

# Anaemia In Preschool Children:its Correlation With Pica

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## Abstract

**Introduction:** According to the third National Family Health Survey, 79% of Indian children are anaemic. Pica is characterized by the persistent ingestion of non-nutritive substances such as plaster, charcoal, chalk, and earth for at least one month in a manner that is inappropriate for their developmental level. We investigated the correlation between pica behaviour and anaemia in preschool children.

**Methods:** In total, 103 children of ages six to 48 months attending the OPD were randomly included in this study for six months; they presented with clinical features of anaemia. Complete blood count and peripheral blood film examination were carried out. The children were assessed clinically for signs and symptoms of anaemia. History of ingestion of clay, sand, chalk, wall paints etc was asked from the parents.

**Results:** Most of the children (90.3%) had microcytic hypochromic anaemia with a mean haemoglobin value of 8.82 g / dl. The mean age was 18 months, and boys slightly outnumbered girls. In total, 57.3% of children had a positive history of pica, and all of them were found to be anaemic. However, no significant statistical correlation was observed between anaemia and history of pica.

**Conclusions:** All children with history of pica were anaemic and the most common type of anaemia was microcytic hypochromic. Although no significant statistical correlation was observed between and history of pica, it is very important for the clinicians to be cautious of this common condition and evaluate for anaemia.

## Introduction

Anaemia is a common nutritional problem characterized by a low concentration of haemoglobin in the blood.<sup>1</sup> WHO defines anaemia as haemoglobin concentration less than 11.0 g / dl in children aged six months to five years (Preschool-age children).<sup>2</sup> Anaemia affects motor function as well as cognitive development in children due to the need for adequate oxygen-carrying capacity during their first few years of life.<sup>1</sup>

Children are naturally curious about everything. Up to a particular developmental stage, they tend to put almost any object in their mouth. Pica is an eating disorder in which children develop craving for non-food

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items, and this craving can last for more than a month. Many patients have acknowledged ingesting ice cubes (Pagopahgia), clay (Geophagia), chalk, paste, resins (Resinphagia), tomatoes, lemons, hair, lead and starch. Although pica is more prominent in individuals with developmental disabilities, it has also been observed in boys and girls of all age groups and with different ethnic backgrounds. Pica is more prevalent among those in the lower socioeconomic classes. It is more prevalent than it is commonly believed to be, and the problem is also broader in scope. However, the majority of the primary healthcare physicians are not aware of the symptoms of pica.<sup>3</sup>

The recent prevalence rate of pica is not known, as no studies are available regarding this topic. According to previous studies, pica has been reported in all parts of the world, with a prevalence varying from 10% to 32.5% of all the children surveyed, and 73% among school-age children. Pica has also been reported in children with autism, mental retardation and in patients with schizophrenia.<sup>4</sup> Iron deficiency anaemia and malnutrition are the most common causes of pica. Malnutrition is often diagnosed between the two entities (malnutrition and pica). Eating clay has also been associated with iron deficiency; however, it is not clear whether decreased iron absorption is caused by eating clay or whether iron deficiency prompts children to eat clay. This study was thus conceptualised to find out the correlation between anaemia and pica.

## Methods

In total, 103 children of ages six months to 48 months attending the OPD were included. Children who presented with clinical features of anaemia were chosen randomly over a period of six months. Sick children that required admission to the hospital were excluded from this study. Assessment of clinical manifestations, detailed medical and personal history, and general physical examination were carried out. Anaemia was classified as mild, moderate, and severe according to the level of haemoglobin in the children. Mild anaemia was defined as haemoglobin level of 10.0 g / dl to 10.9 g / dl, moderate as a haemoglobin level of 7.0 g / dl to 9.9 g / dl, and severe anaemia as level < 7.0 g / dl. Complete blood count for haemoglobin and mean corpuscular haemoglobin concentration were evaluated in all the children. Peripheral blood film examination was also carried out to categorize anaemia into two types: iron deficiency anaemia and dimorphic anaemia. History of ingestion of clay, sand, chalk, wall paints etc was asked from the parents. The correlation between history of pica and anaemia was statistically investigated. Pearson Chi-Square test was applied for statistical analysis, and p values, likelihood ratio were calculated.

## Results

In total, 103 children were recruited, consisting of 56 boys and 47 girls. Their ages ranged from seven months to 48 months, with a mean age of 18 months. Microcytic hypochromic anaemia was the type of anaemia observed in most of the children (90.3%).

Mean haemoglobin level was 8.82 g / dl (Table 1). In total, 59 children (57.3%) were found to have history of pica, and children with a history of pica were found to be anaemic. Most of the children presented with moderate anaemia (Table 2). There was no statistically significant correlation between the severity of anaemia and the gender of the children. An insignificant statistical correlation between pica and anaemia was observed with a p-value of 0.145 and a likelihood ratio of 0.119 (Table 3).

Table 1. Age patterns and haemoglobin levels of the children

	n	Minimum	Maximum	Mean	Standard deviation
Age in months	103	7	48	18.01	8.687
Hb in g/dl	103	6	10.9	8.82	1.219

Table 2. The distribution and percentage of cases according to the sex of the children and the severity of anaemia

	Female	Male	Total
<b>Mild anaemia</b>			
Count	6	6	12
Percentage	50	50	100
Percentage within sex	12.8	10.7	11.7
<b>Moderate anaemia</b>			
Count	28	40	68
Percentage	41.2	58.8	100
Percentage within sex	59.6	71.4	66
<b>Severe anaemia</b>			
Count	13	10	21
Percentage	56.5	43.5	100
Percentage within sex	27.7	17.9	22.3
<b>Total count</b>	<b>47</b>	<b>56</b>	<b>103</b>
<b>Total percentage</b>	<b>45.6</b>	<b>54.4</b>	<b>100</b>

Table 3. Distribution and percentage of cases according to the history of pica and the severity of anaemia

	History of pica present	History of pica absent	Total
Mild anaemia			
Count	2	10	12
Percentage	16.7%	83.3%	100.0%
Percentage within history of pica	4.5%	16.9%	11.7%
Moderate anaemia			
Count	32	36	68
Percentage	47.1%	52.9%	100.0%
Percentage within history of pica	72.7%	61.0%	66.0%
Severe anaemia			
Count	10	13	23
Percentage	43.5%	56.5%	100.0%
Percentage within history of pica	22.7%	22.0%	22.3%
Total			
Count	44	59	103
Percentage	42.7%	57.3%	100.0%
Percentage within history of pica	100.0%	100.0%	100.0%
Chi -square Tests			
	Value	df	Asymptotic Significance (sided 2)
Pearson Chi-square	3.857	2	0.145
Likelihood ratio	4.258	2	0.119
N of valid cases	103		

## Discussion

Eating habits in the youngsters are established during the first two to three years of their lives. Throughout childhood, their food preferences and attitude are associated with food habits established by family influences and culture. Multiple etiologies are projected with respect to ingestion habits in youngsters, and this ranges from psychosocial causes to the biochemical causes. These include nutritional deficiencies (For example iron, zinc and calcium), low socioeconomic standing, ill-usage, poor management of the youngsters, mental illness, learned behaviors, underlying biochemical disorders, cultural and familial factors. The adverse effects of pica embody metal toxicity, nutritional deprivation, excessive intake of calories, and varied helminthic infestations.<sup>4</sup>

Iron deficiency anaemia is the commonest nutrient deficiency in the world. Though the deficiency of iron leads to iron deficiency anaemia, it can even cause many different manifestations, particularly in infancy. And iron deficiency anaemia is particularly prevalent among the infants. Common reasons for this are high demand of iron in these age groups and the consumption of iron deficient diet throughout the infancy. Most significantly, iron deficiency throughout infancy will cause varied irreversible neurodevelopment and psychological disorders. Microcytosis and hypochromia on complete blood count are the most important features to diagnose iron deficiency anaemia at this age.<sup>5</sup> Similar

results were found in our study. Microcytic anemia was discovered in most of the youngsters, followed by dimorphic anaemia.

Pica is not a reason for iron deficiency anaemia; rather, it is an indication of this unwellness. However, these days, physicians usually don't recognize this condition unless the family is specifically queried concerning the actual careful individual history. Clay ingestion is practiced across all races in the world, though it's more common within the Asian population. The pathological process of pica isn't utterly understood. Theories of mineral deficiency, such as iron and zinc, are most commonly cited as its cause. Moreover, supplementation with iron preparations seems to speedily relieve the pica desire in these patients.<sup>6</sup> Amylophagy and geophagy are absolutely related to iron deficiency anaemia and a few gastrointestinal issues. From a public health perspective, it is believed that pica is current everywhere in the globe. The link between these factors (amylophagy and geophagy) warrants elucidation attributable to the prevalence of pica everywhere. A previous study reported that a powerful association of those factors with iron deficiency and anaemia was discovered in pregnant ladies.<sup>7</sup>

The significance of the kind of materials consumed was related to the socio-economic atmosphere and nutritional deficiencies, as reported by Singhi P et al. The mean variety of non-food substances eaten by the youngsters was not tormented by their age or gender.

Clay eating was found to be the foremost common style of pica. A statistically important correlation was discovered between the consumption of calcium containing substances and the clinical proof of rickets. However, findings regarding different nutritional deficiencies, significantly iron deficiency, do not support the read that pica could be a need-based behaviour.<sup>8</sup> Similar findings were noted in our study. There was no statistically important correlation between the history of pica and iron deficiency anaemia.

Plasma levels of iron, zinc, calcium and magnesium, and blood levels of lead were measured in 31 youngsters with a history of pica in a tertiary care teaching hospital, as reported in a study conducted by Singhi S et al. The plasma iron and zinc levels in children with pica were lower than those in the control groups (20% for children with pica and 40% for those in the control groups). However, no statistically important correlation with age at onset of anaemia, period of pica, frequency of pica, and variety of indigestible objects eaten was discovered during this study. They concluded that low zinc and iron levels are also the reasons for pica and not the impact of pica.<sup>9</sup>

According to the National Ingestion Disorders Association, the particular variety of persons tormented by pica continues to be not clear. Iron deficiency anaemia is more common in developing and underdeveloped countries. Additionally, pica is practiced in up to half of the youngsters aged 18 months to 36 months.<sup>10</sup> Similar results were found in our study, wherever pica was practiced in about 57% of children. Pica is not continuously found in conjunction with other micronutrient deficiencies, and therefore the direction of this relationship is additionally not well understood.<sup>11</sup>

These results were almost like those of our study, as no statistically important correlation between pica and anaemia was detected. Pica is discovered most ordinarily in females and youngsters from lower socioeconomic strata. Multiple complications of this disorder are noted within the literature, together with iron deficiency anaemia and parasitic infestations. Pica may be a behavior pattern driven by multiple factors. Recent proof supports the inclusion of pica within the neurotic spectrum of disorders, and this is often why it is important to bear in mind of this common however an unremarkably incomprehensible condition.<sup>12</sup>

The infants are significantly at high risk for iron deficiency and iron deficiency anaemia. Few of the studies summarized the proof of the long effects of iron deficiency throughout infancy. Follow-up studies from educational institution reported poorer psychological feature performance, motor operation, social-emotional ability, further as neurophysiologic variations. Moreover, iron deficiency was additionally reported to be common in initial first year of life.<sup>13</sup>

Micronutrient deficiency because of pica may be caused by various mechanisms. Pica materials usually bind to mucosa of the intestine and inhibit the absorption of multiple micronutrients.<sup>14</sup> Another theory suggests that deficiency of micronutrients may

cause children to seek out the minerals from pica substances.<sup>14,15</sup> Some authors also suggest that pica may be a response of the body to the deficiency of micronutrients, possibly due to some neural disturbances.<sup>16</sup> The pathogenesis of pica is still not clear, although it appears unrelated to the degree of iron deficiency. According to the findings in this series, pica seems to be a consequence of iron deficiency rather than its etiopathogenesis.<sup>17</sup>

Pica sometimes improves in children of normal intelligence when they have been well trained to discriminate between the edible and inedible ones, and when correct supervision is provided. Whereas the relief of family economic associated housing difficulties is an adjunct, being attentive to the children's individual emotional wants and stresses is of dominant importance.<sup>18</sup>

Geophagia is the most typical kind of pica, occurring in approximately 70% of the cases.<sup>19</sup> In few developing countries, soil is also applied on body as a part of their culture, which would promote pica. There are case reports of pain abdomen, where abdominal skiagrams were done in patients with history of geophagy.<sup>20</sup> Pica is considerably related to associate accumulated risk for anaemia and low hemoglobin, hematocrit and plasma levels of zinc. Though the direction of the causal relationship between pica and micronutrient deficiency is still not known, the magnitude of these relationships is comparable to other known causes of micronutrient deficiencies. Pica warrants a bigger public health attention.<sup>10</sup> Pica sometimes begins in childhood and usually lasts for many months.

However, it is likely to be more difficult to manage in children who are developmentally disabled. There is no specific way to prevent this condition. However, paying careful attention to eating habits and carrying out close supervision of the children who are known to put things in their mouths may help curb this disorder. More interestingly, pica is practiced when children are not supervised, and they are usually reluctant to mention their habit of this practice of pica. This is the reason, why the symptoms of pica may go unnoticed until and unless the treating doctor specifically asks for the history from the parents of these children. A thorough medical and personal history of children helps to make a better diagnosis of this condition and create an appropriate treatment plan. The strength of this study was that we discussed about a very commonly ignored eating disorder which is an important sign of anaemia in the children and the clinicians should be cautious of this common condition. The limitations of this study included a smaller study group and sample population being restricted to a small demographic area. Scope for future studies may include a larger study group and also measuring the concentration of other micronutrients like zinc, calcium in pica patients.

## Conclusions

Pica is an intriguing disorder, which has been widely known for centuries. It is an important sign of iron deficiency that should never be ignored. In the present study, all children with a history of pica were found to be anaemic, and the most common type

of anaemia among the children was microcytic hypochromic anaemia. Although no significant statistical correlation was observed between anaemia and history of pica, it is very important for the clinicians to be cautious of this common condition.

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