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Prevalence and Determinants of Nutritional Deficiencies among Children Aged 2–5 Years in Selected Areas of Lucknow

Ms. Neetu Pal [1]

1. M.Sc Nursing Student – St. Mary's College of Nursing, Lucknow

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Abstract

BACKGROUND OF THE STUDY: *Nutritional deficiency is most widespread affecting health of children's due to unhygienic food practices; lack of money, traditional beliefs and inappropriate diet are resulting in malnutrition. Despite governmental efforts to address nutritional deficiencies through schemes and programs, such as food fortification and nutritional education, the problem persists. The prevalence rates of undernutrition and anemia among children in states like Uttar Pradesh underscore the urgency of effective interventions. By addressing the root causes of malnutrition and implementing evidence-based strategies, we can improve the health outcomes and well-being of children, laying the foundation for a healthier future generation. There is a need to integrate readily available nationwide data to reach any denouement and understand the role of fortification of foods to combat micronutrient deficiency for making stronger and age specific recommendations. The aim of the study is to determine the prevalence of micro nutritional deficiencies six preventable micro nutritional deficiencies (vitamin A, vitaminB12, vitamin D, iron, iodine and folic acid) among children under five years old in specific areas of Lucknow, as well as to identify the factors that predispose them to these deficiencies.* ***MATERIALS & METHODS:*** *Quantitative research approach was adapted for this study. Descriptive research design was used to assess the prevalence of nutritional deficiency with diet plan. The population under study comprises children aged 2 to 5 years. The sample size comprises of 100 children, aged between 2 and 5 years from the Mohanlalganj area of Lucknow. Non-probability convenience sampling technique was used to select the samples. In this study, the researcher utilized three tools to collect data from the samples: Tool 1: Demographical data Tool 2: Structured questionnaire method is used to assess the pre-disposing factors of nutritional deficiency Tool 3: Modified recommended dietary allowances (RDA) for children according to ICMR to assess the prevalence of nutritional deficiency through diet plan. The collected data was analyzed using both descriptive and inferential statistics, aligning with the study's objectives and hypotheses.* ***RESULTS:*** *Regarding the prevalence of nutritional deficiency, significant findings emerged. The majority (47%) of 2-3-year-old children showed deficiencies according to recommended daily allowances. Male children (55%) exhibited higher deficiencies compared to females. Hindu children (77%) and those from joint families (61%) also displayed higher deficiency rates. Furthermore, rural areas (70%) showed a higher prevalence of deficiencies compared to urban areas. the birth order of the baby emerges as a significant predisposing factor associated with iron deficiency in children under the age of five. Additionally, the number of children in the family, the age at which breastfeeding ceases, and the spacing between childbirths are all found to be significant factors related to energy deficiency. Furthermore, the occupation of the mother demonstrates statistical significance in relation to protein deficiency at a p-value of 0.05. However, the analysis indicates that all other identified predisposing factors for nutritional deficiency do not reach significance at the 0.05 level. These findings underscore the multifaceted nature of nutritional deficiencies in young children and highlight the importance of considering various factors in preventive and intervention strategies.* ***CONCLUSION:*** *The prevalence of malnutrition is still significant despite the implementation of a number of national nutrition programs, including ICDS, POSHAN Abhiyaan, food fortification initiatives, and vitamin supplementation programs. Preventable micronutrient deficiencies continue to be a significant public health concern. The results of this study indicate that better implementation, community involvement, and ongoing monitoring are necessary to augment current programs. To achieve long-lasting changes in child nutrition, nutrition education, dietary variety, and behavior change communication strategies must be integrated.*

Keywords: Micronutrient Deficiency; Under-Five Children; Nutritional Deficiency; Dietary Intake; Prevalence; Predisposing Factors

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INTRODUCTION

Nutritional deficiency is most widespread affecting health of children's due to unhygienic food practices; lack of money, traditional beliefs and inappropriate diet are resulting in malnutrition. Mothers are the primary care taker of children's because usually the children's depend on their mothers for fulfilling their needs. The nutritional problems are multifactorial with roots in the sectors of education, demography agriculture and development. Poor and inadequate nutrition leads to malnutrition, morbidity and mortality among children in India. As per the recommended dietary allowances for India, a child 2-3 years should consume approximately 1,060 kcal/day while those aged 4-5 years should be consume approximately 1,350 kcal/day [1,2]

"The lack of sufficient amounts of micronutrients affects health, function, and physical and cognitive development throughout the life cycle. Many diseases and morbid conditions have been described to result from nutritional deficiencies. These include developmental defects, such as birth defects, physical and cognitive development delays, increased risk of infectious diseases, as well as increased risk of poor health in adulthood. Almost two-thirds of deaths of young children around the world are related to nutritional deficiencies" [3].

The problem of under nutrition is still an important focus in developing countries because of its correlation with the next generation of children which can have a long term impact on child cognitive and developmental problems. In developing countries, the lack of proper nutrition in children under five still is a top cause of child mortality. A combination of infection and insufficient nutrient intake is a primary factor causing child under nutrition which causes the immune system weak and increasing susceptibility to diseases because children's nutrients intake is low, which influences nutrients absorption.

Childhood and adolescence are the period of rapid physical and cognitive growth and development, requiring adequate nutrition. Any change in nutritional status during this age influences health, learning and physical fitness. Nutrients essential for normal growth and functioning of human body are macronutrients like carbohydrate, fat and proteins, required in large quantities and micronutrients like vitamins and minerals required in small quantities. Vitamins, categorized as fat soluble (A, D, E and K) and water soluble (B group and C), are synthesized in human body in quantities lesser than required. Minerals are required for growth, repair and regulation of vital functions of human body. They are major minerals like iron, iodine, ferritin, fluoride, zinc, copper, cobalt, magnesium, molybdenum, selenium and nickel [4].

Vitamin B12 deficiency is associated with impaired cognitive development in children, including deficits in episodic memory, language skills, attention, and growth. Deficiencies of essential micronutrients such as iron, zinc, folate, iodine, vitamin B12, and inadequate protein intake can adversely affect brain development, leading to reduced intelligence quotient (IQ), poor attention span, learning difficulties, memory impairment, and various neuropsychological and behavioral problems.

According to the WHO 45% of deaths in children aged < 5 years are linked to undernutrition. Globally in low-income countries, Iodine, Iron and vitamin A are considered vitamin micronutrients for health as their deficiency affects children 42% of children aged < 5 years [5]. Rapid growth and development occur during the preschool years. A child grows about 2 to 3 inches and gains 4 to 5 pounds each year. Proper nutrition is critical to ensure the child proper growth. Creating a healthy diet plan for kids is crucial, especially in these periods of rapid growth. A healthy diet plan sets the base for substantial growth.

Globally, 144.0 million under five children's suffer from stunting,47.0 million under five-year children's were wasted of which 14.3 million were severely wasted and 38.3 million were overweight. Poor nutrition leads to poor health [6]. The three leading causes of malnutrition are poverty and lack of food and ignorance. A developing country like India where a vast majority live under the poverty line, has the additional responsibility of producing health future citizens and to lead India into a developed country. In India scenario, there is definitely a need foe well planned, large - scale study using standardized methodologies to estimate the prevalence of micronutrient deficiencies with giving due important to accurate evaluation of socioeconomic factors.

India is coming to grips with a stage of nutrition transition. According to the food Safety and Standards Authority of India (FSSAI), preventable micronutrient deficiency is arising public health percentage in India. However, the foremost public health concern is the lack of national prevalence data. The government of India has launched several schemes and programmes in the wake of micronutrient deficiency, but the problem still exists in a large segment of the population. Food fortification, dietary diversification, nutritional education, micronutrient supplementation, maintenance of environmental sanitation and hygiene are the various available measures taken to tackle the problem of micronutrient malnutrition. But the results have not been satisfactory, and national nutritional programmes have failed to achieve the goals [7].

According to the National Family Health Survey-5 (NFHS-5, 2019-21), 39.7% of children under five years in Uttar Pradesh were stunted (low height-for-age), 32.1% were underweight (low weight-for-age), and 17.3% were wasted (low weight-for-height). It also revealed that, prevalence of among children aged 6-59 months was high at 67.1%, an

increase from NFHS-4, with over two-thirds of young children affected [8].

Despite governmental efforts to address nutritional deficiencies through schemes and programs, such as food fortification and nutritional education, the problem persists. The prevalence rates of undernutrition and anemia among children in states like Uttar Pradesh underscore the urgency of effective interventions. Integration of nationwide data and targeted strategies, including food fortification, is essential to combat micronutrient deficiencies effectively.

Given the significant impact of nutritional deficiencies on child health and development, comprehensive research is essential to inform effective interventions and policies. By addressing the root causes of malnutrition and implementing evidence-based strategies, we can improve the health outcomes and well-being of children, laying the foundation for a healthier future generation.

There is a need to integrate readily available nationwide data to reach any denouement and understand the role of fortification of foods to combat micronutrient deficiency for making stronger and age specific recommendations. The aim of the study is to determine the prevalence of micro nutritional deficiencies six preventable micronutritional deficiencies (vitamin A, vitaminB12, vitamin D, iron, iodine and folic acid) among children under five years old in specific areas of Lucknow, as well as to identify the factors that predispose them to these deficiencies.

METHODOLOGY:

Quantitative research approach was adapted for this study. Descriptive research design was used to assess the prevalence of nutritional deficiency with diet plan. The sample was collected from the specified area of Mohanlalganj in Lucknow. The population under study comprises children aged 2 to 5 years. The accessible population for this study consists of children aged 2 to 5 years residing in Mohanlalganj, Lucknow. The sample size comprises of 100 children, aged between 2 and 5 years from the Mohanlalganj area of Lucknow. Non-probability convenience sampling technique was used to select the samples. In this study, the researcher utilized three tools to collect data from the samples: Tool 1: Demographical data Tool 2: Structured questionnaire method is used to assess the pre-disposing factors of nutritional deficiency Tool 3: Modified recommended dietary allowances (RDA) for children according to ICMR to assess the prevalence of nutritional deficiency through diet plan. Tool 1: Demographical data This tool gathers information about the mothers and includes six items like age of the child, gender, household monthly income, religion, type of family, residence / locality type. 43 Tool 2: Structured questionnaire This tool assesses the predisposing factors of nutritional deficiency and includes the following variables: Type of baby born, no. of children in the family, birth order of the baby, space between the child birth, age of cessation of breast feeding, age of introduction of complementary foods, type of diet, commonly consumed foods, has the child received all vaccination as per the recommended immunization schedule of his/her age, any history of chronic illness, education of the mother, occupation of mother. Tool-3: Modified Recommended Dietary Allowances (RDA) for children according to ICMR to assess the diet plan. Ethical approval was obtained from the Institute Research and Ethical Committee. The collected data was analyzed using both descriptive and inferential statistics, aligning with the study's objectives and hypotheses. The plan for data analysis is outlined as follows: Descriptive statistics: Frequency and percentage distributions were utilized to analyze the socio-demographic variables and predisposing factors. Inferential statistics: the study employed the chi-square test to ascertain the association between predisposing factors and nutritional deficiency with their selected demographic variable.

RESULTS:

The findings of the study are presented under following headings: Section -I presents the frequency and percentage distribution of subjects based on socio-demographic variables. Section –II presents the frequency and percentage distribution of subjects based on the predisposing factors questionnaire. Section -III displays the frequency and percentage distribution for the prevalence of nutritional deficiency according to Recommended Dietary Allowances (RDA). Section –IV analyzes the association between the predisposing factors and nutritional deficiency among 2- to 5-year-old children. Section V- analyzes the association between demographic variables and the prevalence of nutritional deficiency.

Table 1 indicates the frequency and percentage distribution of subjects according to the age. Among the age groups, the majority (47%) fell within the 2-4- year range, with significant proportions in the 3-4 years (24%) and 4-5 years (29%) categories. Gender disparities were observed, with 55% of the samples being male and 45% female. Regarding family income, a significant proportion (37%) belonged to the 5001-7000 rupees bracket, while only 10% were above 9000. Hinduism was the predominant religion among the samples (84%), while other religions constituted only 3%. Joint families constituted the majority (63%) in terms of family type, and rural areas were the primary residence for 71% of the samples. Additionally, the distribution of samples by type of birth indicated that 82% were full term births, with 14% pre-term and 4% post-term. Among families, the majority (56%) had two children, while the birth order of the baby was

predominantly 3rd (45%). Breastfeeding cessation occurred predominantly after six months (78%), and complementary foods were introduced mainly between 6-7 months (90%). Vegetarian diets were more prevalent (58%) compared to non-vegetarian diets (42%). Grains were the most commonly consumed food group (70%), followed by dairy products (20%), fruits (8%), and vegetables (2%). A considerable proportion (53%) of children had not received all recommended vaccinations, and the majority (91%) had no history of chronic illness. Maternal education levels varied, with 64% being illiterate, 25% having completed higher secondary education, 8% intermediate, and 3% graduate.

(n = 100)

Demographic Variables	*Frequency (f)*	*Percentage(%)*
Age (in years)		
2-3	*47*	*47%*
3-4	*24*	*24%*
4-5	*29*	*29%*
Gender		
Male	*55*	*55%*
Female	*45*	*45%*
Income		
3000-5000	*21*	*21%*
5001-7000	*37*	*37%*
7001-9000	*32*	*32%*
Above 9000	*10*	*10%*
Religion		
Hindu	*84*	*84%*
Muslim	*9*	*9%*
Christian	*4*	*4%*
Others	*3*	*3%*
Types of the family		
Nuclear family	*37*	*37%*
Joint family	*63*	*63%*
Area of Residence		
Rural	*71*	*71%*
Urban	*29*	*29%*

Table -1 Frequency and percentage distribution of subjects according to the age.

Table – 2 indicates percentage distribution for prevalence of nutritional deficiency according to RDA (Recommended Daily Allowances).Regarding the prevalence of nutritional deficiency, significant findings emerged. The majority (47%) of 2-3-year-old children showed deficiencies according to recommended daily allowances. Male children (55%) exhibited higher deficiencies compared to females. Hindu children (77%) and those from joint families (61%) also displayed higher deficiency rates. Furthermore, rural areas (70%) showed a higher prevalence of deficiencies compared to urban areas. These findings underscore the importance of targeted interventions and policies to address nutritional deficiencies among children in Lucknow, considering the various demographic factors influencing their nutritional status.

(n = 100)

Variables.	***Energy***		***Protein***		***Ca***		***Iron***		***Vit A***		***Folic acid***	
Age	*<RDA %*	*>RDA %*	*<RDA %*	*>RDA %*	*<RDA %*	*>RDA %*	*<RDA %*	*>RDA %*	*<RDA %*	*>RDA %*	*<RDA %*	*>RDA %*
2-3	*43*	*4*	*46*	*1*	*47*	*0*	*47*	*0*	*47*	*0*	*46*	*1*
3-4	*22*	*2*	*23*	*1*	*23*	*1*	*24*	*0*	*23*	*1*	*24*	*0*
4-5	*27*	*2*	*27*	*2*	*27*	*2*	*27*	*2*	*29*	*0*	*26*	*3*
Gender												
Male	*55*	*0*	*52*	*3*	*53*	*2*	*53*	*2*	*54*	*1*	*54*	*1*
Female	*41*	*4*	*44*	*1*	*45*	*0*	*45*	*0*	*44*	*1*	*42*	*3*
Income												
3000-5000	*21*	*0*	*19*	*2*	*19*	*2*	*20*	*1*	*21*	*0*	*20*	*1*
5100-7000	*35*	*2*	*36*	*1*	*37*	*0*	*36*	*0*	*37*	*0*	*34*	*3*
70001-9000	*28*	*4*	*31*	*1*	*31*	*1*	*32*	*0*	*31*	*1*	*32*	*0*
>9000	*10*	*0*	*10*	*0*	*10*	*0*	*10*	*0*	*9*	*1*	*10*	*0*
Religion												
Hindu	*77*	*7*	*82*	*2*	*83*	*1*	*82*	*2*	*82*	*2*	*80*	*4*
Muslim	*8*	*1*	*7*	*2*	*8*	*1*	*9*	*0*	*9*	*0*	*9*	*0*
Christian	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*
Others	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*
Type of family												
Joint	*60*	*3*	*61*	*2*	*60*	*3*	*61*	*2*	*61*	*2*	*60*	*3*
Nuclear	*32*	*5*	*37*	*0*	*37*	*0*	*37*	*0*	*37*	*0*	*36*	*1*
Area of Residence												
Rural	*66*	*5*	*68*	*3*	*69*	*2*	*70*	*1*	*69*	*2*	*67*	*4*
Urban	*28*	*1*	*28*	*1*	*28*	*1*	*28*	*1*	*29*	*0*	*29*	*0*

Table – 2 Frequency and Percentage Distribution for prevalence of nutritional deficiency according to RDA.

Table No. 3 reveals that in this research, the birth order ofdeficiency at a p-value of 0.05. However, the analysis indicates the baby emerges as a significant predisposing factorthat all other identified predisposing factors for nutritional associated with iron deficiency in children under the age ofdeficiency do not reach significance at the 0.05 level. These five. Additionally, the number of children in the family, thefindings underscore the multifaceted nature of nutritional age at which breastfeeding ceases, and the spacing betweendeficiencies in young children and highlight the importance of childbirths are all found to be significant factors related toconsidering various factors in preventive and intervention energy deficiency. Furthermore, the occupation of the motherstrategies.
demonstrates statistical significance in relation to protein

Predisposing Factors	***Energy***		***Protein***		***Ca***		***Iron***		***Vitamin A***		***Folic Acid***	
	<RDA	*RDA>*	*<RDA*	*RDA>*	*<RDA*	*RDA>*	*<RDA*	*RDA>*	*<RDA*	*RDA>*	*<RDA*	*RDA>*
Type of Birth												
Pre - Term	*14*	*0*	*13*	*1*	*14*	*0*	*14*	*0*	*14*	*0*	*14*	*0*
Full -Term	*75*	*7*	*79*	*3*	*79*	*3*	*80*	*2*	*80*	*2*	*78*	*4*
Post - Term	*3*	*1*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*
X^2 Value	*2.8201*		*0.551*		*0.678*		*0.447*		*0.447*		*0.914*	
Remarks	*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*	

No. of Children in the Family												
1	*21*	*0*	*21*	*0*	*21*	*0*	*20*	*1*	*20*	*1*	*21*	*0*
2	*51*	*5*	*53*	*3*	*55*	*1*	*55*	*1*	*55*	*1*	*53*	*3*
3	*10*	*0*	*9*	*1*	*9*	*1*	*10*	*0*	*10*	*0*	*9*	*1*
4 & Above	*8*	*5*	*13*	*0*	*9*	*1*	*13*	*0*	*13*	*0*	*13*	*0*
X^2 Value	*15.216*		*2.622*		*4.173*		*1.299*		*1.299*		*2.622*	
Remarks	*df= 3 S*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
Birth order of the baby												
1	*10*	*1*	*10*	*1*	*11*	*0*	*9*	*2*	*10*	*1*	*11*	*0*
2	*31*	*6*	*35*	*2*	*35*	*2*	*37*	*0*	*36*	*1*	*33*	*4*
3	*44*	*1*	*42*	*3*	*45*	*0*	*45*	*0*	*45*	*0*	*45*	*0*
4 & Above	*7*	*0*	*7*	*0*	*6*	*1*	*7*	*0*	*7*	*0*	*7*	*0*
X^2 Value	*6.061*		*0.691*		*5.531*		*16.51*		*3.976*		*7.094*	
Remarks	*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 S*		*df= 3 NS*		*df= 3 NS*	
Space between the Child Birth												
1 Year	*2*	*2*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*
2 Years	*28*	*5*	*32*	*1*	*31*	*2*	*33*	*0*	*33*	*0*	*33*	*0*
3 Years	*37*	*1*	*37*	*1*	*38*	*0*	*37*	*1*	*37*	*1*	*37*	*1*
4 Years & Above	*25*	*0*	*24*	*1*	*24*	*1*	*24*	*1*	*24*	*1*	*22*	*3*
X^2 Value	*15.54*		*0.227*		*2.447*		*1.342*		*1.34*		*5.893*	
Remarks	*df= 3 S**		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
Age of the Cessation of the breast Feeding												
0-3 Month	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*
3- 4 Month	*7*	*2*	*9*	*0*	*9*	*0*	*9*	*0*	*8*	*1*	*9*	*0*
5-6 Month	*5*	*6*	*10*	*1*	*11*	*0*	*10*	*1*	*11*	*0*	*11*	*0*
More than 6 Month	*78*	*0*	*75*	*3*	*75*	*3*	*77*	*1*	*77*	*1*	*74*	*4*
X^2 Value	*41.8*		*1.2*		*0.872*		*3.251*		*4.28*		*1.175*	
Remarks	*df= 3 S*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
Age of Introduction of Complementary Foods												
Less than 6 Month	*5*	*0*	*5*	*0*	*5*	*0*	*5*	*0*	*5*	*0*	*5*	*0*
6- 7 Month	*83*	*7*	*86*	*4*	*87*	*3*	*88*	*2*	*88*	*2*	*86*	*4*
More than 8 Month	*4*	*1*	*5*	*0*	*5*	*0*	*5*	*0*	*5*	*0*	*5*	*0*
X^2 Value	*1.141*		*0.4629*		*0.343*		*0.226*		*0.226*		*0.4629*	
Remarks	*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*		*df= 2 NS*	
Type of Diet												
Vegetarian	*55*	*3*	*54*	*4*	*56*	*2*	*56*	*2*	*56*	*2*	*56*	*2*
Non Vegetarian	*37*	*5*	*42*	*0*	*41*	*1*	*42*	*0*	*42*	*0*	*40*	*2*
X^2 Value	*1.5*		*3.017*		*0.0953*		*1.477*		*1.47*		*0.109*	
Remarks	*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*	
Commonly Consumed Foods												
Fruits	*8*	*0*	*8*	*0*	*8*	*0*	*8*	*0*	*8*	*0*	*8*	*0*
Vegetables	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*
Milk/ Dairy roducts	*18*	*2*	*19*	*1*	*19*	*1*	*20*	*0*	*20*	*0*	*19*	*1*
Cereals & Grains	*64*	*6*	*67*	*3*	*68*	*2*	*68*	*2*	*68*	*2*	*67*	*3*
X^2 Value	*1.009*		*0.453*		*0.589*		*0.874*		*0.874*		*0.4836*	
Remarks	*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
Completed all Vaccinations as per recommended immunization schedule												
Yes	*42*	*5*	*44*	*3*	*44*	*3*	*46*	*1*	*46*	*1*	*45*	*2*
No	*50*	*3*	*52*	*1*	*53*	*0*	*52*	*1*	*52*	*1*	*51*	*2*
X^2 Value	*0.838*		*1.311*		*3.487*		*0.007*		*0.007*		*0.015*	
Remarks	*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*	
History of Chronic Illness												
Yes	*9*	*0*	*9*	*0*	*9*	*0*	*9*	*0*	*9*	*0*	*9*	*0*
No	*83*	*8*	*87*	*4*	*88*	*3*	*89*	*2*	*89*	*2*	*87*	*4*
X^2 Value	*0.86*		*0.412*		*0.305*		*0.201*		*0.201*		*0.412*	
Remarks	*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*		*df=1 NS*	
Education of the Mother												
Illiterate	*60*	*4*	*63*	*1*	*61*	*3*	*64*	*0*	*63*	*1*	*60*	*4*
Higher Secondary	*23*	*2*	*23*	*2*	*25*	*0*	*24*	*1*	*24*	*1*	*25*	*0*
Intermediate	*6*	*2*	*7*	*1*	*8*	*0*	*8*	*0*	*8*	*0*	*8*	*0*

Graduate	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*	*3*	*0*
X^2 Value	*3.66*		*3.66*		*1.739*		*3.03*		*0.797*		*2.34*	
Remarks	*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
Occupation of the Mother												
Housewife	*83*	*7*	*88*	*2*	*87*	*3*	*88*	*2*	*88*	*2*	*86*	*4*
Private Job	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*
Government Job	*1*	*1*	*1*	*1*	*2*	*0*	*2*	*0*	*2*	*0*	*2*	*0*
Daily Wage Labour	*4*	*0*	*3*	*1*	*4*	*0*	*4*	*0*	*4*	*0*	*4*	*0*
X^2 Value	*5.49*		*16.521*		*0.343*		*0.226*		*0.226*		*0.4629*	
Remarks	*df= 3 NS*		*df= 3 S*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*		*df= 3 NS*	
S = Significant	*NS= Not Significant*			*df = Degree of freedom*			*P=0.05 level*					

Table -3 Association between predisposing factors and nutritional deficiency

DISCUSSION

The present study was conducted to explore the prevalence of nutritional deficiencies among children aged 2–5 years residing in selected areas of Mohanlalganj, Lucknow, and to identify the predisposing factors associated with these deficiencies. The results of the study revealed that nutritional deficiencies remain a significant public health concern among preschool children, reflecting both global and national trends.

Prevalence of Nutritional Deficiency

The results of this study show that children between the 2-5 Years of age have a high prevalence of dietary deficiencies. As per the estimates from the World Bank, UNICEF, and WHO, 47 million children under five are wasted, including 14.3 million who are seriously wasted, and 144 million are stunted [9]. These figures indicates the existence of early childhood malnutrition in spite of advancements in healthcare and nutrition related policy.

This study identified the significant prevalence of nutritional deficiencies in under five children which is consistent with earlier Indian research that found preschoolers to be severely undernourished. As per the data from NFHS-4 in Uttar Pradesh, 46.3% of children under five were stunted, 39.5% were underweight, and 17.9% were wasting, according [10]. Findings of this study, further support the idea that preschoolers in rural and semi-urban areas are still at risk for poor nutritional outcomes and insufficient dietary intake.

Dietary Intake and Recommended Dietary Allowances

The assessment of dietary intake based on the ICMR Recommended Dietary Allowances suggested that a significant proportion of children did not meet their daily caloric and nutrient requirements. As per the ICMR guidelines, children aged between 2 and 3 years require approximately 1,060 kcal/day, while those aged between 4 and 5 years require around 1,350 kcal/day for optimal growth and development [11]. Deficient intake of calories and essential nutrients during this critical period can lead to growth faltering, lack of immumity, and impaired cognitive development.

Similar findings have been reported in earlier studies, which revealed that insufficient dietary diversity and lack of intake of proteins, vitamins, and minerals are major contributors to undernutrition among preschool children [12]. These findings emphasizes the need of ensuring age appropriate, balanced diets during early childhood.

Micronutrient Deficiencies and Child Development

The current study showed how micronutrient deficiency will affect the health and development of children. Iron, vitamin B12, vitamin A, folate, zinc, and vitamin D deficiencies will have a negative impact on immunological response, cognitive development, and physical growth.As per WHO estimates, micronutrient deficiencies account for approximately two-thirds of young children's deaths globally and are a leading contributor to childhood morbidity and mortality [13].

Findings of the previous studies indicate that iron deficiency anemia affects cognition, cognitive function, and attention span, whereas deficiencies in vitamin B12 and folate are linked to poor memory and developmental delays [14]. These views are supported by the current study's findings, which highlight the critical necessity for early detection and treatment of micronutrient deficiencies.

Predisposing Factors of Nutritional Deficiency

The results of the study showed that, maternal and socio-demographic characteristics were linked to children's nutritional deficiencies. Children's nutritional health was greatly affected by a number of factors, including low household income, maternal education, birth order, short birth spacing, delayed or incorrect supplemental feeding, and poor dietary behaviors. These results align with previous research that found cultural feeding patterns, poverty, and maternal ignorance to be the main causes of child malnutrition [15].

Mothers are crucial in determining their children's nutritional health. Undernutrition has been found to be largely caused by mothers' ignorance of baby and young child feeding habits, such as exclusive breastfeeding and supplemental feeding [16]. The current study highlights the necessity of improving community-based maternal nutrition education and counseling programs.

The evidence that undernutrition and recurrent illnesses are closely related is further supported by the current investigation. Children who are malnourished are more vulnerable to common childhood illnesses including measles, respiratory infections, and diarrhea, which worsen nutritional deficits by decreasing appetite and hindering vitamin absorption [17]. Child morbidity and death in impoverished nations are still mostly caused by this vicious cycle of infection and starvation.

CONCLUSION

The prevalence of malnutrition is still significant despite the implementation of a number of national nutrition programs, including ICDS, POSHAN Abhiyaan, food fortification initiatives, and vitamin supplementation programs. Preventable micronutrient deficiencies continue to be a significant public health concern because of insufficient coverage, low compliance, and a lack of thorough monitoring systems, according to reports from the Food Safety and Standards Authority of India [18]. The results of this study indicate that better implementation, community involvement, and ongoing monitoring are necessary to augment current programs. To achieve long-lasting changes in child nutrition, nutrition education, dietary variety, and behavior change communication strategies must be integrated.

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