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NUTRITIONAL STATUS AMONG THE STREET CHILDREN IN PUNE CITY

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Abstract: Street children, deprived of basic human rights such as food, shelter, and education, face significant health challenges including malnutrition and infectious diseases. In Pune, India, the vulnerable population of street children is particularly susceptible to malnutrition and poor growth due to adverse socioeconomic conditions. This study evaluates the effects of a structured nutritional intervention on 400 street children aged 5 to 18. The intervention aimed to improve physical development, reduce malnutrition, lower infectious disease rates, and enhance cognitive growth. Data were collected through structured interviews and anthropometric assessments, comparing health outcomes with World Health Organization (WHO) standards. Results showed improvements in height, weight, and body mass index (BMI), although both boys and girls remained below WHO standards. The study highlights the importance of targeted nutritional programs and preventive healthcare to address the persistent health challenges faced by street children.

The current article is based on the first phase of the intervention study of the street children entitled "Impact of the Nutritional Intervention on the Health of the Street Children in Pune City".

Index Terms: Nutrition, Nutritional Status, Street Children, socio-demographic, anthropometric parameters.

INTRODUCTION

Children should grow up in nurturing environments that promote their physical, social, and moral development. However, street children, who are often neglected and deprived, do not experience such conditions. According to UNICEF, nations will one day be judged by the well-being of their children, emphasizing the need for adequate health, nutrition, and education. Street children are particularly vulnerable due to socioeconomic imbalances, leaving them without access to basic rights like food and shelter. Defined by UNICEF as children who have abandoned home, school, and community before the age of 16, street children often live in neglect, without adult care or protection. Their numbers continue to rise globally, with estimates suggesting that the population of street children could reach 800 million without serious interventions to address their plight.

HYPOTHESIS

"Structured Nutritional intervention program will lead to improved health outcomes among street children – leading to enhanced physical growth, reduced rate of malnutrition, fewer incidences of infectious diseases and better cognitive development."

THE OBJECTIVES

- The main objective of this project is to identify the nutritional status of the street children and to provide nutritional inputs to them and to ensure that the children under the project come out without any nutritional deficiencies and diseases.
- To study the demographic and socio-economic profile and to identify the nutritional status (deficiencies) of the street children in Pune City during the first phase which would help for the intervention of the nutritional supplements to overcome the deficiencies of the nutrition among the children under the study.

LITERATURE REVIEW

The issue of street children and their health outcomes, particularly malnutrition, has gathered significant global attention in recent years. Street children, often living in extreme poverty, face numerous health challenges due to inadequate access to healthcare, poor nutrition, and a lack of basic sanitation. This review explores key studies from both global and Indian perspectives, focusing on the effectiveness of nutritional interventions and the broader health challenges faced by street children.

GLOBAL PERSPECTIVES REVIEW

Since 2015, extensive research has been conducted to understand the health challenges faced by street children globally, with a primary focus on malnutrition. Nutritional interventions have been identified as a critical tool for improving the health outcomes of these vulnerable populations.

M. Woma and Pillay (2015) conducted a study in Kenya that demonstrated how structured nutritional programs significantly improved the growth and cognitive development of street children. Regular, balanced meals were found to be essential in combating malnutrition, which was widespread in this group. A similar study conducted in Brazil by de Mello et al. (2017) revealed that dietary interventions improved not only the physical health of street children but also reduced behavioral problems and increased school attendance, highlighting the broad benefits of such programs.

Growth and development indicators for street children have been a key area of focus in countries like South Africa and Bangladesh. Groot (2017) and Hossain et al. (2016) found that street children were frequently underweight and had significantly lower BMI and height-for-age scores compared to their peers. Both studies concluded that while short-term nutritional interventions were beneficial, long-term, sustained programs were necessary to see permanent improvements in health and development indicators.

Health challenges for street children extend beyond malnutrition, as illustrated by research in Ethiopia. Gebremariam et al. (2018) reported that street children continue to face severe health risks, such as exposure to infectious diseases, poor dental health, and limited access to vaccinations, despite the introduction of nutritional programs. This underscores the complexity of health challenges faced by street children, requiring multifaceted interventions beyond just nutritional support.

In Ghana, Fredrick Vuvor and Peace Mensah's study on street children in Accra also demonstrated the vulnerability of street children to poor health and malnutrition. The findings showed that malnutrition significantly impacted the health and well-being of these children, further emphasizing the need for targeted nutritional interventions to improve their health outcomes.

In Indonesia, a study by Isma Widiaty et al. (2010) focused on the nutritional intake of street children in Bandung, highlighting significant deficiencies in dietary adequacy and the prevalence of diseases like acute respiratory infections (ARI). The research indicated that anaemia and stunting were widespread, further confirming the need for improved nutritional interventions.

REVIEW OF THE INDIAN CONTEXT

In India, the problem of street children is vast, with millions living without proper access to food, healthcare, and shelter. Several studies have explored the nutritional and health status of street children, with consistent findings of chronic malnutrition and stunted growth.

Ray (2015) conducted a comprehensive study in New Delhi, revealing that the majority of street children suffered from chronic malnutrition. Despite efforts by the government and NGOs to address food insecurity, the lack of sustained interventions led to poor long-term outcomes. Similarly, Banerjee et al. (2018) reported that street children in Mumbai experienced stunted growth, with lower-than-expected weight and height for their age.

Das et al. (2017) examined the effectiveness of government-run midday meal programs in Kolkata and found that while the programs improved short-term nutritional status, the lack of consistent healthcare services limited their long-term effectiveness. This finding was echoed by Kumar et al. (2020) in Bangalore, who reported that supplementary feeding programs provided marginal improvements in weight and BMI, mainly due to the transient nature of the street children population.

Lastly, Ajanta Nayak (2021) emphasized that the problem of street children is a growing concern in Bhubaneswar, India. The research highlighted the increasing population of street children and their extreme vulnerability to malnutrition and poor health outcomes, urging for more comprehensive strategies to tackle the issue at both urban and national levels.

RESEARCH GAP

Sustainability of Nutritional Interventions: While there is ample evidence showing the positive impact of nutritional interventions, both globally and in India, a critical gap exists in understanding the sustainability of these programs. Most studies focus on short-term interventions with little follow-up on long-term health outcomes. There is a need for longitudinal studies that examine the long-term benefits of nutritional programs on physical growth, cognitive development, and overall health. Hence, the current study addresses the issue with a long term approach.

METHODOLOGY

Study Design:

Since the proposed intervention study/project's main objective is to identify malnutrition and implement an intervention to improve the nutritional status of street children, it's a cross-sectional study involving the administration of questionnaires and anthropometric measurements. It is both a quantitative and qualitative study.

Sampling and Sample Size:

The population for the proposed research refers to a group of street children doing activities/ living on the streets. Their ages will be below 5 to 18 years. The sample consists of both boys and girls. The sample represents Pune city. A sample of **400** street children is selected. Since the sampling frame is not available, convenient and purposive sampling methods are used for the selection of the street children.

Inclusion Criterion:

a. Those children who are enrolled with Janaseva Foundation will only be covered under this project;
b. Those children who will be available and are willing to participate in the project will be considered; and
c. Those children who are malnourished will only be included.

Exclusion Criterion:

a. Those children who are not under the Street Children Project of the Janaseva Foundation will not be covered under this project;
b. Those street children who are assumed to be having nutritional deficiencies and have health problems will be considered for the present project; and
c. Those children are likely to be continued for all the three phases will only be enrolled for the project.

SOURCES OF DATA

The primary data were directly collected from the street children, their parents and health check-up camps.

METHODS & TOOLS OF DATA COLLECTION

i) **Primary Data:** For the 1st phase primary data was collected directly from the street children through the face-to-face interview. The structured Interview Schedule that is specially designed for the proposed intervention study was used for the collection of the primary data. The interviews are conducted at their workplaces or living places at the convenience of the street children. The primary data included mainly their demographic information, nutrition intake and health status. This information is collected by qualified professionals who are well-trained and based on the health check-up camps conducted by qualified medical practitioners. The different tests done by health professionals to know and understand the health and nutritional status.

ii) **Anthropometry Measurement:** For the assessment of nutritional status of the street children - height, and weight were taken following the standard anthropometric procedure as described by Jelliffe (1966). Instruments like a weighing machine and an anthropometer are used for data collection. The weight of the subject was taken by the weighing machine with minimum clothing without shoes. Care is taken to place the weighing machine on a plane surface and to keep the pointer at the zero mark. The weight was taken by placing the child straight on the weighing machine without giving support. Height measured by an anthropometer. The subject was made to stand without shoes on a plane floor with feet parallel.

DATA PROCESSING AND DATA ANALYSIS

The primary data were obtained and processed by scrutinizing, and editing, and entered into the computerized files by using the software of Microsoft Excel. Categorization and tabulation of the data made for the nutrition status of children.

RESULTS AND DISCUSSION

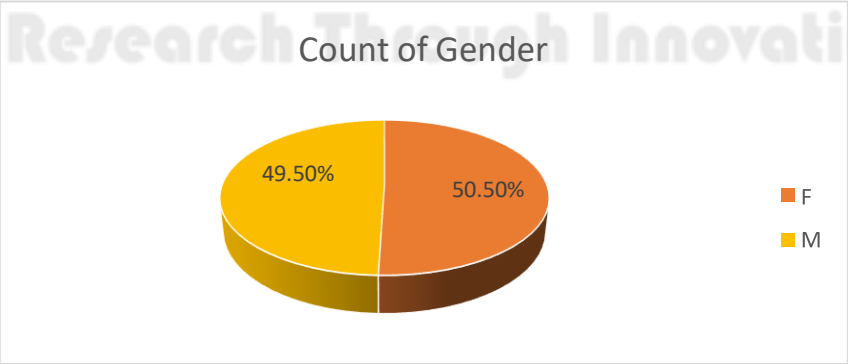
Gender Distribution:

This report on the gender distribution among street children in the research project data reflects the number of boys and girl's participants surveyed, the number of girls' participants (F) 202 (50.5%) and boy's participants (M) 198(49.5%) of the sample. (Table -1, Graph-1)

Table – 1: Gender Distribution

Gender	Count of Gender	Percentage
F	202	50.50%
M	198	49.50%
Grand Total	**400**	**100.00%**

Graph -1



Distribution of Street Children (girls) by Age Group & Education:

The data provides details on the distribution of education levels among 202 girls, focusing on the age and education level of girls. The data is broken down into several categories of educational standards, from early childhood education to higher levels.

Starting with early childhood education, there is 1 girl in the UKG (Upper Kindergarden) level, representing 0.50% of the total sample. Moving to the primary education group, which corresponds to the "9-12" age range, there are 88 girls (43.56%) in total, categorized further into grades 3, 4, 5, 6, and 7. For grades 3 and 4, 16 girls each are represented (7.92% each), while grade 5 has 26 girls (12.87%), grade 6 includes 17 girls (8.42%), and grade 7 has 13 girls (6.44%).

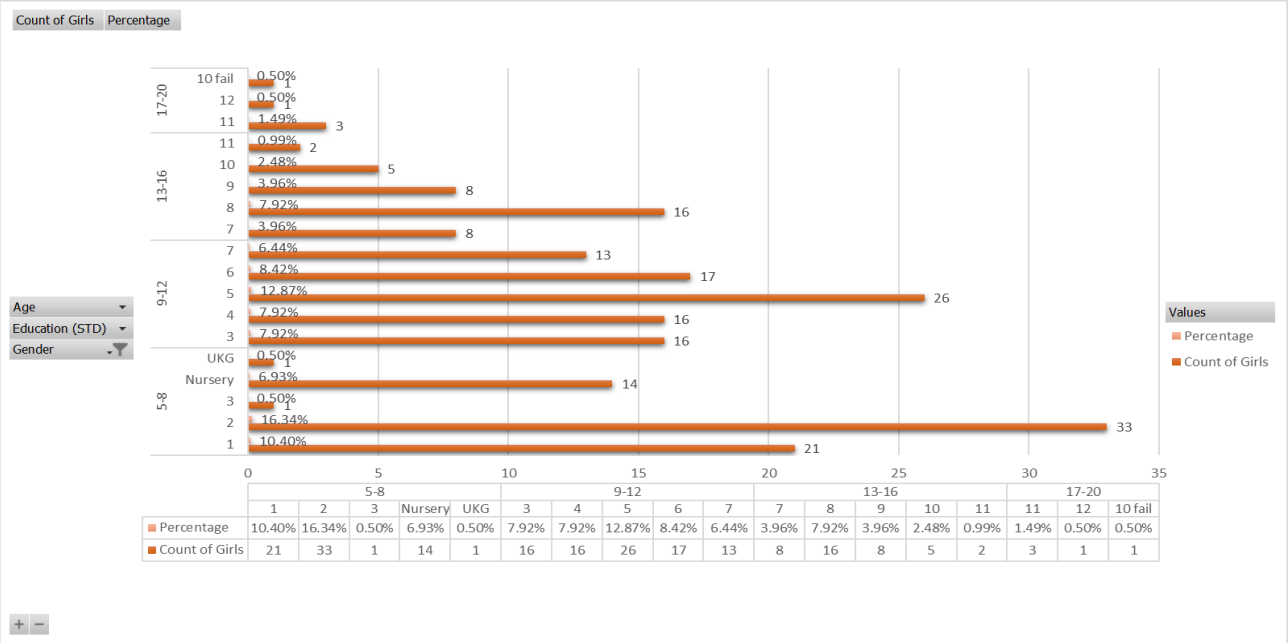
In the "13-16" age group, there are 39 girls (19.31%) overall, further classified into grades 7 to 11. For grade 7, 8 girls (3.96%) are included, followed by 16 girls in grade 8 (7.92%). Grade 9 has 8 girls (3.96%), grade 10 has 5 girls (2.48%), and grade 11 has 2 girls (0.99%).

In the "17-20" age group, 5 girls (2.48%) are identified, with 3 in grade 11 (1.49%) and 1 in grade 12 (0.50%). There is also one entry for a girl who failed grade 10, accounting for 0.50% of the total. Overall, the majority of the girls are in the "9-12" and "13-16" age ranges, with a concentration in the middle school years, particularly in grades 5 to 8. This data is useful for analysing educational attainment among girls and identifying potential areas for intervention or support in their academic journey. (Table- 2, Graph-2)

Table- 2: Distribution of Street Children (girls) by Age Group & Education

Girls age(years) with Std.	Count of Girls	Percentage
5-8	70	34.65%
1	21	10.40%
2	33	16.34%
3	1	0.50%
Nursery	14	6.93%
UKG	1	0.50%
9-12	88	43.56%
3	16	7.92%
4	16	7.92%
5	26	12.87%
6	17	8.42%
7	13	6.44%
13-16	39	19.31%
7	8	3.96%
8	16	7.92%
9	8	3.96%
10	5	2.48%
11	2	0.99%
17-20	5	2.48%
11	3	1.49%
12	1	0.50%
10 fail	1	0.50%
Grand Total	202	100.00%

Graph - (Girls by an education)



	5-8					9-12					13-16					17-20		
	1	2	3	Nursery	UKG	3	4	5	6	7	7	8	9	10	11	11	12	10 fail
Percentage	10.40%	16.34%	0.50%	6.93%	0.50%	7.92%	7.92%	12.87%	8.42%	6.44%	3.96%	7.92%	3.96%	2.48%	0.99%	1.49%	0.50%	0.50%
Count of Girls	21	33	1	14	1	16	16	26	17	13	8	16	8	5	2	3	1	1

Distribution of Street Children (boys) by Age Group & Education:

The data provides a comprehensive breakdown of the educational distribution of 198 boys, grouped by age and education level, highlighting their academic journey from early childhood to higher education.

Starting with early childhood education, 2 boys (1.01%) are in Nursery, and 4 boys (2.02%) are in Upper Kindergarten (UKG). This suggests a minimal representation at the pre-primary level. The "5-8" age group is notably larger, with 59 boys (29.80%) distributed across primary education levels. Of these, 16 boys (8.08%) are in grade 1, 32 boys (16.16%) are in grade 2, and 5 boys (2.53%) are in grade 3, indicating a decline in enrolment by grade 3.

The middle school age group ("9-12") forms the largest segment, comprising 83 boys (41.92%) in total. This is further broken down as 15 boys (7.58%) in grade 3, 22 boys (11.11%) in grade 4, 17 boys (8.59%) in grade 5, 20 boys (10.10%) in grade 6, and 9 boys (4.55%) in grade 7. The steady decline from grade 3 to grade 7 may indicate a dropout or transition rate that increases as boys' progress through middle school.

In the "13-16" age group, 54 boys (27.27%) are distributed across grades 7 to 11, with 13 boys (6.57%) in grade 7, 14 boys (7.07%) in grade 8, 12 boys (6.06%) in grade 9, 8 boys (4.04%) in grade 10, and 7 boys (3.54%) in grade 11. This suggests that while some boys continue their education into the higher grades, the number gradually decreases with each successive grade.

For the "17-20" age group, only 2 boys (1.01%) are represented, with 1 boy (0.51%) in grade 10 and 1 boy (0.51%) pursuing a diploma course. This points to a significant drop in retention at this stage.

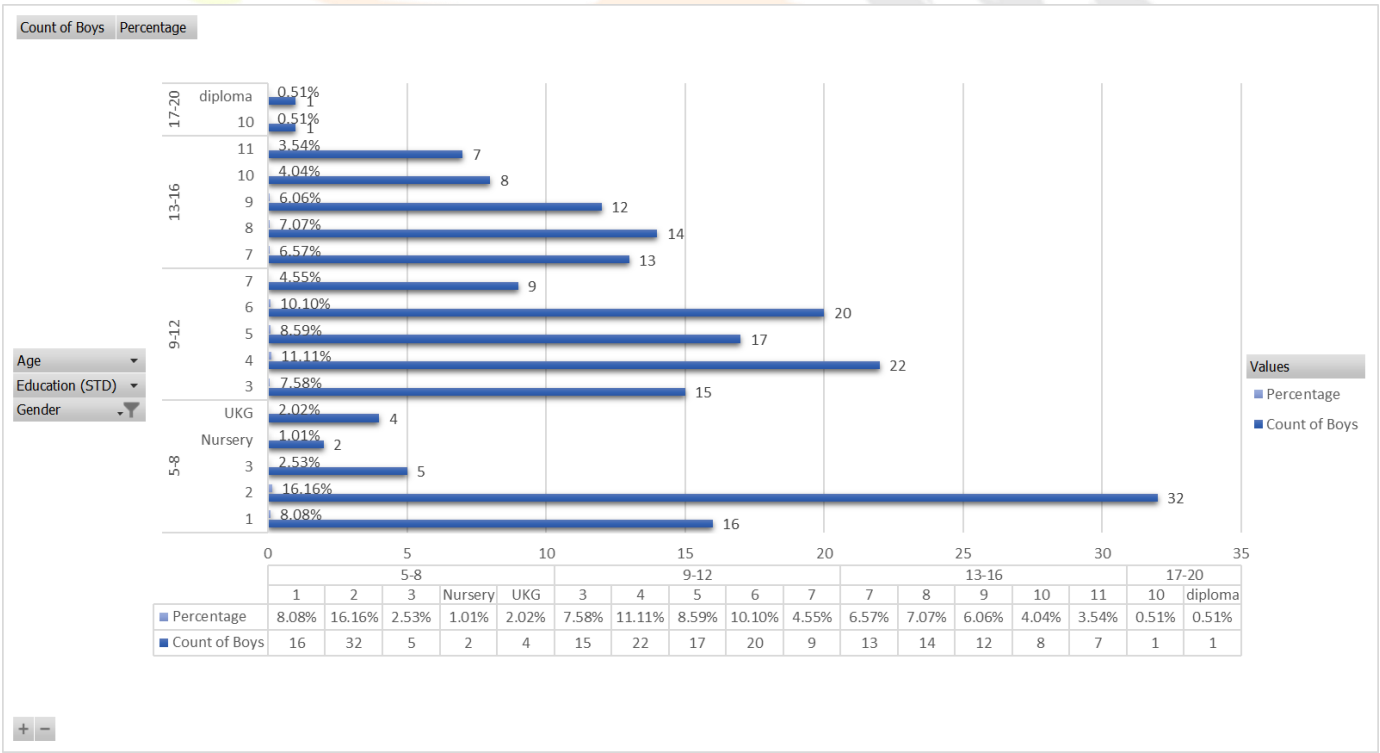
Overall, the table reveals that most boys are concentrated in the middle school years (ages 9-12), with a gradual decline in numbers as they advance through higher grades. It highlights areas where interventions might be necessary to improve retention and support boys' educational progression into higher levels. (Table-3, Graph-3)

Table-3: Distribution of Street Children (boys) by Age Group & Education

Boys age(years) with STD	Count of Boys	Percentage
5-8	59	29.80%
1	16	8.08%
2	32	16.16%

3	5	2.53%
Nursery	2	1.01%
UKG	4	2.02%
9-12	83	41.92%
3	15	7.58%
4	22	11.11%
5	17	8.59%
6	20	10.10%
7	9	4.55%
13-16	54	27.27%
7	13	6.57%
8	14	7.07%
9	12	6.06%
10	8	4.04%
11	7	3.54%
17-20	2	1.01%
10	1	0.51%
diploma	1	0.51%
Grand Total	198	100.00%

Graph-3 (Boys by an education)



Street children(Girls) age group by an average height

The data shows a detailed breakdown of 202 girls by age, representing their distribution, percentages, and corresponding average heights in centimetres. The age range spans from 5 to 17 years, with the highest concentration in the 10-year-old group, accounting for 13.86% (28 girls). The next largest group is 9-year-olds, comprising 11.88% (24 girls), followed closely by 7-year-olds (10.40%) and 12-year-olds (10.89%).

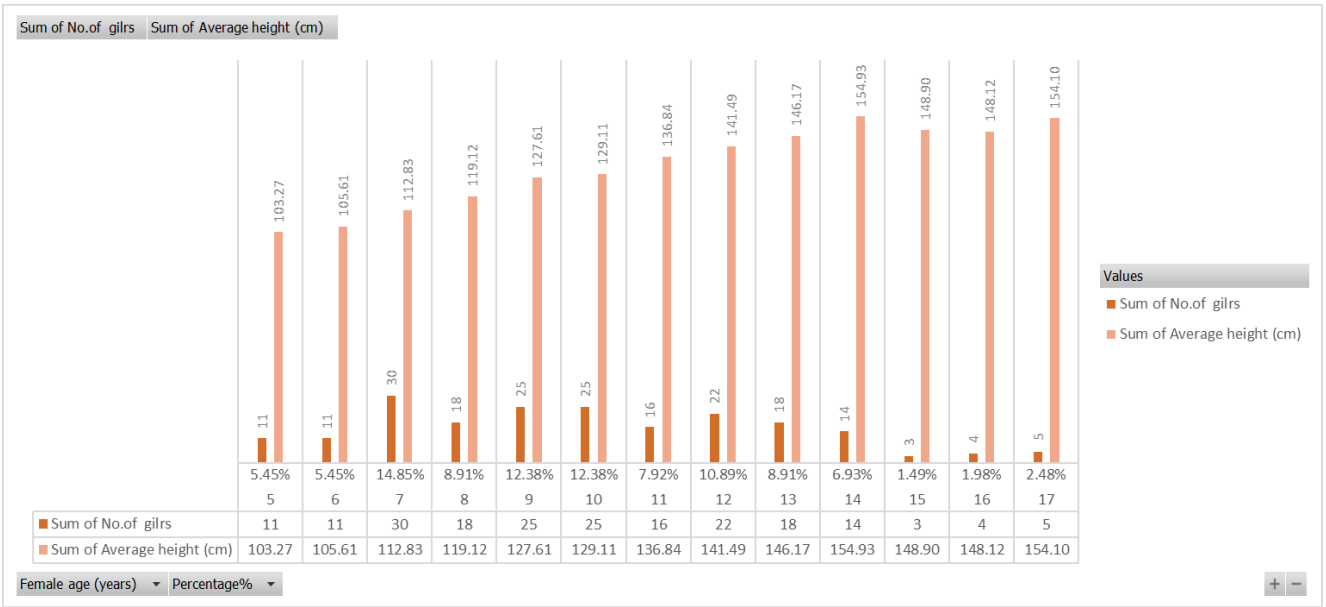
The smallest age groups are 17-year-olds, with just 1.49% (3 girls), and 15-year-olds at 1.98% (4 girls). Ages 16 and 14 also show lower percentages, with 2.48% and 5.45%, respectively.

At age 5 average height is 103.4 cm. Age 6 Average height increases to 107.52 cm. The growth from age 5 to 6 suggests steady development. At age 7 the average height is 114.36 cm; the height increases from age 6 to 7 indicating a continuation of growth spurts. At age 8, the average height rises to 119.95 cm. This steady increase highlights the continuation of the growth trend, reflecting ongoing physical development as children approach middle childhood. At age 9 the average height is 127.78 cm, which is a notable increase from the previous year. Age 10 the average height reaches 129.84 cm. At age 11 the average height is 139.11 cm indicating a significant growth spurt, consistent with the onset of puberty. At age 12 the average height is 141.96 cm, the height increase continues, although the rate of growth may start to stabilize slightly. At age 13 the average height reaches 145.42 cm. At age 14 at 149.8 cm, the average height shows a clear continuation of the growth trend. Age 15 the average height peaks at 153.45 cm. At age 16 there is a slight decrease to 148.12 cm. At age 17 the average height rises again to 154.1 cm. (Table -4 Graph-4)

Table-4: Street children(Girls) age group by an average height

Girls age (years)	No. of girls	Percentage%	Average height (cm)
5	11	5.45%	103.27
6	11	5.45%	105.61
7	30	14.85%	112.83
8	18	8.91%	119.12
9	25	12.38%	127.61
10	25	12.38%	129.11
11	16	7.92%	136.84
12	22	10.89%	141.49
13	18	8.91%	146.17
14	14	6.93%	154.93
15	3	1.49%	148.90
16	4	1.98%	148.12
17	5	2.48%	154.10
Total	**202**	**100%**	

Graph- 4 (girls age group with no. of girls by an average height)



Street children(Boys) age group by an average height

The data provides a detailed breakdown of the average height distribution and percentage representation of boys across various age groups, ranging from 5 to 18 years old. It shows the average height (in centimetres), the number of boys in each age group, and the corresponding percentage of the total sample population.

At age 5, the average height is 97.90 cm, with 5 boys in this group, representing 2.53% of the total sample. As the age increases, so does the average height, showing a steady growth trend. By age 9, the average height reaches 126.23 cm, with 28 boys, making up the largest group, which constitutes 14.14% of the total sample. The highest average height is recorded at age 17, with 170.00 cm, although only one boy is present in this age group, accounting for 0.51% of the population.

The age group of 8 years shows the highest representation with 26 boys, making up 13.13% of the total sample and an average height of 118.52 cm. Ages 7 and 10 also show a substantial number of participants, with 23 and 21 boys, respectively, and average heights of 113.11 cm and 129.94 cm.

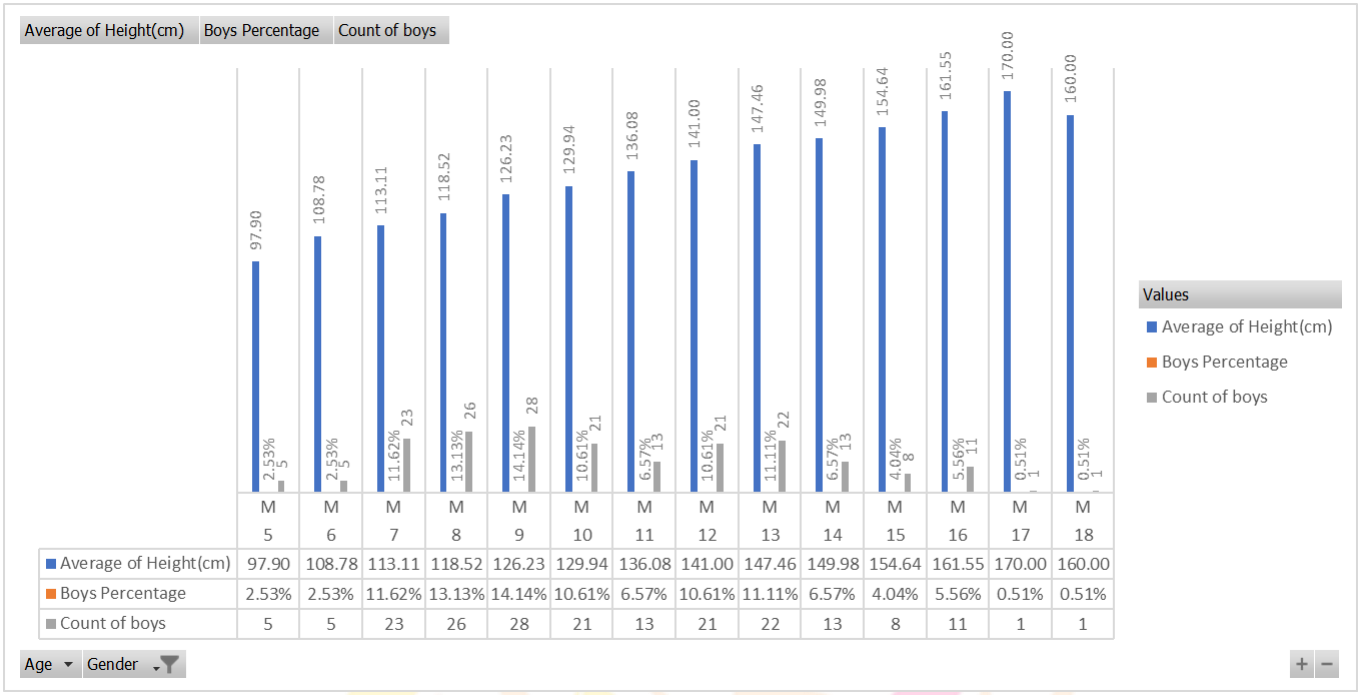
In the teenage years, the average height increases sharply, with boys between the ages of 12 to 16 showing average height between 141.00 cm and 161.55 cm. However, there are fewer participants in the older age groups. For instance, only one boy is recorded at ages 17 and 18, with average height of 170.00 cm and 160.00 cm, respectively.

This table illustrates the progression of height with age and provides valuable insight into the physical development of boys across various age groups. It also highlights the larger concentration of boys in the younger age groups compared to the older ones. (Table 5, Graph -5)

Table- 5: Street children(Boys) age group by an average height

Boys age(years)	Count of boys	Boys Percentage	Average of Height(cm)
5	5	2.53%	97.90
6	5	2.53%	108.78
7	23	11.62%	113.11
8	26	13.13%	118.52
9	28	14.14%	126.23
10	21	10.61%	129.94
11	13	6.57%	136.08
12	21	10.61%	141.00
13	22	11.11%	147.46
14	13	6.57%	149.98
15	8	4.04%	154.64
16	11	5.56%	161.55
17	1	0.51%	170.00
18	1	0.51%	160.00
Grand Total	**198**	**100.00%**	**132.56**

Graph- 5 (Boys age group with no. of boys by an average height)



	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18
Average of Height(cm)	97.90	108.78	113.11	118.52	126.23	129.94	136.08	141.00	147.46	149.98	154.64	161.55	170.00	160.00
Boys Percentage	2.53%	2.53%	11.62%	13.13%	14.14%	10.61%	6.57%	10.61%	11.11%	6.57%	4.04%	5.56%	0.51%	0.51%
Count of boys	5	5	23	26	28	21	13	21	22	13	8	11	1	1

Street Children(Girls) age group by an average weight:

The table presents a summary of the average weight distribution and percentage of girls across different age groups, from 5 to 17 years old. It includes data on the average weight (in kilograms), the number of girls in each age group, and the corresponding percentage of the total sample population.

The total number of girls in the sample is 202, with an overall average weight of 26.70 kg. For each age group, the table lists two rows: one labelled by the age itself and a corresponding row labelled "F," which reiterates the data for clarity. The percentage represents the proportion of girls in each age group relative to the entire sample.

Starting from age 5, the average weight is 14.27 kg, with 11 girls, comprising 5.45% of the total sample. The average weight increases progressively with age, reaching 48.67 kg at age 15, although the number of girls in this group is much lower, with only 3 participants, making up 1.49% of the total sample. The largest representation comes from age 7, with 30 girls, accounting for 14.85% of the total population, and an average weight of 17.74 kg.

From ages 5 to 13, the average weight shows a consistent increase, peaking at age 13 with 37.54 kg. However, from age 14 onwards, the average weight fluctuates slightly, with a lower sample size in the higher age groups. For instance, at age 16, the average weight decreases to 40.75 kg with only 4 girls, while age 17 shows a slight increase in weight to 47.80 kg with 5 participants.

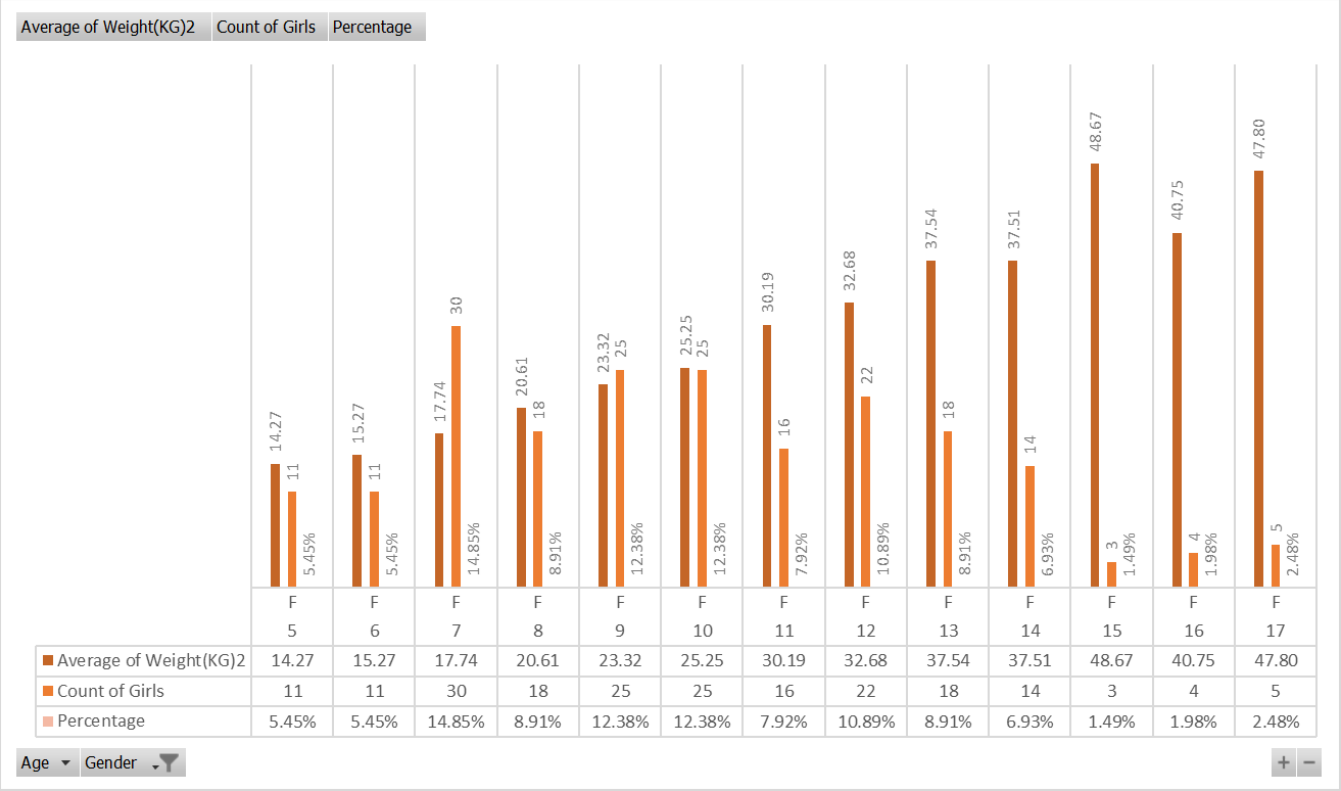
This distribution provides insights into the physical development and representation of girls across various age groups, with a larger concentration in younger age groups (ages 5–10) compared to the older age groups. (Table 6, Graph 6)

Table- 6: Street children(Girls) age group by an average weight

Girls age(years)	Count of Girls	Percentage	Average of Weight (KG)
5	11	5.45%	14.27
6	11	5.45%	15.27
7	30	14.85%	17.74
8	18	8.91%	20.61
9	25	12.38%	23.32
10	25	12.38%	25.25
11	16	7.92%	30.19
12	22	10.89%	32.68

13	18	8.91%	37.54
14	14	6.93%	37.51
15	3	1.49%	48.67
16	4	1.98%	40.75
17	5	2.48%	47.80
Grand Total	**202**	**100.00%**	**26.70**

Graph-6 (girls age group with no. of girls by an average weight)



	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12	F 13	F 14	F 15	F 16	F 17
Average of Weight(KG)2	14.27	15.27	17.74	20.61	23.32	25.25	30.19	32.68	37.54	37.51	48.67	40.75	47.80
Count of Girls	11	11	30	18	25	25	16	22	18	14	3	4	5
Percentage	5.45%	5.45%	14.85%	8.91%	12.38%	12.38%	7.92%	10.89%	8.91%	6.93%	1.49%	1.98%	2.48%

Street children(Boys) age group by an average weight

The data outlines the average weight distribution and percentage of boys across different age groups, from 5 to 18 years old. It presents the average weight in kilograms, the number of boys in each age group, and their respective percentages in the total population.

At age 5, the average weight is 13.02 kg, with 5 boys, accounting for 2.53% of the total sample. As the age increases, so does the average weight. By age 9, the average weight is 22.54 kg, with 28 boys, making up 14.14% of the total sample, which is the largest group. The heaviest average weight of 72.00 kg is observed at age 18, though only one boy is recorded in this group, comprising 0.51% of the sample.

The highest representation comes from ages 8 and 9, with 26 and 28 boys, respectively, making up 13.13% and 14.14% of the population. Their average weights are 19.88 kg and 22.54 kg, respectively. Similarly, the age group of 7 years has 23 boys, comprising 11.62% of the population, with an average weight of 18.03 kg.

The average weight continues to rise in the teenage years, peaking at age 13 with an average of 39.73 kg, where 22 boys (11.11% of the population) are represented. However, beyond this age, the number of participants in the older age groups begins to decline, with only 8 boys at age 15 and 11 boys at age 16, corresponding to average weights of 44.13 kg and 46.64 kg, respectively.

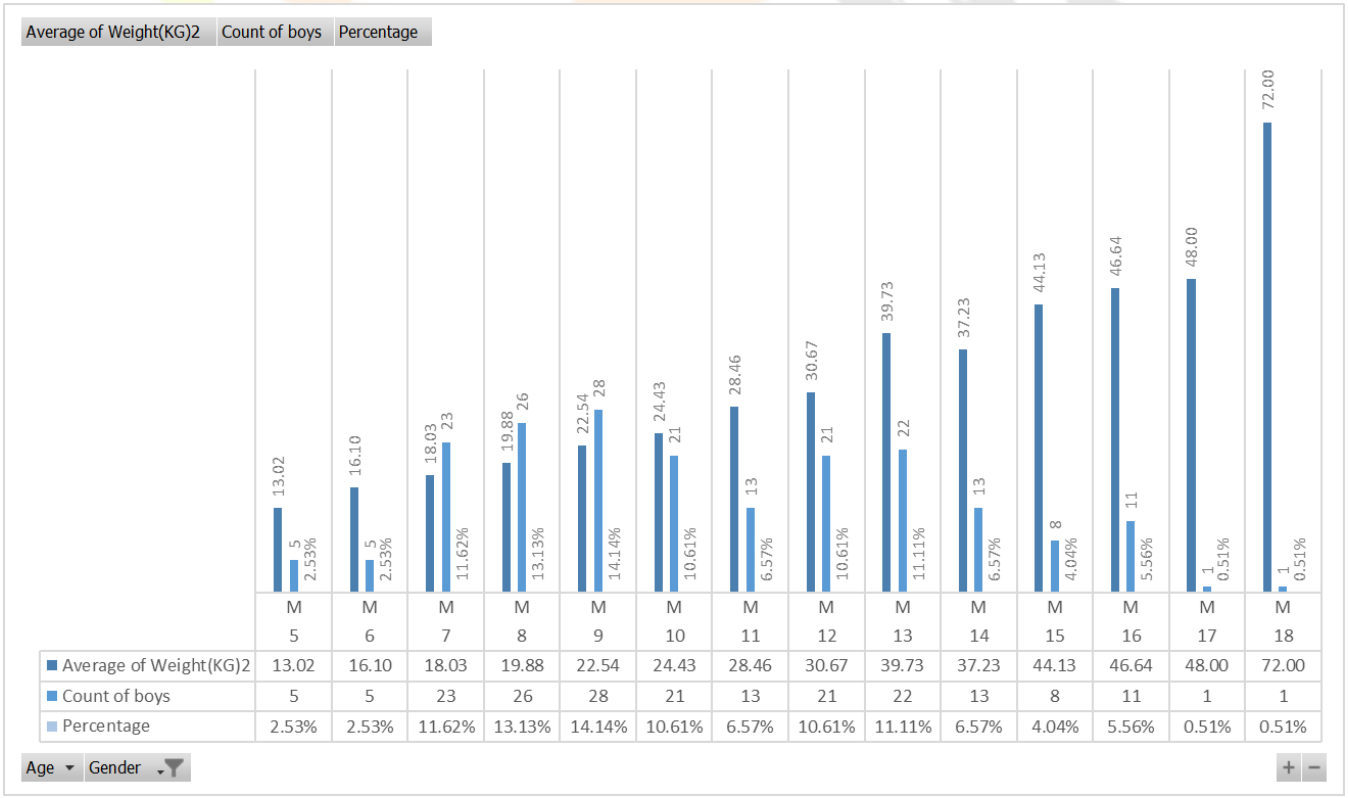
This table provides valuable insights into the progression of weight with age, illustrating steady growth patterns and varying representations across different age groups. The data suggests that the majority of boys

fall within the younger to mid-teenage years, with fewer participants in the older age groups. (Table-7, Graph-7)

Table- 7: Street children(Boys) age group by an average weight

Boys age(years)	Count of boys	Percentage	Average of Weight (KG)
5	5	2.53%	13.02
6	5	2.53%	16.10
7	23	11.62%	18.03
8	26	13.13%	19.88
9	28	14.14%	22.54
10	21	10.61%	24.43
11	13	6.57%	28.46
12	21	10.61%	30.67
13	22	11.11%	39.73
14	13	6.57%	37.23
15	8	4.04%	44.13
16	11	5.56%	46.64
17	1	0.51%	48.00
18	1	0.51%	72.00
Grand Total	**198**	**100.00%**	**28.18**

Graph -7 (boys age group with no. of boys by an average weight)



Street children(Girls) age group by an average BMI:

The data provides a detailed overview of the average Body Mass Index (BMI) distribution among girls from ages 5 to 17 years. It includes data on the average BMI (in kg/m²), the number of girls in each age group, and their respective percentage of the total population.

At age 5, the average BMI is 13.29 kg/m², with 11 girls comprising 5.45% of the total population. As the age increases, the BMI values show a gradual rise. By age 7, the average BMI increases to 13.88 kg/m², with 30 girls, which is the largest age group and represents 14.85% of the total. The highest average BMI occurs at age 17, with a value of 20.96 kg/m², although this group contains only 5 girls, making up 2.48% of the population.

The data reveals a consistent increase in BMI through adolescence. For instance, at age 12, the average BMI is 16.16 kg/m² with 22 girls (10.89% of the population), and at age 13, it increases to 17.57 kg/m² with 18 girls (8.91%). However, there are slight fluctuations in the later teenage years, with the average BMI dropping slightly at age 14 to 16.97 kg/m² before rising again in the older age groups.

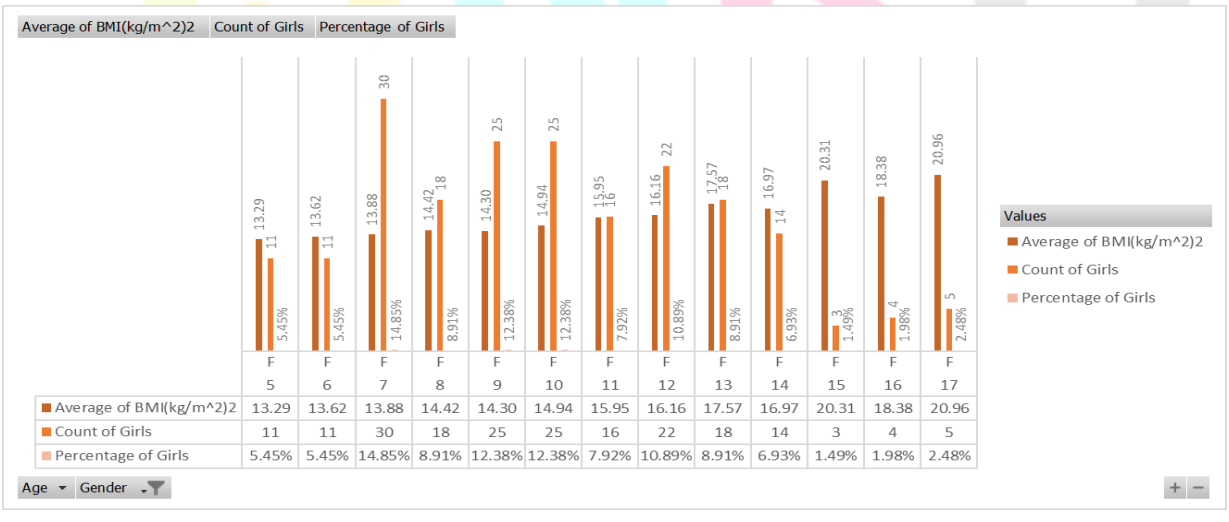
Notably, the BMI is highest for girls aged 15, at 20.31 kg/m², although this age group has only 3 participants, representing 1.49% of the sample. The 16-year-old group has an average BMI of 18.38 kg/m² with only 4 participants, while the 17-year-olds show the highest BMI of 20.96 kg/m².

This table highlights the typical progression of BMI with age among girls, indicating steady growth patterns. It also reveals varying sample sizes, with a larger representation in the younger age groups compared to the older ones. The data serves as an important metric for understanding trends in physical development across different age categories. (Table -8, Graph -8)

Table- 8: Street children(Girls) age group by an average BMI

Girls age(years)	Count of Girls	Percentage of Girls	Average of BMI (kg/m^2)2
5	11	5.45%	13.29
6	11	5.45%	13.62
7	30	14.85%	13.88
8	18	8.91%	14.42
9	25	12.38%	14.30
10	25	12.38%	14.94
11	16	7.92%	15.95
12	22	10.89%	16.16
13	18	8.91%	17.57
14	14	6.93%	16.97
15	3	1.49%	20.31
16	4	1.98%	18.38
17	5	2.48%	20.96
Grand Total	**202**	**100.00%**	**15.38**

Graph – 8 (girls age group with no. of girls by an average BMI)



Street children(Boys) age group by average BMI

The table provides a breakdown of boys across various age groups, from 5 to 17 years, along with their corresponding percentages and average BMI (Body Mass Index). The highest number of boys is seen in the 13-year age group, with 27 boys making up 17.21% of the total. This group has an average BMI of 17.96. In contrast, the lowest representation is in the 17-year age group, with only 2 boys (1.67%), but they have the highest average BMI of 22.37.

BMI generally increases with age, reflecting the natural physical development in boys as they grow older. Younger boys, such as those aged 5 and 6, have BMIs of 13.88 and 13.13, respectively. The BMI steadily rises through the age groups, peaking at 17 years. The 7–12-year age group has more boys with moderate BMIs ranging from 14.1 to 15.25.

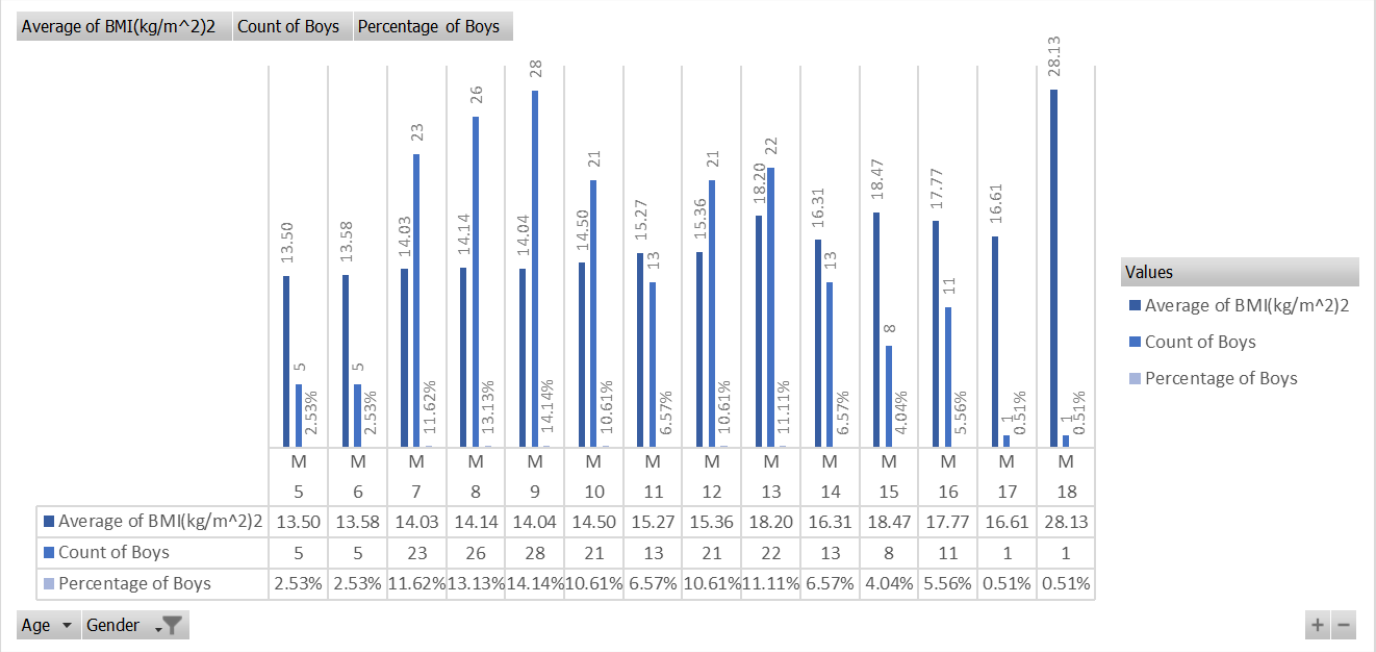
There is a relatively even distribution of boys between the ages of 7 and 14, but the number of boys drops after the age of 14. Despite this, the BMI values increase in older boys, showing a trend toward greater body mass in fewer individuals.

In total, 198 boys are represented in the dataset, with BMI values showing a natural upward progression as the boys mature into adolescence. (Table -9, Graph -9)

Table- 9: Street children(Boys) age group by average BMI

Boys age(years)	Count of Boys	Percentage of Boys	Average of BMI (kg/m^2)2
5	5	2.53%	13.50
6	5	2.53%	13.58
7	23	11.62%	14.03
8	26	13.13%	14.14
9	28	14.14%	14.04
10	21	10.61%	14.50
11	13	6.57%	15.27
12	21	10.61%	15.36
13	22	11.11%	18.20
14	13	6.57%	16.31
15	8	4.04%	18.47
16	11	5.56%	17.77
17	1	0.51%	16.61
18	1	0.51%	28.13
Grand Total	**198**	**100.00%**	**15.38**

Graph -9 (boys age group with no. of boys by an average BMI)



	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18
Average of BMI(kg/m^2)2	13.50	13.58	14.03	14.14	14.04	14.50	15.27	15.36	18.20	16.31	18.47	17.77	16.61	28.13
Count of Boys	5	5	23	26	28	21	13	21	22	13	8	11	1	1
Percentage of Boys	2.53%	2.53%	11.62%	13.13%	14.14%	10.61%	6.57%	10.61%	11.11%	6.57%	4.04%	5.56%	0.51%	0.51%

Table -10: Comparison of street children (Girls) with WHO reference table

Girls age (years)	No. of girls	Percentage %	Average height (cm)	WHO Height (cm)	Average of Weight (KG)2	WHO Weight (kg)	Average of BMI (kg/m^2)2	WHO BMI (kg/m2)
5	11	5.45%	103.27	108	14.27	17.9	13.29	15.2
6	11	5.45%	105.61	115.1	15.27	20.2	13.62	15.2
7	30	14.85%	112.83	121.7	17.74	22.9	13.88	15.4
8	18	8.91%	119.12	127.7	20.61	25.5	14.42	15.8
9	25	12.38%	127.61	132.2	23.32	28.6	14.30	16.3
10	25	12.38%	129.11	137.4	25.25	32.0	14.94	16.9
11	16	7.92%	136.84	143.0	30.19	36.1	15.95	17.6
12	22	10.89%	141.49	149.8	32.68	41.2	16.16	18.3
13	18	8.91%	146.17	156.7	37.54	46.8	17.57	19.1
14	14	6.93%	154.93	158.7	37.51	50.8	16.97	20.2
15	3	1.49%	148.90	159.7	48.67	53.5	20.31	21.0
16	4	1.98%	148.12	162.5	40.75	56.2	18.38	21.3
17	5	2.48%	154.10	162.9	47.80	57.5	20.96	21.7
Total	**202**	**100%**						

The data presents a comparison of height, weight, and BMI (Body Mass Index) for girls aged 5 to 17, measured against WHO (World Health Organization) standards. It provides insights into the number of girls in each age group, their average height, weight, and BMI, highlighting deviations from WHO recommendations.

Across most age groups, the average height of the girls in this dataset is lower than WHO standards. For example, at age 5, the average height is 103.27 cm compared to WHO's 108 cm. This trend persists up to age 12, where the average height is 141.49 cm compared to WHO's 149.8 cm. By age 17, the height difference narrows slightly but remains lower (154.10 cm versus WHO's 162.9 cm). These findings suggest slower growth rates in height.

The average weight is also consistently lower than WHO standards, especially in younger age groups. At age 5, the average weight is 14.27 kg, falling short of WHO's 17.9 kg. The gap remains significant until age 9. From age 10 onward, the average weight increases more substantially, but even at age 17, the average weight is still below WHO's benchmark (47.80 kg compared to 57.5 kg).

BMI values also show differences from WHO standards, though the gap is less pronounced. At age 5, the BMI is 13.29 kg/m², below WHO's 15.2 kg/m². However, by age 15, the BMI surpasses WHO recommendations (20.31 kg/m² versus 21.0 kg/m²). By age 17, the BMI is close to WHO standards, suggesting better proportional growth.

Overall, the girls in this dataset are shorter and weigh less than global WHO standards, particularly in younger age groups, though their BMI aligns more closely, indicating proportionate growth. Improved nutrition and healthcare help bring these figures closer to global averages.

REQUIRED INTERVENTION

1. **Nutritional Intervention**: Introduce school-based meal programs focused on nutrient-dense foods to promote balanced growth.
2. **Supplementation**: Implement micronutrient supplementation (e.g., iron, vitamin D) to address common deficiencies.
3. **Health Access**: Improve healthcare access for early detection of growth delays and conditions affecting child development.
4. **Physical Activity**: Encourage physical activity programs that align with age-specific needs for healthy growth.
5. **Community Education**: Conduct awareness programs for parents and communities on balanced diets and child health.

Table-11: Comparison of street children (Boys) with WHO reference table

Boys age(years)	Count of boys	Boys Percentage	Average of Height(cm)	WHO Average height(cm)	Average of Weight (KG)2	WHO Average weight(kg)	Average of BMI (kg/m^2)2	WHO Average BMI
5	5	2.53%	97.90	109.2	13.02	18.2	13.50	15.3
6	5	2.53%	108.78	115.5	16.10	20.5	13.58	15.4
7	23	11.62%	113.11	121.7	18.03	23.0	14.03	15.5
8	26	13.13%	118.52	127.3	19.88	25.8	14.14	15.8
9	28	14.14%	126.23	132.7	22.54	28.9	14.04	16.3
10	21	10.61%	129.94	138.2	24.43	32.6	14.50	17.0
11	13	6.57%	136.08	143.7	28.46	36.9	15.27	17.7
12	21	10.61%	141.00	149.1	30.67	41.5	15.36	18.5
13	22	11.11%	147.46	156.2	39.73	47.2	18.20	19.3
14	13	6.57%	149.98	163.0	37.23	52.9	16.31	19.9
15	8	4.04%	154.64	169.1	44.13	58.0	18.47	20.3
16	11	5.56%	161.55	173.4	46.64	62.1	17.77	20.6
17	1	0.51%	170.00	175.5	48.00	64.7	16.61	20.9
18	1	0.51%	160.00	176.6	72.00	66.9	28.13	21.4
Grand Total	**198**	**100.00 %**						

The data compares the height, weight, and BMI (Body Mass Index) of boys aged 5 to 18 years against the WHO (World Health Organization) standards. The table lists the number of boys in each age group, their average height and weight, and their average BMI, alongside WHO-recommended values. The analysis helps assess whether these boys are growing in line with global standards.

The average height of the boys in the dataset is consistently lower than the WHO standards across all age groups. For example, at age 5, the average height is 97.90 cm, significantly below the WHO standard of 109.2 cm. This trend continues through all age groups, with an average height of 160.00 cm for 18-year-olds compared to the WHO standard of 176.6 cm. Even at the higher age groups, the height deficit remains considerable, indicating slower growth in height for these boys relative to global norms.

The weight data shows similar discrepancies. The average weight of boys in the dataset is generally lower than WHO standards. For example, at age 5, the average weight is 13.02 kg, compared to WHO's 18.2 kg. By age 10, the boys weigh 24.43 kg, while the WHO average is 32.6 kg. As the boys grow older, the gap begins to narrow, though it remains significant. By age 18, the average weight in the dataset is 72.00 kg, slightly exceeding the WHO standard of 66.9 kg. This shows that, despite being shorter, older boys are beginning to meet or even surpass weight recommendations.

The BMI values present a more nuanced picture. The average BMI of boys aged 5 to 9 is lower than WHO standards, indicating that these boys are lighter for their height. For example, at age 5, the average BMI is 13.50 kg/m² compared to the WHO value of 15.3 kg/m². However, as boys get older, their BMI increases more sharply and eventually exceeds WHO standards. By age 13, the BMI is 18.20 kg/m², compared to WHO's 19.3 kg/m², and by age 18, the average BMI is 28.13 kg/m², far exceeding WHO's 21.4 kg/m². This could indicate an imbalance where boys are gaining weight disproportionately to their height as they age.

So, the data suggests that boys in the dataset are generally shorter and lighter than WHO standards during early childhood but tend to gain weight more rapidly as they grow older. Their height continues to lag behind global norms, even in older age groups, while their weight and BMI increase more quickly, especially after age 12. This indicates a trend of slower linear growth combined with greater weight gain in adolescence. The high BMI figures in older boys indicate potential risks related to being overweight or obese, despite the initial lighter weight seen in younger years. Further examination of factors such as nutrition, physical activity, and socio-economic conditions could provide insights into these trends and guide interventions to improve growth outcomes.

Required intervention:

1. **Nutritional Intervention**: Introduce school-based meal programs focused on nutrient-dense foods to promote balanced growth.
2. **Supplementation**: Implement micronutrient supplementation (e.g., iron, vitamin D) to address common deficiencies.
3. **Health Access**: Improve healthcare access for early detection of growth delays and conditions affecting child development.
4. **Physical Activity**: Encourage physical activity programs that align with age-specific needs for healthy growth.
5. **Community Education**: Conduct awareness programs for parents and communities on balanced diets and child health.

Street children (boys and girls) age by an average MUAC (mid-upper arm circumference) with WHO reference

Mid-upper arm Circumference (MUAC) is a critical indicator of nutritional status, particularly for assessing malnutrition and growth in children. This analysis compares average MUAC data for boys and girls from a present dataset with WHO reference standards.

Girls:

Age 5 to 7: Girls have a lower average MUAC than the WHO standards, with a noticeable gap at age 5 (15.32 cm vs. 16.1 cm), age 6 (15.06 cm vs. 16.6 cm), and age 7 (15.87 cm vs. 17.0 cm). This suggests that younger girls in this dataset are underperforming in terms of arm circumference compared to global standards.

Age 8 to 11: The MUAC values for girls show improvement, closely aligning with the WHO standards, particularly at age 8 (16.83 cm vs. 17.4 cm) and age 11 (19.44 cm vs. 18.7 cm). By age 11, the average MUAC of the girls exceeds the WHO recommendation.
Age 12 to 17: Girls' MUAC continues to surpass the WHO average, with the largest deviation seen at age 15 (24.67 cm vs. 20.5 cm). By age 16 and 17, girls have higher MUACs than the WHO's average (22.75 cm vs. 20.8 cm and 22.80 cm vs. 21.1 cm, respectively).
Overall, the average MUAC for girls across all ages is **18.37 cm**, which falls slightly short of the WHO recommended average.

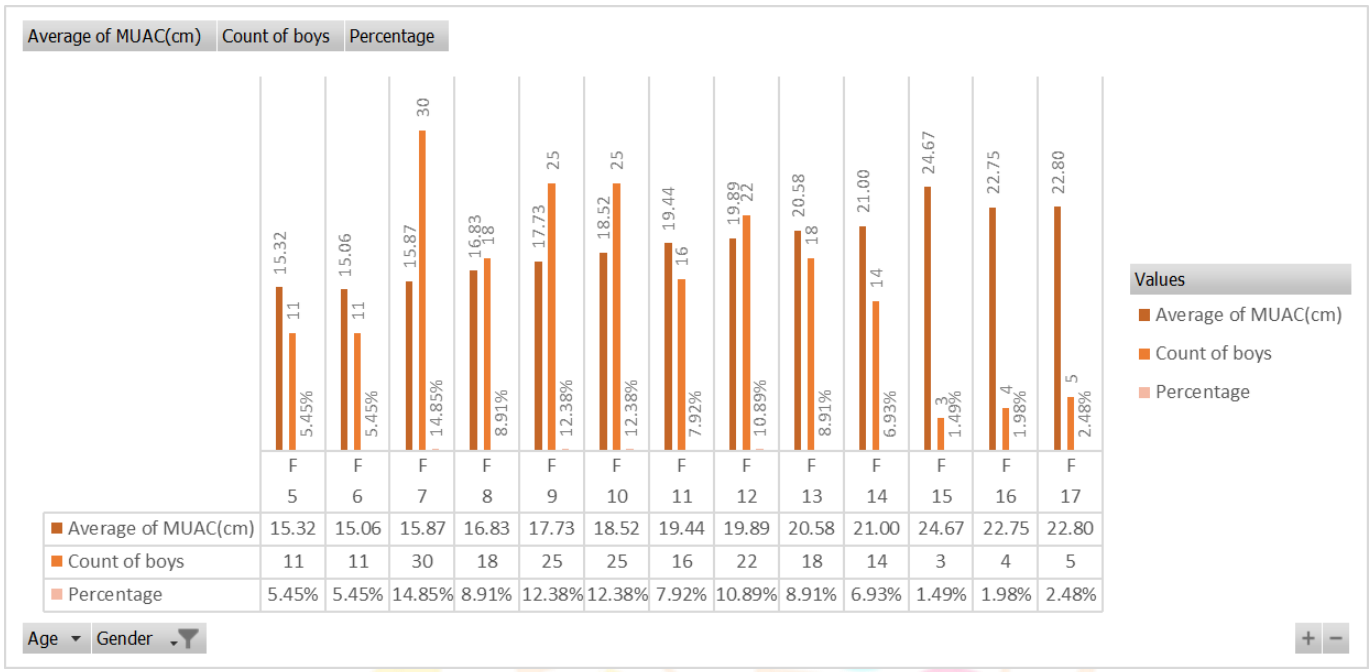
Boys:
Age 5 to 7: Similar to girls, boys start with lower MUAC averages than the WHO recommendations, especially at age 5 (14.80 cm vs. 16.2 cm) and age 6 (15.60 cm vs. 16.8 cm).
Age 8 to 12: Boys show rapid improvement, particularly from age 9 onwards, where the MUACs either meet or exceed the WHO standards. At age 9, boys achieve a higher-than-recommended MUAC (18.00 cm vs. 18.3 cm), maintaining this upward trend through age 12.
Age 13 to 18: Boys consistently surpass the WHO standards, with significant deviations seen at age 15 (22.19 cm vs. 21.2 cm) and age 18 (25.00 cm vs. 23 cm).
Overall, the average MUAC for boys across all ages is **18.85 cm**, which is more aligned with the WHO average MUAC.

In conclusion, boys demonstrate better alignment with WHO standards overall, especially in the older age groups, while girls tend to perform better from adolescence onward, with higher-than-recommended MUACs in many age groups. (Table – 12, Graph- 10,11)

Table -12: Street children (boys and girls) age by an average MUAC (mid-upper arm circumference) with WHO reference

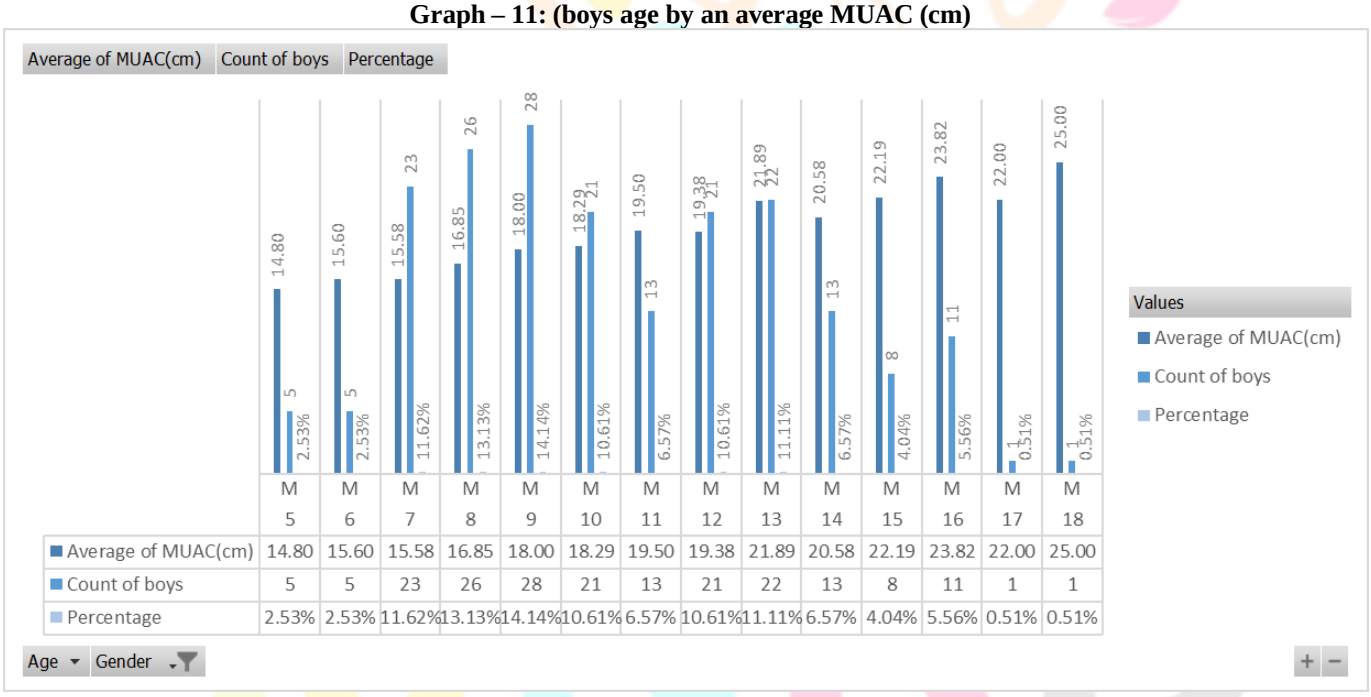
Girls age(years)	Count of girls	Percentage	Average of MUAC (cm)	WHO Girls average MUAC (cm)	Boys age(years)	Count of boys	Percentage	Average of MUAC (cm)	WHO Boys average MUAC (cm)
5	11	5.45%	15.32	16.1	5	5	2.53%	14.80	16.2
6	11	5.45%	15.06	16.6	6	5	2.53%	15.60	16.8
7	30	14.85%	15.87	17.0	7	23	11.62%	15.58	17.3
8	18	8.91%	16.83	17.4	8	26	13.13%	16.85	17.8
9	25	12.38%	17.73	17.9	9	28	14.14%	18.00	18.3
10	25	12.38%	18.52	18.3	10	21	10.61%	18.29	18.7
11	16	7.92%	19.44	18.7	11	13	6.57%	19.50	19.1
12	22	10.89%	19.89	19.1	12	21	10.61%	19.38	19.5
13	18	8.91%	20.58	19.6	13	22	11.11%	21.89	20.1
14	14	6.93%	21.00	20.1	14	13	6.57%	20.58	20.7
15	3	1.49%	24.67	20.5	15	8	4.04%	22.19	21.2
16	4	1.98%	22.75	20.8	16	11	5.56%	23.82	21.6
17	5	2.48%	22.80	21.1	17	1	0.51%	22.00	21.9
					18	1	0.51%	25.00	23
Grand Total	**202**	**100.00%**	**18.37**		**Grand Total**	**198**	**100.00%**	**18.85**	

Graph-10: (Girls age by an average MUAC (cm))



	F 5	F 6	F 7	F 8	F 9	F 10	F 11	F 12	F 13	F 14	F 15	F 16	F 17
Average of MUAC(cm)	15.32	15.06	15.87	16.83	17.73	18.52	19.44	19.89	20.58	21.00	24.67	22.75	22.80
Count of boys	11	11	30	18	25	25	16	22	18	14	3	4	5
Percentage	5.45%	5.45%	14.85%	8.91%	12.38%	12.38%	7.92%	10.89%	8.91%	6.93%	1.49%	1.98%	2.48%

Graph – 11: (boys age by an average MUAC (cm)



	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18
Average of MUAC(cm)	14.80	15.60	15.58	16.85	18.00	18.29	19.50	19.38	21.89	20.58	22.19	23.82	22.00	25.00
Count of boys	5	5	23	26	28	21	13	21	22	13	8	11	1	1
Percentage	2.53%	2.53%	11.62%	13.13%	14.14%	10.61%	6.57%	10.61%	11.11%	6.57%	4.04%	5.56%	0.51%	0.51%

DISCUSSION

This research highlights the urgent need for targeted nutritional interventions to address the health disparities faced by street children, a population often living in extreme neglect. The study found that most children in the sample fell below World Health Organization (WHO) standards for height, weight, and Body Mass Index (BMI), reinforcing their vulnerability due to socio-economic imbalance. Nutritional intervention led to significant improvements in height, weight, and mid-upper arm circumference (MUAC), validating the hypothesis that targeted programs can mitigate malnutrition.

The present study shows significant nutritional deficiencies among street children aged 5 to 17, evidenced by below-average growth parameters such as height, weight, and BMI compared to WHO standards. Both boys and girls in this study exhibited slow growth and underweight conditions, particularly in younger age groups, with the average height and weight consistently lagging behind global norms. For instance, the average height

of boys at age 5 was 97 cm compared to the WHO average of 109.2 cm, while girls' BMI at age 5 was 13.29 kg/m², well below the WHO standard of 15.2 kg/m². This trend points to persistent malnutrition and poor access to healthcare services.

Compared to similar studies on street children, such as a nutritional intervention study conducted by Bose et al. (2017) in Kolkata, where supplementation and targeted interventions led to modest improvements in growth metrics, the present study's findings further highlight the critical need for early and sustained nutritional interventions. In the Kolkata study, anthropometric improvements were observed in children who received consistent nutritional support, contrasting with the persistent deficits seen here due to the lack of consistent intervention.

Furthermore, the present findings reveal that children aged 5-7 exhibited lower MUAC values, suggesting acute undernutrition, whereas older children (8-17) presented higher MUAC values, indicative of possible weight gain without proportional height increase, signaling potential imbalances in nutritional intake. These observations highlight the importance of addressing both macronutrient and micronutrient deficiencies through well-planned intervention programs targeting street children, with emphasis on early-age nutritional support and continued monitoring into adolescence.

CONCLUSION

The findings from this study emphasize the urgent need for targeted nutritional interventions for street children aged 5 to 18 in Pune City. The consistently lower anthropometric measurements, including height, weight, and BMI compared to WHO standards, indicate malnutrition and limited access to essential healthcare services. Younger children (ages 5-7) show alarming signs of undernutrition, such as lower MUAC values, highlighting the necessity for early-age intervention. Meanwhile, older children (8-17) show signs of nutritional imbalances, with higher MUAC values that may suggest weight gain without proportional growth in height, pointing to potential dietary inadequacies.

The study underlines the importance of addressing both macronutrient and micronutrient deficiencies in these street children. A comprehensive intervention strategy combining nutritional supplementation, medical treatment, and educational and socio-cultural activities is essential for improving the well-being of these street children. Such an approach would not only enhance their physical health but also help them integrate into mainstream society by providing better opportunities for growth and development.

If successful, the project can be replicated in other areas of Pune and across major Indian cities, serving as a model for policymakers to implement tailored nutritional programs for street children, potentially reshaping national strategies for addressing urban child malnutrition.

RECOMMENDATIONS AND SUGGESTIONS

To improve the health and nutritional status of street children in Pune, targeted interventions are crucial.

1)Nutritional programs must focus on early childhood (ages 5-7) as this group shows severe undernutrition, particularly in weight and MUAC values. Providing balanced meals, fortified foods, and micronutrient supplements will help address deficiencies.

2)Regular health check-ups and medical treatment should be integrated with nutritional support, ensuring that health issues related to malnutrition are promptly addressed. Educational and socio-cultural activities should be part of the intervention to promote healthy eating habits and hygiene practices among street children.

3)Community engagement is vital in creating awareness about the importance of nutrition and healthcare. Policymakers should implement city-wide nutritional programs, informed by this study, and replicate them in other regions. Continuous monitoring and evaluation of the interventions will help track progress and make necessary adjustments, ensuring that the children not only meet nutritional standards but also integrate successfully into mainstream society.

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