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# DETERMINANTS OF PREVALENCE OF VITAMIN D AND ANAEMIA AMONG 5-9 YEARS CHILDREN IN INDIA

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**Abstract:** Anaemia and micronutrional deficiency is a worldwide health issue among children .This article is related to prevalence of Vitamin D deficiency and anaemia among 5 to 9 years Indian children. This study is based on data of 14664 children having age 5 to 9 years and data is collected from a Comprehensive National Nutrition Survey Report. The main aim of this paper is to evaluate the characteristics of children, mothers, and household that are the main reasons of anaemia in age of 5 to 9 years children. The study uses logistic regression analysis to examine the data. Result of this study showed that the prevalence of anaemia was 23.4% in children and deficiency of vitamin D was 2711 out of 14664 children. The result of this analysis suggested that there is a need to do improvements in deficiencies of micronutrients in socio economic status and mother's education in anaemic children of age 5-9 year.

**Index Terms** - ***Vitamin D, Anaemia, Haemoglobin, Micronutrient, socio- economic etc.***

## I. INTRODUCTION:

Anaemia is a common disease associated with micronutrient deficits and national health problems. Anaemia is a blood condition that occurs when the body's blood cells do not contain enough haemoglobin. The causes of anaemia are malnutrition and iron deficiency. Iron deficiency along with vitamin D deficiency is the main cause of anaemia. Iron deficiency has a dangerous effect on health of children because of developing age of their body and brain. In India, Approximate 46 % girls below 15 are anaemic, according to report of SRL Diagnostic which was released on the National Girl Child Day and also raise awareness to encourage the rights, health, education and nutrition of the child. World Health Organisation had targeted to achieve 50% decrease of anaemia in reproductive age women by 2025. Anaemia has an effect on children and older adult's health, human weight and also the pregnancy stage of women. Vitamin D deficiency plays a significant role in prevalence of rickets, cardiovascular diseases, diabetes and cancer. There are many signs and symptoms of anaemia such as fatigue, weakness and headache, Pale and dry skin. Anaemia happens when a person doesn't get adequate animal protein, enough vitamin B12 and is used to alcohol abuse. Our human body needs sufficient hormones to make red blood cells. If there are not enough hormones, our body may suffer from advanced kidney disease and infection also. Some types of anaemia are not related to iron deficiency such as pernicious anaemia, hemolytic anaemia etc. Vitamin D deficiency is a common illness in which the body has insufficient stores of vitamin D. Vitamin D is vital for health, absorption of calcium and the building of strong bones. Vitamin D also plays a significance role for hormone regulation, irritation reduction, and the optimum functioning of the nervous system and immune system. Sign of vitamin D deficiency include body pain, dental deformities, motor delay, low growth in children& loss of height. By eating adequate food such as eggs, meat, fish, and dairy products we can rectify the deficiency of vitamin D. There is direct relationship between deficiency of vitamin D and depression also. It is important to study the relationship between deficiency of vitamin D or anaemia in children so that we can take measures to improve the health of children. The main objective of this study to find out the effect of anaemia due to deficiency of vitamin D on the health of children between the age of 5 to 9. Belwel E. et. al (2021) showed that 55% women in India have anaemia in National Family Health Survey. By Anand K.,(CEO of SRL Diagnostics), Among children from 6 months to 5 years of age, more than 67 % are anaemic as compared to 58.6 % in the last survey conducted in 2015-16. By National Family Health Survey (NFHS-V) in 2019-21, more than 50% women and children are anaemic. Many studies have been conducted in past to find out the relationship between vitamins D deficiency, anaemia and disease. (Kolsteren et al, 1999) suggested that iron deficiency anaemia affected with supplementation of vitamin A, zinc and iron in women. Ann Hematol (2010) evaluated the prevalence of anaemia with vitamin D deficiency in individual population and related it with normal levels in a population for the period of 2004 to 2010. Joe et. al.(2010) studied about the better conditions of socio- economic level in Southern region of India which reflect good health of children. Kotecha P. V. (2011) examined the relationship between anaemia and iron deficiency and found that there was a relationship between the iron deficiency and anaemia.. Ratish. N, et.al (2012) examined the relationship between vitamin D and chronic disease and suggested that vitamin D play significant role to prevent chronic disease clinical implication. Ritu &Ajay (2014) studies the prevalence, causalities& interventions of vitamin D. Ellen. Smith & Tangpricha (2015) showed the association between vitamin D and anaemia and suggested that maintenance of sufficient vitamin D status may be important in preventing anaemia. Lee et.al (2015) examined the association between vitamin D deficiency and anaemia. Aman jot K, et.al (2019) evaluated

the prevalence of anaemia in urban and rural adolescent girls of 10 to 16 years of age in Ambala district. They stated that overall prevalence of anaemia was found to be 69.7%, and prevalence of anaemia was very high among adolescent girls**.** Vikas M, et.al (2020) evaluated the state of the evidence, synthesize the knowledge gaps, and formulate commendations for improved research in this area with the help of 61 studies and concluded that Serum vitamin D levels inversely correlated with clinical depression. Bharati, Pal et.al, (2020) examined rate of anaemia among children aging between 6 to 59 months in India and found that prevalence of anaemia in children is due to socio- economic conditions of households.

**II. Objective of the study:**

The main objective of this study is to find out the effect of anaemia due to deficiency of vitamin D on the health of children between the age of 5 to 9 years.

**III. Data Source:**

The study based on data disclosed by CNNS (report) in 2016 to 2018. This report survey was taken under the supervision of the UNICEF, MoHFW, the US CDC and a Technical Advisory Group (TAG). This report is based on the investigation of four survey agencies Indian Institute of Health Management Research, Jaipur, Gkf Mode Pvt. Ltd., New Delhi, KANTAR Public New Delhi, SIGMA Research and Consulting pvt. Ltd. The CNNS report based on the sample of children having age 5 to 9 years in 30 states of India.

**IV. Sample Size:**

This study is based on the sample size of 14664 children of age 5-9 years.

**V. Variables include in the study:**

This study is based on characteristics of children, maternal, household characteristics.

**VI. Statistical analysis:**

This study uses logistic regression analysis to examine the prevalence of anaemia and rate conveyance with sample of 14664 children having age of 5 to 9 years old.

**VII. Analysis & interpretation of data:**

**Table1: The percentage distribution of five to nine years on the basis of Children characteristics in India**.

| | **Vitamin D** | **Vitamin B12 deficient** | **Iodine deficient** | **Multi vitamin tablets taken** | **Deworming tablets taken** | **IFA tablets taken** | **Sex** | | **Age (in years)** | | **Schooling** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **M** | **F** | **5--7** | **7--9** | **C.A.** | **C.N.A.** |
| Percentage | **18.5** | 17.1 | 4.3 | 10.3 | 40.3 | 9.6 | 51 | 49 | 59.5 | 40.5 | 92.3 | 7.7 |
| Number | **2711** | 2506 | 632 | 1505 | 5908 | 1406 | 7476 | 7188 | 8728 | 5936 | 13529 | 1135 |

C.A .- Currently Attending, C.N.A. – Currently Not Attending

Source: The Comprehensive National Nutrition Survey, (2016- 18)

Above table showed that the problem of anaemia was found 59.5 percent in five-to-seven-year children and 40 .5 percent in seven-to-nine-year children by equally distributed of sex. Deficiency of vitamin D was found 18.5 percent. The result of above table also showed that consumption of tablets of multivitamin, deworming and IFA was 10.3%, 40.3% and 9.6% respectively.

**Table2: The percentage distribution of five to nine years children on the basis of Material's characteristics in India.**

| | **Mother's Age** | | **Mother's Schooling** | | | |
|---|---|---|---|---|---|---|
| | **<30** | **>=30** | **No Formal Schooling** | **Up to Primary** | **Above primary to Secondary** | **Above Secondary** |
| Percentage | 38.6 | 61.4 | 39.5 | 16.7 | **31.7** | 12.1 |
| Number | 5659 | 9005 | 5789 | 2450 | 4648 | 1776 |

Source: The Comprehensive National Nutrition Survey, (2016- 18)

Analysis of above table disclosed that 39.5 percent had no formal education and their schooling above primary to secondary was 31.7 percent, above secondary was 12.1 percent.

**Table3: The percentage distribution of five to nine years children on the basis of Household's characteristics in India.**

| Wealth Quintile | | | Residence | | Religion | | | Caste | | | Region | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poor | Middle | Rich | Rural | Urban | Hindu | Muslim | others | SC/ST | OBC | Others | North | Central | East | North-East | West | South |
| 38.3 | 21.1 | 40.6 | 75.2 | 24.8 | 80.9 | 14.2 | 4.9 | 34.8 | 40.2 | 25 | 12.6 | 27.7 | 27.5 | 3.6 | 12.9 | 15.7 |
| 5616 | 3094 | 592 | 11029 | 3635 | 11857 | 2087 | 721 | 5106 | 5889 | 3667 | 1851 | 4065 | 4033 | 521 | 1889 | 2307 |

Source: The Comprehensive National Nutrition Survey, (2016- 18)

According to above table the majority 80.9% of children related to Hindu religion, 14.2 are related to Muslim and 4.9 percent of children related to other religion. Out of total children's 40 percent of the children belong to backward classes and 34.8 percent under the scheduled castes. In India, total occurrence of anaemia in East (27.5%), west (12.9%), North (12.6%), South (15.7%), and central region (27.7%) was found in five-to-nine-year age children in India.

**Table 4: Percentage distribution of prevalence of anaemia in five to nine years children on the basis of Children background characteristics in India.**

| Vitamin D | | Vitamin B12 Level | | Iodine Level | | Multivitamin | | Deworming | | IFA | | Sex | | Age (in years) | | Schooling | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal | Low | Normal | Low | Normal | Low | Yes | No | Yes | No | Yes | No | M | F | 5-7 | 7-9 | C.A. | C.N.A. |
| 21.9 | 16.4 | 20.5 | 21.1 | 19.4 | 21.6 | 19 | 20.3 | 18.9 | 21.4 | 22.7 | 19.8 | 22.2 | 24.7 | 27.8 | 17 | 22.7 | 32 |

Source: The Comprehensive National Nutrition Survey, (2016- 18)

The existence of anaemia was 23.4% in five-to-nine-year children in India and the deficiency of vitamin D was found 21.9% normal and low 16.4 percent in children. This analysis found 22.7 percent rate of IFA in children.

**Table 5: Percentage distribution of prevalence of anaemia in five to nine years on the basis of Material's background characteristics in India.**

| Mother's Age | | Mother's Schooling | | | |
|---|---|---|---|---|---|
| <30 | >=30 | No Formal Schooling | Up to Primary | Above primary to Secondary | Above Secondary |
| 25.9 | 21.8 | 27.5 | 25.7 | 20.5 | 14.4 |

Source: The Comprehensive National Nutrition Survey, (2016- 18)

Analysis of above table disclosed that 27.5 percent had no formal education and their schooling from primary to secondary was 20.5percent, above secondary was 14.4 percent. The above table also showed that 25.9 percent mothers age were below 30 and 21.8 percent mothers age were above the 30 year.

**Table 6: Percentage distribution of prevalence of anaemia in five-to-nine-year children on the basis of Household's background characteristics in India.**

| Wealth Quintile | | | Residence | | Religion | | | Caste | | | Region | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poor | Middle | Rich | Rural | Urban | Hindu | Muslim | others | SC/ST | OBC | Others | North | Central | East | North-East | West | South |
| 29.6 | 22.3 | 18.1 | 24.3 | 20.6 | 23.5 | 22.2 | 25.7 | 28.8 | 20.6 | 20.5 | 15.9 | 22.4 | 30.5 | 30.9 | 24.1 | 16.5 |

Source: The Comprehensive National Nutrition Survey,(2016- 18)

According to above table the 23.5% of children related to Hindu religion, 22.2% are related to Muslims and 25.7 percent of children related to other religion. Rich households children affected by less anaemia comparatively poor children. Out of total children 20.5 percent of the children belong to backward classes and 28.8 percent under the scheduled castes / scheduled tribes. In India, total occurrence of anaemia in East region (30.5%), Central 30.50%, North-East 30.90%, North 15.9%, West 24.10% & South 16.50%. was found in five-to-nine-year age children in India.

**Table 7: Odd Ratio showing the adjusted effect of vitamin D deficiency anaemia in 5 to 9 year of age group**

| Vitamin D | | Vitamin B12 Level | | Iodine Level | | Multivitamin | | Deworming | | IFA | | Sex | | Age (in years) | | Schooling | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normal | Low | Normal | Low | Normal | Low | Yes | No | Yes | No | Yes | No | M | F | 5-7 | 7-9 | C.A. | C.N.A. |
| | 0.81*** | | 0.99 | | 1.15 | | 1.10 | | 1.11** | | 0.93 | | 1.11* | | 0.68*** | | 1.10 |

*** -P< 0.01,** -P<0.05, *-P<0.1

Source: The Comprehensive National Nutrition Survey,(2016- 18)

Above table showed a deficiency of vitamin D during anaemia in 5 to 9 years children of age (0.81, -p <0.01).

**Table 8: Effect of vitamin D deficiency on anaemia in children of age 5 -9 with parental characteristics, India.**

| Mother's Age | | Mother's Schooling | | | |
|---|---|---|---|---|---|
| <30 | >=30 | No Formal Schooling | Upto Primary | Above primary to Secondary | Above Secondary |
| | 0.85*** | | 0.98 | 0.83** | 0.69*** |

*** -P< 0.01,** -P<0.05, *-P<0.1

Source: The Comprehensive National Nutrition Survey,(2016- 18)

The ratio of mother's age was (0.85, -p<o.o1) and schooling up to primary level 0.98, above primary to secondary (0.83,-p< 0.05) and above secondary (0.69, -p< 0.5)

**Table 9: Effect of Vitamin deficiency on anaemia in children of age 5 -9 in India on the basis of household's characteristics.**

| Wealth Quintile | | | Residence | | Religion | | | Caste | | | Region | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poor | Middle | Rich | Rural | Urban | Hindu | Muslim | others | SC/ ST | OBC | Others | North | Central | East | North-East | West | South |
| | 0.77*** | 0.65*** | | 1.03 | | 0.82** | 0.70*** | | 0.79*** | 0.72*** | | 1.19 | 1.74*** | 1.42*** | 1.26** | 0.75*** |

*** -P< 0.01,** -P<0.05, *-P<0.1

According to this study high prevalence of Muslim children 0.82, and other religion 0.70, with backward class (OBC) 0.79, and others 0.72. The rich wealth quintile children have less anaemia than poor wealth quintile children.The presence of anaemia in our study is higher in east region 1.74, north-east region 1.42, west 1.26, central 1.19 and south 0.75 .

## VIII. Discussion:

This study examined the existence of anaemia among Indian children ageing 5 to 9 years. The previous research papers mostly connected with anaemia have shown the results among children under the age of five years (Dutta et al., 2020). But this study spoken about the many important results. This study showed that children having age between 5 to 7 years had more chance of as compare to children having age 8 to 9 years. There is also relationship between mother age and anaemia. Mother age of more than thirty year are less chance of anaemia in their children as compare to mother's age of less than thirty year. Education of parents also plays a significant role to avoid the problem of anaemia in children. In household characteristics of wealth quintile, the rich families have less risk of anaemia in children. More cases of anaemia were found in rural children as compare to urban children. By WHO (2012) had targeted to achieve 50% decrease of anemia in reproductive age women by 2025,

Many studies have been conducted in past to analysis the problem of anaemia in Indian children but this study observed the occurrence and factors those are responsible for anaemia in children of age 5 to 9 years. The anaemia is a major health problem in Indian nation. It creates a serious issue in the children. The study tried to describe this problem among the children of 5-to-9-year age. This problem is examined by parents' characteristics and domestic factors. This study also detected that the level of anaemia was more in those children who have lower level of consumption of vitamin D, folate. The study also found that mother characteristics also have significant effect on the deficiency of vitamin D and anaemia. The southern region's children were observed with lower level of anaemia. The study can help the policy makers to design proper policy and implementation the policy to improve the health of children by reducing the problem of an anaemia. We cannot prevent inherited anaemia problem but we can prevent ourself from anaemia caused by iron deficiency, vitamin D deficiency and vitamin B by eating healthy diet. We can prevent the problem of anaemia by having healthy foods, taking proper quantity of water, regular exercise to avoid infection. Parent's education also plays a significant role to avoid this problem in children.

## IX. Recommendation:

It is important to apply some measurement for children of aged five to nine to improve their deficiency of vitamin D are:

- It is necessary for presence of adequate vitamins in food of children of their daily meal's schedules.
- It is also essential to include green vegetables in their meals to improve the nutritional level of the body.
- It is also recommended that educated mothers can even help to reduce anaemia and micro nutritional deficiencies among children.
- Government need to be designed and implement proper polices for the development of rural areas so that anaemia problem can be reduced in rural areas.
- It is also needed to aware the society about the problems of anaemia by health centre or educational institution.
- By increasing sun exposure and eating more vitamin D-rich foods we can avoid the deficiency of vitamin D.

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