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Research Article

A DESCRIPTIVE CROSS-SECTIONAL STUDY ON ASSESSMENT OF NUTRITIONAL STATUS OF CHILDREN UNDER 5 YEARS OLD: A COMMUNITY EVALUATION OF ASSOCIATED RISK FACTORS

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ABSTRACT

Malnutrition is a condition that occurs when a person's nutrient intake is deficient, excessive or imbalanced. Nutrition among children under 5 years of age plays a vital role in the overall growth of children bodily and cognitively. It affects all facets of children's life and its fallout is not restricted to physical health but extent to mental, social and spiritual wellbeing. The objective of study was to assess malnutrition and evaluate their associated risk factors among under five years (0 – 5 years of age) children of Anganwadi Kendra's of both Rural and Urban areas of Visakhapatnam. A community based descriptive cross-sectional study was performed among 150 under five-year-old children to assess the nutritional status by calculating anthropometric parameters like Height-for-age, Weight-for-age, Mid-arm-circumference according to WHO growth standards and evaluation of their associated risk factors by under taking Sociodemographic characteristic, dietary intake, breastfeeding practices, complementary feeding practices, clinical details of child & both parents through a structured questionnaire. The prevalence rate of underweight and stunting was 28% and 36% respectively among 150 children. The prevalence of underweight and stunting was found to be higher in males than females in our study. Overall highest prevalence rate in both stunting and underweight was found to be among under 1 year old children. The study concludes highest determinant affecting malnutrition are poor economic status of their parents (P-value: 0.01), birth order (P-value: 0.03), family size (P-value: 0.04) & few physical factors played a significant role in malnutrition of children under-five-year-old in our study. The findings showed that the nutritional status of under-five-children was quite moderate but it's evident that it still persists as a major health problem among young children due to low socioeconomic factors and physical factors.

Keywords: Nutritional assessment, Anthropometry, Socioeconomic, Prevalence, Malnutrition.

INTRODUCTION

Malnutrition is a condition that occurs when a person's nutrient intake is deficient, excessive, or imbalanced. It can also refer to impaired nutrient utilization (World Health Organization). The malnutrition has an enormous impact in the children under 5 years of age comprise of underweight, stunting, wasting with or without oedema (Earlier known as marasmus and kwashiorkor, sequentially) and even death (Govender *et al*., 2021). Malnutrition poses a significant threat to human development and holds back development across the globe, without good nutrition and good health is not possible, and costing the world billions of dollars annually in lost economic growth, wasted human capital, and preventable deaths that requires urgent attention and action to ensure good health allied with avertible deaths in both children and adults (Global Nutrition Report, n.d.). Nutrition among children under 5 years of age plays a vital role in the overall growth of children bodily and cognitively. Nutritional deficiencies and malnutrition generally affect child's growth (Amoah *et al*., 2023). The cognitive and physical growth can radically affect the

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child's nutritional status leading to minimized accuracy of the life in grown-ups and so nutritional status throughout childhood can have long-standing effects on health consequences later in life (Ijaiya *et al*., 2024). In 2022, 148.1 million children under 5 years of age were too petite for their age (stunting), 45.0 million were too skinny for their height (wasting) and 37.0 million were too hefty for their height (overweight) (World Health Organization, n.d.). A Clinical Pharmacist holds the information and skills that are necessary to address the issues associated to nutrition management. With their knowledge in pharmacoeconomics, pharmacists are well-equipped to offer cost-effective nutritional solutions. Their understanding of cost-effective foodstuffs and alternate therapies help to ensure the finest healthy outcomes while considering the financial aspect. Clinical pharmacists can play an important role in supporting infant health by maternal education about breastfeeding, its long-standing benefits, formula feeding, balancing foods, and good hygiene practices. Likewise, clinical pharmacists can initiate community awareness programs fixated on preventing malnutrition. So, clinical pharmacists can aid as a trustworthy and vital source for guiding healthcare professionals in incorporating both health and economic results of nutrition into their practice. Their participation is crucial in decreasing the rate of malnutrition among children and refining overall public health (Singla *et al.,* 2023).

MATERIALS AND METHODS

Study site

A community based descriptive cross-sectional study has been conducted in Anganwadi Kendra's of Visakhapatnam Urban & Rural regions.

Study period

This study has been conducted for period of 6 months. (JULY – DECEMBER 2024)

Study design

Descriptive Cross-sectional study.

Sampling technique

Samples were collected using simple random sampling.

Sample population

A total of 150 study population was enrolled.

Study criteria

The study criteria include children under-5-years of both urban and rural regions.

RESULTS AND DISCUSSION

Here are the child demographic parameters that are taken into consideration. Among the 150 participants in the study, 17(11%) were <1 year old, 32(21%) were 1-2 years old, 87(58%) were 3-4 years old, 14(9%) were 5 years old. With mean and standard deviation (SD) of 33.4 months±16.33. The majority of the population are seen in 3-4 years with 87 individuals or 58%. The age and gender-wise distribution of children in the sample population of 150 individuals. For males, the age distribution is as follows, <1 year are 12 (15%), 1-2 years are 20 (25%), 3-4 years are 35 (44%) and 5 years are 12 (15%). In contrast, the female age distribution is as follows <1 year are 5 (7%), 1-2 years are 12 (17%), 3-4 years are 52 (73%) and 5 years are 2 (3%). By combing the data for both genders, the overall age distribution <1 year old are 17 (11%), 1-2 years old are 32 (21%), 3-4 years are old 87 (58%) and 5 years old are 14 (9%). This suggests that the majority of the children in sample population are between 3-4 years, with a higher proportion of females in this age groups. Additionally, there is a notable difference in the age distribution between males and females, with males being more evenly distributed across the age groups, while females are more concentrated in the 3-4 years age groups.

The data reveals the distribution of maternal age at marriage, providing insight into the age at which women are getting married. The majority of women 78 (52%) got married between the ages of 19-23, indicating that this is the most common age range for marriage. A significant proportion 31 (21%) got married at a younger age between 14-18 highlighting the prevalence of early marriage. In contrast, only 35 (23%) women got married between the ages of 24-28, and a mere 6 (4%). The above data depicts that the maternal age at marriage and malnutrition in which the woman who got married at the age of 14-18 years, 4 children(3%) were malnourished as the age of women increase the number of malnourished children also increase, women who got married at age of 19-23 years, 26(17%) children were malnourished, women who got married at age of 24-28 years, 17 children(11%) were malnourished, when to compared to all age group women who got married at the age of 29-33 years only 2 children(1%) were malnourished. This suggests that maternal and child health, as well as education and economic opportunities for women are important. Under 5-year-old male and female children were participants of the study. The populations were males with 79(53%), while the female with 71(47%) in the total population of total 150 members. From the above data distribution of maternal age at childbirth, providing insight into the age at which women are giving birth. The majority of women 69(46%) gave birth between the ages of 21-25, indicating that this is the most common age range for childbirth. A significant proportion 28(19%) gave birth between the ages of 16-20, highlighting the prevalence of teenage pregnancy and young motherhood. Additionally, 41(27%) women gave birth between the ages of 26-30, suggesting that many women are delaying childbirth until their late twenties. A smaller proportion 11(7%) gave birth

between the ages of 31-35, and only 1(1%) woman gave birth between the ages of 36-40.

Table 1. Tabular representation on age of child in the study.

Age group	Total number	Percentage
<1 year	17	11%
1-2 years	32	21%
3-4years	87	58%
5years	14	9%
Total	150	100%

Table 2. Tabular representation on gender of child in the study.

Gender	Total number	Percentage
Male	79	53%
Female	71	47%
Total	150	100%

Table 3. Tabular representation on age- and gender wise distribution of children.

Age group	Male	Percentage	Female	Percentage	Total	Percentage
<1 year	12	15%	5	7%	17	11%
1-2 years	20	25%	12	17%	32	21%
3-4years	35	44%	52	73%	87	58%
5	12	15%	2	3%	14	9%
Total	79	100%	71	100%	150	100%

Table 4. Tabular representation of mother's age at marriage of respective child in the study.

Maternal age at marriage	Total number	Percentage
14 - 18years	31	21%
19 - 23 years	78	52%
24 - 28 years	35	23%
29 - 33 years	6	4%
Total	150	100%

Table 5. Tabular representation of mother's age at marriage and malnourished children.

Maternal age at marriage	Malnourished	Malnourished (in %)
14 - 18years	4	3%
19 - 23 years	26	17%
24 - 28 years	17	11%
29 - 33 years	2	1%

Table 6. Tabular representation on mother's age at childbirth of children included in the study.

Maternal age at Childbrith	Total number	Percentage
16 - 20 years	28	19%
21 - 25 years	69	46%
26 - 30 years	41	27%
31 - 35 years	11	7%
36 - 40 years	1	1%
Total	150	100%

Table 7. Tabular representation on mother's age at childbirth and malnourished children.

Maternal age at childbrith	Malnourished	Percentage
16 - 20 years	1	1%
21 - 25 years	22	15%
26 - 30 years	21	14%
31 - 35 years	4	3%
36 - 40 years	1	1%

The above data shows that maternal age at child birth and malnourished in which 16-20 years only 1 child (1%) is malnourished, in 21-25 years 22 children (15%) are malnourished showing the highest number among the age groups, in 26-30 years 21 children (14%) are malnourished and a drastic decrease in the 31-35 years 4 children (3%) were malnourished, in the 36-40 years age group only a single child (1%) is malnourished. This has inference for maternal and childbirth as well as socioeconomic outcomes for their women and their families. From the above data the distribution of maternal education, providing insight into the educational attainment of mothers. A significant proportion 47(31%) of mothers are illiterate, indicating a lack of formal education. A small number 9(6%) have completed primary school, while a larger proportion 43(29%) have completed secondary school. Additionally, 19(13%) mothers have completed intermediate education and 32(21%) have attained a college degree.

Table 8. Tabular representation on mother's educational status.

Maternal education	No. of subjects	Percentage
Illiterate	47	31%
Primary school	9	6%
Secondary school	43	29%
Intermediate	19	13%
College Graduate	32	21%
Total	150	100%

Table 9. Tabular representation on mother's educational status and malnourished children.

Maternal education	Malnourished	Percentage
Illiterate	14	9%
Primary school	1	1%
Secondary school	11	7%
Intermediate	4	3%
College Graduate	19	13%

Table 10. Tabular representation on head of the family income status.

Family income	Total number	Percentage
No income	9	6%
1,000/- to 10,000/-	54	36%
11,000/- to 20,000/-	62	41%
21,000/- to 30,000/-	14	9%
31,000/- to 40,000/-	6	4%
41,000 to 50,000	5	3%
Total	150	100%

The above data shows maternal education and malnourished children Among mothers who are illiterates 14 children (9%) were found to be malnourished, mothers who studied till primary schools only one child(1%) is found to be malnourished, mothers who studied till secondary school 11 children(7%) were found to be malnourished, mothers with intermediate 4 children(3%) were found to be malnourished and mothers who studied till college graduate show very high number i.e., 19 children(13%) were malnourished. This variation in educational attainment has implications for maternal and child health. The above data represents the distribution of family income, providing insight into the economic status of households. A small proportion 9(6%) of families have no income, indicating a significant level of low economic vulnerability. The majority of families 54(36%) have an income between 1,000 and 10,000 suggesting that many households are living on a relatively low income. A significant proportion 62(41%) of families have an income between 11,000 and 20,000 indicating a moderate level of economic stability. A smaller proportion 14(9%) of families have an income between 21,000 and 30,000 and 6(4%) families have an income between 31,000 and 40,000 suggesting a relatively higher level of economic comfort. Finally, 5(3%) families have an income above 50,000 indicating a high level of economic prosperity. The data represents the distribution of family income. 7(5%) children were malnourished in families have no income; The majority of families 17(11%) children are malnourished in families with income between 1,000 and 10,000. 62(41%) children were malnourished were in families with an income between 11,000 and 20,000. 7(5%) children were malnourished in families with an income between 21,000 and 30,000 and 3(2%) children were malnourished in families with an income between 31,000 and 40,000. Finally, 2(1%) children were in families with an income above 50,000. Overall, the data suggests that many families are living on a limited income.

Table 11. Tabular representation on family size

Family size	Total number	Percentage
TWO members	2	1%
THREE members	40	27%
FOUR members	75	50%
FIVE members	23	15%
SIX members	10	7%
TOTAL	150	100%

Table 12. Tabular representation on family size and malnourished children

Family size	Malnourished	Percentage
TWO members	1	1%
THREE members	12	8%
FOUR members	20	13%
FIVE members	10	7%
SIX members	6	4%

Among the above data represents the distribution of family size, providing insight into the number of individuals living in each household. The majority of families, 75(50%) have 4 members, indicating that small to medium-sized families are the most common. A significant proportion 40(27%) of families have 3 members, suggesting that many households are small and potentially nuclear families. A smaller proportion, 23(15%) of families have 5 members and 10(7%) families have 6 members, indicating that larger families are less common. The above data presents the distribution of family size and malnourished. 1(1%) malnourished child have 2 members.12(8%) of families have 3 members. 20(13%) malnourished children have families of 4 members and 10(7%) malnourished children have families of 5 members,6(4%) malnourished children have families of 6 members. The presence of smaller families may also suggest a trend towards nuclear families and a decrease in extended family households. The data presents the distribution of birth order, providing insight into the position of each child within their family. The majority of children, 69(46%) are first-born, indicating that a significant proportion of families have only one child or that the first child is the focus of the study. A similar proportion, 68(45%) of children are second-born, suggesting that many families have at least two children and that the second child is also an important part of the family dynamics. In contrast, only 7(5%) children are third-born, indicating that larger families with three or more children are less common. Additionally, 6(4%) children are twins, highlighting the presence of multiple births within the sample.

Table 13. Tabular representation on birth order of child

Birth order	Total number	Percentage
1st child	69	46%
2nd child	68	45%
3rd child	7	5%
Twins	6	4%
Total	150	100%

Table 14. Tabular representation on birth order of child and malnourished children.

Birth order	Malnourished	Percentage
1st child	22	15%
2nd child	18	12%
3rd child	2	1%
Twins	6	4%

Table 15. Tabular representation on breastfeeding duration given to child.

Breastfeeding duration	No. of subjects	Percentage
No production of milk	6	4%
<6 months	27	18%
<1 year	36	24%
<2 years	48	32%
<3 years	11	7%
Continuing since birth	22	15%
Total	150	100%

The data represents the distribution of birth order and malnourished children The majority of children, 22(15%) malnourished children were first-born, 18(12%) malnourished children were second-born, in contrast, only 2(1%) malnourished children are third-born. Additionally, 6(4%) malnourished children are twins. The data also highlights the importance of considering birth order when examining child development and health as birth order can have a significant impact. The above data represents the distribution of breastfeeding practices, specifically the duration of breastfeeding, among a sample of mothers. A small proportion, 6(4%) of mothers reported no production of milk, indicating that they were unable to breastfeed their children. The majority of mothers, 27(18%) breastfed their children for less than six months, suggesting that many mothers are not meeting the recommended breastfeeding duration. A significant proportion, 36(24%) of mothers breastfed for less than one year, and 48(32%) mothers breastfed for less than two years, indicating that breastfeeding is often discontinued before the recommended two-year mark. Only 11(7%) mothers breastfed for less than three years, and 22(15%) mothers are continuing to breastfeed since birth, suggesting that a small but dedicated group of mothers are committed to long-term breastfeeding.

Table 16. Tabular representation on breastfeeding duration given to child and malnourished children

Breastfeeding duration	Malnourished	Percentage
No production of milk	3	2%
<6 months	4	3%
<1 year	10	7%
<2 years	10	7%
<3 years	0	0%
Continuing since birth	22	15%

The data presents the distribution of breastfeeding duration and malnourished children. In which No milk production mothers 3(2%) children were malnourished, <6 months breast feeding mothers 4(3%) children were malnourished, <1 year breast feeding mothers 10(7%) children were malnourished, <2 years breast feeding mothers 10(7%) children were malnourished, <3 years breast feeding mothers 0(0%) children were malnourished, and mothers who are continuing the breastfeed since birth 22(15%) children were malnourished. Suggesting that a small but dedicated group of mothers are committed to long-term breast feeding. This has implications for infant health and development, as well as for maternal health and well-being. The data presents the information on the feeding practices of infants under 6 months of age with 15 sample individuals, out of which 11 are consuming of breast milk, indicating that the majority of mothers are breastfeeding their babies, However, 4 children are not consuming milk which is very essential for infant growth and development. Feeding practice of 6 months- 2 years with 34 sample individuals, in which 9 are consuming cerelac, 25 are consuming homemade mashed grain cereal, 11 are consuming breast whereas 22 are consuming tetra milk and only 1 individual is not consuming milk. Feeding practices of children from 3-5 years with a sample individual of 101 members in which 100 individuals are consuming egg, 101 individuals are consuming milk, 96 are consuming fruits, 98 are consuming vegetables and some of the individuals are consuming Meat and fish, once a week with 80 individuals, twice a week with 15 individuals, thrice a week with 6 individuals in it.

Height for age is used to indicate stunting in children. MEAN HEIGHT FOR AGE was 86.10. After calculating their Z-scores by using WHO growth chart -2SD to +2SD from median indicates healthy; <-2SD from median indicates Moderately stunted; <-3SD from median indicates Severely stunted. In our study children less than 1 year in which 1(1%) is healthy, 6(4%) are moderately stunting and 10(7%) are severely stunting, indicating a high prevalence of stunting in this age group. Among children aged 1-2 years in which 17(11%) are healthy, 12(8%) are moderately stunting and 3(2%) are severely stunting, suggesting a relatively lower prevalence of stunting compared to the younger age group. However, for children aged 3-4 years, the majority 75(50%) are healthy, with only 6(4%) being moderately stunting and 6(4%) severely stunting, indicating a significant improvement in height for age in this age group. Finally, among children aged 5 years in which 13(9%) are healthy, with no cases of moderate stunting and only 1(1%) case of severe stunting. Overall, the data suggests that stunting is most prevalent among children under 1 year age, and that the prevalence of stunting decreases as children get older, with the majority of children aged 3-4 years and 5 years being healthy.

Weight for age is used to indicate underweight in children. MEAN WEIGHT FOR AGE was 11.34. After calculating their Z-scores by using WHO growth chart -2SD to +2SD from median indicates healthy; <-2SD from median indicates Moderately underweight; <-3SD from median indicates Severely underweight. I our study children less than 1 year old, 1(1%) is healthy, 6(4%) are moderately underweight, and 10(7%) are severely

underweight, indicating a high prevalence of underweight in this age group. Among children aged 1-2 years, 20(13%) are healthy, 8(5%) are moderately underweight, and 4(3%) are Severely underweight. For children aged 3-4 years, the majority 74(49%) are healthy, with 7(5%) being moderately underweight and 6(4%) severely underweight, indicating a significant proportion of healthy children in this age group. Finally, among children aged 5 years, 13(9%) are healthy, with no cases of moderate underweight and only 1(1%) case of severe underweight. Overall, the data suggests that severely underweight is most prevalent among children under 1 year old, and that the prevalence of underweight decreases as children get older, with the majority of children in older age groups being healthy.

Table 17. Tabular representation on mid arm circumference anthropometric parameter

Mid Arm Circumference	Total Number	Percentage
Normal (>13.5cm)	113	75%
Moderately Malnourished (12.5 - 13.5)	7	5%
Severely Malnourished (<12.5)	30	20%
Total	150	100%

The data represents the Mid Arm Circumference of the sample individuals of 150 members are depicted in 3 categories and with MEAN MID ARM CIRCUMFERENCE was 13.05. Normal(>13.5cm) with 113(75%) in number, moderately malnourished (12.5-13.5cm) with 7(5%) in number, severely malnourished (<12.5) with 30(20%) in number. This data does not include children whose age is less than 1 year because research indicates it is not a reliable indicator of malnutrition in this age group due to lack of data on its accuracy and predictive value and make it difficult to interpret the results properly. The data represents Age-Malnourished of children in sample population shows that the age of children under less than 1 year with 0 healthy and 17 malnourished, 1-2 years with 14 healthy and 18 malnourished, 3-4 years with 74 healthy and 13 malnourished, 5 years with 13 healthy and 1 malnourished. Indicating majority of children under malnourished are in the age group of 1-2 years. The data reveals the gender-wise distribution of Healthy and malnourished children. Among them, 48 are Healthy males with 31 malnourished and 53 Healthy females with 18 malnourished. Indicating that slightly more males are affected by malnutrition when compared to females.

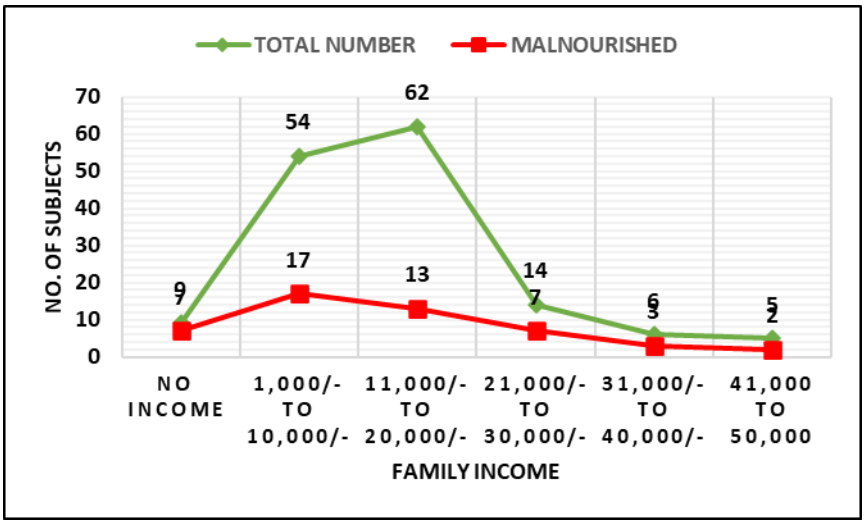

Figure 1. Graphical representation of correlation between family income and malnourished child.

A linear correlation has been observed between Family income and Malnourished child. A positive correlation has been obtained with the value of 0.9151, 95% confidence interval: 0.4021 to 0.9908. The coefficient of determination was 0.8374 The two-tailed P value is 0.0105, considered significant.

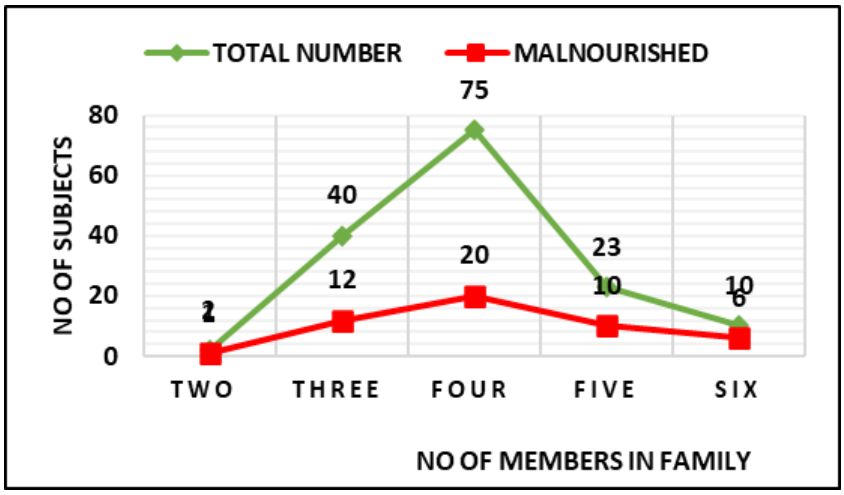

Figure 2. Graphical representation of correlation between family size and malnourished child

A linear correlation has been observed between Family size and Malnourished child. A positive correlation has been obtained with the value of 0.9767, 95% confidence interval: 0.6824 to 0.9985. The coefficient of determination was 0.9539. The two-tailed P value is 0.043, considered very significant.

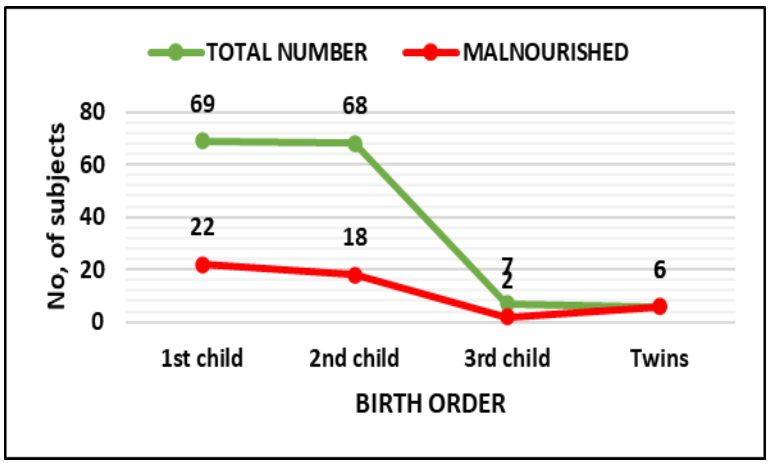

Figure 3. Graphical representation of correlation between birth order and malnourished child.

A linear correlation has been observed between Birth order and Malnourished child. A positive correlation has been obtained with the value of 0.9700, 95% confidence interval: 0.1314 to 0.9994. The coefficient of determination was 0.9409. The two-tailed P value is 0.03, considered significant. This descriptive cross-sectional study was conducted with a view to determine the nutritional status of under-5-year-old children from Anganwadi Kendra's of Visakhapatnam (Urban and Rual). In our study we included a sample size of 150 children. The age of children was ranging between <1 year to 5 years, in which we have categorised into four groups. The groups are <1 year (11%), 1 – 2 years (21%), 3 – 4 years (58%), 5 years (9%). With mean and standard deviation (SD) of 33.4 months±16.33. Our study has similar results to that of nutritional assessment study conducted in Palpa, Nepal

(Singla *et al.,* 2023). In our study the Males were (53%) while Females were (47%) indicating a slightly higher proportion of males compared to females. According to same study conducted in Tumkur, In our study slightly more males are affected by malnutrition when compared to females. Among age groups of children between 0 to 2 years were affected by malnutrition. In current study we have considered Maternal age at marriage which is categorised into 14 - 18years (21%), 19 – 23 years (52%), 24 – 28 years (23%), 29 – 33 years (4%) in which malnutrition in children was found to be 3%,17%,11%,1% respectively. Among the grouped maternal ages at marriage, the age group of 19 – 23 years & 24 – 28 years has shown at higher percentage. In our study, maternal age at marriage do not show effect on child nutritional status as most mothers were married at ideal age of marriage.

Maternal age at childbirth is categorised into 16 – 20years (19%), 21 – 25years (46%), 26 – 30years (27%), 31 – 35years (7%), 36 – 40years (1%) in which malnourished child was found to be 1%,15%,14%,3%,1% respectively. Among the grouped maternal ages at childbirth, the age group of 21 – 25years & 26 – 30years has shown at higher percentage. While the study conducted in rural areas of lowland Nepal results early marriage and pregnancy were associated with poor growth and development of child. Thus, in our study maternal age at childbirth do not show effect on child nutritional status as most mother's gave birth at ideal age (Raikhola *et al.,* 2021). According to many research studies conducted Maternal education is the most effected determinant of child's malnutrition. In our current study we have categorised into Illiterate (31%), primary school (6%), secondary school (29%), intermediate (13%), college graduate (21%) in which malnourished child was found to be 9%,1%,7%,3%,13% respectively. Among above data mother who have higher level of education has shown higher percentage. Thus, no association was found between maternal education and nutritional status of children in our study. According study conducted in Rural school children in Fayoum, Egypt has resulted an association between maternal education and undernutrition which differs from our current study (Wells *et al.,* 2022).

Family income is another most important determinant of malnutrition in children as it states the standards of living and economic status. The present study showed that 83% were no to low income, while 16% were ranging from moderate to good income so there was significant association between family income and low nutritious child. While, same study conducted in India using NFHS-3 data found correlation between malnutrition among poor income households is relatively more when compared to high income; on the other hand, study conducted in Bangladesh found that poor parents cannot afford proper diet and post-natal care [16] which matched with our present study. When statistically family income and malnourishment in child were correlated a linear and positive correlation has been obtained with the value of 0.9151, 95% confidence interval: 0.4021 to 0.9908. The coefficient of determination (r squared) = 0.8374. The two-tailed P value is 0.0105, considered significant.

Family size is found to be another factor effecting malnutrition it can be influenced when the income is low and not sufficient for a surge of family members in a family. In present study, >4 – 6 members were 72% who were also from low-income families, while <4 – 2 members were 28% who were from low to moderate income families so there was significant association between family size and malnourished child. While, the same study conducted in in Western Maharashtra has found that that prevalence of undernutrition rises as the size of family grows which is similar to our study (Anik *et al.,* 2021). When statistically family size and malnourishment in child were correlated a linear and positive correlation has been obtained with the value of 0.9767, 95% confidence interval: 0.6824 to 0.9985. The coefficient of determination (r squared) = 0.9539. The two-tailed P value is 0.043, considered very significant. Birth order is also most found determinant of malnutrition in children under-5-years in global research studies it is determined when there is not required (2 – 4 years recommended for complete recovery of mother physical strength) birth gap between two or more children. In our study we categorized into 1st Child (46%), 2nd Child (45%), 3rd Child (5%), Twins (4%) in which the higher percentage of malnutrition was found in 1st child (15%), followed by 2nd child (12%), followed by 3rd child (1%), followed by Twins (4%). We have observed that maternal age during childbirth for 1st born was ranging between late 20's to 36 years which is quite risky age for pregnancy. While, there is less than 2 years of gap between first and rest of the siblings for 2nd born and 3rd born who are also with family size of 4 – 6 members with low economic status. While, the twins were malnourished due to low birth weight which is dependent on mother's nutritional status during pregnancy or any other factors. So, there was association between birth order and low nutritious child.

When statistically birth order and malnourishment in child were correlated a linear and positive correlation has been obtained with the value of 0.9700, 95% confidence interval: 0.1314 to 0.9994. The coefficient of determination (r squared) = 0.9409. The two-tailed P value is 0.03, considered significant. The study conducted in Haryana has shown that child's higher birth order and increased family size were more prevalent to malnourishment which is similar to our study (Gangurde *et al.,* 2023). Breastfeeding also plays a crucial role in overall child's growth and development. In our study we have categorised breastfeeding practice duration into no production milk (4%), less than 6 months (18%), less than 1 year (32%), less than 2 years (7%), continuing since birth (15%), in which malnourished child was found be among continuing since birth with higher percentage of 15%, followed by < 1 and <2 years with 7 %, followed by < 6 months with 3%, followed by no production of milk from mothers with 2%. In our study, no association was found between breastfeeding and malnutrition, as undernourished children were frequently observed even among those who continued to breastfeed. The study done in Urban slums -Rural, Maharashtra indicates that undernutrition is significantly influenced by breastfeeding which is differed from our

study (Murarkar *et al.,* 2020). In our study, we have also found most causative determinant physical factor in malnourished children the results drawn as follows Reduced appetite (37%), followed by low consumption of milk (35%), followed by low birth weight (33%), followed by selective eating (20%), others (20%). Thus, in most children in higher percentage we found out that due to lack eating or lack of appetite lead to low nourishment. The next most causative physical determinant was low birth weight lead to low nourishment among <1-year-old children in our study. While, these are two most important independent determinants causing malnutrition which eventually leads to lack of energy, selective eating habits, frequent suffering from illness etc.

Anthropometry measures were utilised and calculated Z-scores compared them with WHO growth chart to categorise children into severe (< -3SD), moderate (< -2SD) and normal (> -2SD to < +2SD) to in terms of height-for-age and weight-for-age and MAC. Our study resulted in overall prevalence of stunting was 36% in which 20% were severe stunting, and 16% were moderate stunting. The prevalence of stunting was higher among 0 to 2 years children while the prevalence of stunting decreases as children gets older, with the majority of children aged 3-4 years and 5 years being healthy. The overall prevalence of underweight was 28% in which 14% were sever underweight, and 14% were moderate underweight. The prevalence of underweight was higher among ,1 year old while that the prevalence of underweight also decreases as children get older, with the majority of children in older age groups being healthy. According to MUAC assessment, 20% severe, 5% moderate. However, MUAC has limitations as it doesn't include < 1 year old. While, the study conducted in rural area of Pondicherry have reported similar prevalence of underweight 18.3%, stunting 31.6% similar to our study which shows prevalence of malnutrition is still evident and to be addressed as a major public health concern (Vasudevan & Udayashankar, 2019).

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

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AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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