.

1. **Gender**

Table 4: Distribution of the respondent according to Gender

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gender of Preschool Child** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Male | 211 | 54.8 | 54.8 | 54.8 |
| Female | 174 | 45.2 | 45.2 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The result furnished in the table (4) indicates that majority of 54.8 % of the respondent sample were male and 45.2 % of respondent sample were female in the age group of 3-5 years old. This highlights potential gender-related biases or disparities in recruitment, participation, or representation. Also, this distribution provides valuable insights into the gender representation within the surveyed population. Understanding the gender composition of the sample is crucial for ensuring the validity and generalizability of study findings, especially in fields where gender-related factors play a significant role. Gender-specific analyses can provide valuable insights into gender related phenomena and inform gender-sensitive interventions or policies. Ethical considerations should also be considered, as acknowledging and addressing gender disparities in research is essential for producing valid, reliable, and socially responsible findings that accurately reflect diverse perspectives and experiences. Ensuring fairness and equity in participant recruitment and representation is essential for upholding ethical standards in research practices. Understanding these demographics is crucial for interpreting the results accurately and drawing meaningful conclusions from the data.

1. **Education of respondent**

Table 5: Distribution according to Education Status

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Education of Child** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Play School | 385 | 100.0 | 100.0 | 100.0 |

The result furnished on table (5) indicates that the education status of participants was 100 %.

1. **Family type of respondent**

Table 6: Distribution of the family type of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type of Family** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Joint Family | 66 | 17.1 | 17.1 | 17.1 |
| Nuclear Family | 319 | 82.9 | 82.9 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The result furnished in the table (6) indicates that majority of 17.1 % of the respondent family type were belonging to the joint family and 82.9 % of the respondent family type were belonging to the nuclear family.

1. **Number of family members**

Table 7: Distribution of family members

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Family Members** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 2 members | 92 | 23.9 | 23.9 | 23.9 |
| 3 members | 117 | 30.4 | 30.4 | 54.3 |
| 4 members | 175 | 45.5 | 45.5 | 99.7 |
| 6 members | 1 | .3 | .3 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished in the table (7) indicated that 23.9 % of the family members were belong to the category of 2 members, 30.4 % of the family members were belong to the category of 3 members, 45.5 % of the family members were belong to the category of 4 members and 0.3 % of the family members were belong to the category of 6 members. Thus, it was found that the majority (45.5%) of the family members were belong to the category of 4 members.

1. **Education of family members**

Table 8: Distribution of education of family members

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Literacy of Family Member** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Literate | 378 | 98.2 | 98.2 | 98.2 |
| Illiterate | 7 | 1.8 | 1.8 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished in the table (8) indicated that 98.2 % of the family members education were belong to the category of literate and 1.8 % of the family members education were belong to the category of illiterate. Thus, it was found that the majority (98.2%) of the family members education were belong to the category of literate.

1. **Occupation of family members:**

Table 9: Distribution of occupation of family members of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Occupation of Family Member** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Employed | 231 | 60.0 | 60.0 | 60.0 |
| Unemployed | 13 | 3.4 | 3.4 | 63.4 |
| Business | 73 | 19.0 | 19.0 | 82.3 |
| Farmer | 68 | 17.7 | 17.7 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished data in the table (9) indicates that 60.0 % % of the family members were belong to the category of Employed, 3.4 % of the family members were belong to the category of unemployed, 19.0 % of the family members were belong to the category of Business and 17.7 % of the family members were belong to the category of farmer. Figure (1) offers valuable insights into the occupational distribution of the respondents, providing a comprehensive understanding of the employment landscape within the surveyed population. Occupational status is a crucial determinant of socio-economic well-being, access to resources, and overall quality of life. Analysing the distribution across various occupational categories can illuminate patterns of employment, economic activity, and potential implications for social policies and interventions.

1. **Monthly household Income:**

Table 10: Distribution according to the family income per month

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monthly Household Income** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Less than 5,000 Rupee | 60 | 15.6 | 15.6 | 15.6 |
| 5,000-10,000 Rupee | 228 | 59.2 | 59.2 | 74.8 |
| 10,000-15,000 Rupee | 51 | 13.2 | 13.2 | 88.1 |
| 15,000-20,000 Rupee | 46 | 11.9 | 11.9 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished data of table (10) indicates that the 15.6 % of the respondent were belong to the category of less than 5000-rupee monthly income, 59.2 % of the respondent were belong to the category of 5,000-10,000 rupees monthly income, 13.2 % of the respondent were belong to the category of 10,000-15,000 rupees monthly income and 11.9 % of the respondent were belong to the category of 15,000-20,000 rupees monthly income. Therefore, suggesting a considerable proportion transitioning into the middle-income bracket. This group may experience a slightly higher standard of living compared to the lower income brackets, with greater financial stability and access to some discretionary spending.

1. **Anthropometric measurement of preschool children**

Anthropometric measurements are non-invasive quantitative measurements of the body, used to assess nutritional status in children and adults. They can also help determine body composition in adults, identify underlying nutritional status. The core elements of anthropometry include height, weight, head circumference, MUAC (Mid Upper Arm Circumference), waist circumference and BMI.

1. **Height:**

Height is a measure of the length of a child from the top of the head to the soles of the feet when standing straight, without shoes. It is used to assess the child’s overall growth and development, particularly to monitor if they are growing within expected ranges for their age.

Table 11: Distribution of height of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Height of the Child in Centimetres** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 88 | 4 | 1.0 | 1.0 | 1.0 |
| 92 | 4 | 1.0 | 1.0 | 2.1 |
| 98 | 4 | 1.0 | 1.0 | 3.1 |
| 100 | 12 | 3.1 | 3.1 | 6.2 |
| 101 | 18 | 4.7 | 4.7 | 10.9 |
| 102 | 12 | 3.1 | 3.1 | 14.0 |
| 103 | 26 | 6.8 | 6.8 | 20.8 |
| 104 | 58 | 15.1 | 15.1 | 35.8 |
| 105 | 40 | 10.4 | 10.4 | 46.2 |
| 106 | 23 | 6.0 | 6.0 | 52.2 |
| 107 | 41 | 10.6 | 10.6 | 62.9 |
| 108 | 12 | 3.1 | 3.1 | 66.0 |
| 109 | 25 | 6.5 | 6.5 | 72.5 |
| 110 | 4 | 1.0 | 1.0 | 73.5 |
| 111 | 27 | 7.0 | 7.0 | 80.5 |
| 112 | 28 | 7.3 | 7.3 | 87.8 |
| 113 | 19 | 4.9 | 4.9 | 92.7 |
| 114 | 4 | 1.0 | 1.0 | 93.8 |
| 115 | 4 | 1.0 | 1.0 | 94.8 |
| 116 | 4 | 1.0 | 1.0 | 95.8 |
| 117 | 16 | 4.2 | 4.2 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished data of table (11) contributes that 1 % of the respondent belong to the category of 88 cm of height, 1% of the respondent belong to the category of 92 cm of height, 1 % of the 98 cm of height, 3.1 % of the respondent belong to the category of 100 cm of height, 4.7 % of the respondent belong to the category of 101 cm of height, 3.1 % of the respondent belong to the category of 102 cm of height, 6.8 % of the respondent belong to the category of 103 cm of height, 15.1 % of the respondent belong to the category of 104 cm of height, 10.4 % of the respondent belong to the category of 105 cm of height, 6.0 % of the respondent belong to the category of 106 cm of height, 10.6 % of the respondent belong to the category of 107 cm of height, 3.1 % of the respondent belong to the category of 108 cm of height, 6.5 % of the respondent belong to the category of 109 cm of height, 1.0 % of the respondent belong to the category of 110 cm of height, 7.0 % of the respondent belong to the category of 111 cm of height, 7.3 % of the respondent belong to the category of 112 cm of height, 4.9 % of the respondent belong to the category of 113 cm of height, 1.0 % of the respondent belong to the category of 114 cm of height, 1.0 % of the respondent belong to the category of 115 cm of height, 1.0 % of the respondent belong to the category of 116 cm of height and 4.2 % of the respondent belong to the category of 117 cm of height. The study presents the demographic profile of the population, focusing on the total number of individuals surveyed and their height distribution. Future research could explore the relationship between height and socio-economic or health indicators.

1. **Weight:**

Weight is the measure of a child’s mass, usually taken with a calibrated scale. Weight is an important indicator of nutritional status. Significant deviations from expected weight ranges can indicate undernutrition, overnutrition, or health conditions.

Table 12: Distribution of weight of respondent

|  |  |  |
| --- | --- | --- |
| **Weight** | | |
| **Kg** | **Frequency (N=385)** | **Percentage (%)** |
| 12 | 7 | 1.8 |
| 13 | 16 | 4.2 |
| 14 | 54 | 14 |
| 15 | 133 | 34.5 |
| 16 | 119 | 31.1 |
| 17 | 44 | 11.4 |
| 18 | 4 | 1 |
| 19 | 4 | 1 |
| 20 | 4 | 1 |

The furnished data of table (12) contributes that the 1.8 % respondent belongs to the category of 12 kg of weight, 4.2 % respondent belongs to the category of 13 kg of weight, 14 % respondent belongs to the category of 14 kg of weight, 34.5 % respondent belongs to the category of 15 kg of weight, 31.1 % respondent belongs to the category of 16 kg of weight, 11.4 % respondent belongs to the category of 17 kg of weight, 1 % respondent belongs to the category of 18 kg of weight, 1 % respondent belongs to the category of 19 kg of weight and 1 % respondent belongs to the category of 20 kg of weight. Potential health implications of different weight categories among preschool children, including risks associated with underweight, overweight, and obesity. Consider short-term and long-term consequences for physical health, psychosocial well-being, and development. Also, promoting healthy weight status and addressing modifiable risk factors to support optimal growth and development during the preschool years.

1. **Head circumference:**

Head circumference is the measurement around the largest part of a child’s head, just above the eyebrows and ears. It is used to monitor brain growth and development in children, as abnormal measurements may suggest neurological conditions or malnutrition.

Table 13: Distribution of head circumference of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Head Circumference in Centimetres** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 41 | 4 | 1.0 | 1.0 | 1.0 |
| 42 | 59 | 15.3 | 15.3 | 16.4 |
| 43 | 158 | 41.0 | 41.0 | 57.4 |
| 44 | 76 | 19.7 | 19.7 | 77.1 |
| 45 | 16 | 4.2 | 4.2 | 81.3 |
| 46 | 16 | 4.2 | 4.2 | 85.5 |
| 47 | 24 | 6.2 | 6.2 | 91.7 |
| 48 | 20 | 5.2 | 5.2 | 96.9 |
| 49 | 8 | 2.1 | 2.1 | 99.0 |
| 50 | 4 | 1.0 | 1.0 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished data of table (13) contributes that the 1.0 % respondent belongs to the category of 41 cm of head circumference, 15.3 % respondent belongs to the category of 42 cm of head circumference, 41 % respondent belongs to the category of 43 cm of head circumference, 19.7 % respondent belongs to the category of 44 cm of head circumference, 4.2 % respondent belongs to the category of 45 cm of head circumference, 4.2 % respondent belongs to the category of 46 cm of head circumference, 6.2 % respondent belongs to the category of 47 cm of head circumference, 5.2 % respondent belongs to the category of 48 cm of head circumference, 2.1 % respondent belongs to the category of 49 cm of head circumference and 1.0 % respondent belongs to the category of 50 cm of head circumference. Possible explanations for variations in head circumference measurements observed in existing literature on head circumference and child development. Consider potential interventions or preventive strategies aimed at promoting optimal head growth and neurodevelopment in children.

1. **Mid Upper Arm Circumference:**

MUAC is the circumference of the upper arm, measured at the midpoint between the shoulder and the elbow. It is a quick and effective screening tool to assess nutritional status, particularly for detecting undernutrition. A low MUAC is often used to identify children at risk of malnutrition.

Table 14: Distribution of MUAC of respondent

|  |  |  |
| --- | --- | --- |
| **Mid Upper Arm Circumference** | | |
| **cm** | **Frequency (N)** | **Percentage (%)** |
| 13 | 4 | 1 |
| 14 | 67 | 17.4 |
| 15 | 61 | 15.8 |
| 16 | 110 | 28.6 |
| 17 | 105 | 27.3 |
| 18 | 38 | 9.9 |

The furnished data of table (14) contributes that the 1 % respondent belongs to the category of 13 cm of MUAC, 17.4 % respondent belongs to the category of 14 cm of MUAC, 15.8 % respondent belongs to the category of 15 cm of MUAC, 28.6 % respondent belongs to the category of 16 cm of MUAC, 27.3 % respondent belongs to the category of 17 cm of MUAC and 9.9 % respondent belongs to the category of 18 cm of MUAC. Implications of the MUAC measurements in the context of nutritional assessment. Highlight the significance of MUAC as a simple, non-invasive indicator of acute malnutrition in preschool children and also, further investigation, such as longitudinal studies to assess the predictive value of MUAC for long-term health outcomes in preschool children.

1. **Waist Circumference:**

Waist circumference is the measurement around the waist at the level of the navel (belly button). This measurement can help assess the risk of overweight or obesity in children. It is often used alongside other measurements like BMI to understand body fat distribution.

Table 15: Distribution of waist circumference of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Waist Circumference in Centimetres** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 41 | 4 | 1.0 | 1.0 | 1.0 |
| 42 | 4 | 1.0 | 1.0 | 2.1 |
| 43 | 54 | 14.0 | 14.0 | 16.1 |
| 44 | 136 | 35.3 | 35.3 | 51.4 |
| 45 | 153 | 39.7 | 39.7 | 91.2 |
| 46 | 30 | 7.8 | 7.8 | 99.0 |
| 47 | 4 | 1.0 | 1.0 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The analysis of data of table (15) contributes that the 1 % respondent belongs to the category 41 cm of waist circumference, 1 % respondent belongs to the category 42 cm of waist circumference, 14 % respondent belongs to the category 43 cm of waist circumference, 35.3 % respondent belongs to the category 44 cm of waist circumference, 39.7 % respondent belongs to the category 45 cm of waist circumference, 7.8 % respondent belongs to the category 46 cm of waist circumference and 1 % respondent belongs to the category 47 cm of waist circumference. Implications of the observed waist circumference measurements for the health and well-being of preschool children. Consider how waist circumference relates to body composition, abdominal adiposity, and risk factors for chronic diseases. And, the observed waist circumference measurements align with established reference values or growth standards for preschool children.

1. **Body Mass Index (BMI):**

BMI is calculated using the formula:

**BMI = Weight (kg) / Height (m)2**

BMI is used to assess whether a child has a healthy weight for their height. It can be used to identify underweight, normal weight, overweight, or obesity in children, though growth charts specific to children’s age and sex are essential for interpreting BMI in this age group.

Table 16: Distribution of BMI of respondent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **BMI** | | | | | |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Under weight | 294 | 76.4 | 76.4 | 76.4 |
| Normal | 72 | 18.7 | 18.7 | 95.1 |
| overweight | 12 | 3.1 | 3.1 | 98.2 |
| Obese | 7 | 1.8 | 1.8 | 100.0 |
| Total | 385 | 100.0 | 100.0 |  |

The furnished data of table (16) contributes that the 76.4 % of respondent among the category of underweight, 18.7 % of respondent among the category of normal, 3.1 % of respondent among the category of overweight and 1.8 % of respondent among the category of obese. Potential factors that may influence BMI among preschool children, such as diet quality, physical activity levels, parental feeding practices, socioeconomic status, and environmental factors and also, promoting healthy weight management and preventing obesity among preschool children. This may include strategies targeting diet, physical activity, screen time, and the food environment.

**Conclusion:**

**The study discussed the demographic and socioeconomic status of study subject.**

The study reveals that the majority of respondents (48.1%) were aged 3-5 years old. The majority of the respondents were in joint families, with a majority of their family members being 4 members. The majority of the respondents were educated, with 98.2% of their family members being literate. The majority of respondents were employed, with a small percentage being unemployed. The majority of respondent family had monthly incomes between 5,000-10,000 rupees and 15,000-20,000 rupees.

**Anthropometric measurement of preschool children**

1. Height**:**

According to the data that a majority of respondents fall into the categories of 88 cm, 92 cm, 98 cm, 100 cm, 101 cm, 102 cm, 103 cm, 104 cm, 105 cm, 106 cm, 107 cm, 108 cm, 109 cm, 110 cm, 111 cm, 113 cm, 114 cm, 115 cm, 116 cm, and 117 cm.

1. Weight**:**

The majority of respondents weigh 12 kg, 4.2 kg, 14 kg, 15 kg, 16 kg, 17 kg, 18 kg, 19 kg, and 20 kg. They have a head circumference of 41 cm, 15.3 cm, 42 cm, 43 cm, 44 cm, 45 cm, 46 cm, 47 cm, 48 cm, 2.1%, 2.1%, 49 cm, and 50 cm.

1. MUAC:

The survey reveals that a significant percentage of respondents fall into the 13 cm, 17.4 cm, 15.8 cm, 28.6 cm, 27.3 cm, and 9.9 cm categories of MUAC.

1. Waist circumference:

The majority of respondents have a waist circumference of 41 cm, 42 cm, 43 cm, 44 cm, 45 cm, 7.8%, 46 cm, and 47 cm. 76.4% of respondents are underweight, 18.7% are normal, 3.1 % are overweight, and 1.8 % are obese.

1. BMI:

The data also shows that 76.4 % of respondents are obese, with 18.7% being normal, 3.1 % being overweight, and 1.8 % being obese. These findings highlight the diverse weight categories and head circumferences among respondents.

**Reference:**

* Van Stralen, M.M., Te Velde, S.J., Van Nassau, F., Brug, J., Grammatikaki, E., Maes, L., De Bourdeaudhuij, I., Verbestel, V., Galcheva, S., Iotova, V. and Koletzko, B.V., 2012. Weight status of European preschool children and associations with family demographics and energy balance‐related behaviours: a pooled analysis of six European studies. *Obesity reviews*, *13*, pp.29-41.
* Nanayakkara, V., Renzaho, A., Oldenburg, B. and Ekanayake, L., 2013. Ethnic and socio-economic disparities in oral health outcomes and quality of life among Sri Lankan preschoolers: a cross-sectional study. *International journal for equity in health*, *12*, pp.1-9.
* Anderson, M.A., 1979. Comparison of anthropometric measures of nutritional status in preschool children in five developing countries. *The American Journal of Clinical Nutrition*, *32*(11), pp.2339-2345.
* Johnson, M.D., Yamanaka, W.K. and Formacion, C.S., 1984. A comparison of anthropometric methods for assessing nutritional status of preschool children: The Philippines study. *Journal of tropical pediatrics*, *30*(2), pp.96-104.
* Chen, L.C., Chowdhury, A.A. and Huffman, S.L., 1980. Anthropometric assessment of energy-protein malnutrition and subsequent risk of mortality among preschool aged children. *The American journal of clinical nutrition*, *33*(8), pp.1836-1845.
* Eisenmann, J.C., Heelan, K.A. and Welk, G.J., 2004. Assessing body composition among 3‐to 8‐year‐old children: Anthropometry, bia, and dxa. *Obesity research*, *12*(10), pp.1633-1640.
* Bandikolla, V. and Harika, V.C., 2015. A study on Anthropometric Measurements of Preschool children. *International Journal of Advanced Research*, *3*(12), pp.1603-1606.
* Zemel, B.S., Riley, E.M. and Stallings, V.A., 1997. Evaluation of methodology for nutritional assessment in children: anthropometry, body composition, and energy expenditure. *Annual review of nutrition*, *17*(1), pp.211-235.
* Gorstein, J., Sullivan, K., Yip, R., De Onis, M., Trowbridge, F., Fajans, P. and Clugston, G., 1994. Issues in the assessment of nutritional status using anthropometry. *Bulletin of the World health Organization*, *72*(2), p.273.
* Phogat, R., Rani, G., Manjunath, B.C., Kumar, A. and Rani, V., 2023. Relationship of Anthropometric Measurements and Nutritional Status with Early Childhood Caries among Rural Preschool Children–A Cross-sectional Analytical Study. *Journal of Indian Association of Public Health Dentistry*, *21*(4), pp.306-312.