

Iron Deficiency, Anemia and Intestinal Parasitic Infection in Children with Pica

PIKALI ÇOCUKLARDA DEMİR EKSİKLİĞİ, ANEMİ VE PARAZİTER BARSAK İNFEKSİYONU

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Summary

In order to determine iron deficiency, anemia and intestinal parasitic infections incidence in preschool children with pica, 107 children among 1-6 years of age (Mean age 29.54±12.73 months) were investigated. Sixty children in same age group without pica were taken as control group. Soil was the most frequently ingested substance (in 85.9% of cases); followed by wall plaster (in 15.9%), coal (in 9.3%), sand and stone (in 7.5%), and ashes (in 5.6%). Twenty one percent of the cases were found to ingest more than one substance. Anemia was found in 57% and iron deficiency in 76.6% of the children with pica. In control group without pica, anemia and iron deficiency were found in 21.7% and 35.0% of the children, respectively. The differences between two groups were significant ($p<0.01$ and $p<0.01$). The iron deficiency rate was 85.2% in anemic children with pica. Intestinal parasitic infections were found in 62% of the children and polyparasitism rate was 27.5%. There were important relationships between severity of anemia, duration of pica and polyparasitism. Treatment with iron supplements led to cessation of pica in 79% of children with pica and iron deficiency. This study indicated that iron deficiency and anemia are more prevalent and perhaps the main causes of pica in preschool children with pica.

Key Words: Pica, Iron deficiency. Anemia, Intestinal parasite.

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Pica is the persistent eating of non-nutritive substances (1-3). The etiology and mechanism of development of pica is still unclear. It appears to be

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Özet

Pikası olan okul öncesi dönemi çocuklarda demir eksikliği, anemi ve bağırsak parazitleri sıklığını tespit amacıyla 1-6 yaşları arasında (ortalama yaş 29.54 ± 12.73 ay) olan 107 çocuk incelendi. Kontrol grubu olarak aynı yaş grubunda ve pika hikayesi olmayan 60 çocuk alındı. En sık yenilen maddeler; toprak (%85.9), duvar sıvaları (%15.9), kömür (%9.3), taş parçaları ve kum (%7.5), ve kül (%5.6 vakada) olarak bulundu. Vakaların %21'inin birden fazla madde yediği tesbit edildi. Pikalı çocukların %57'sinde anemi, %76.6'sında demir eksikliği bulunurken, kontrol grubunda anemi %21.7, demir eksikliği %35.0 oranlarında görüldü. İki grup arasındaki bu farklılıklar anlamlıydı ($p<0.01$ ve $p<0.01$). Pika ve anemisi olan çocuklarda demir eksikliği ise %85.2 oranında bulundu. Çocukların %62'sinde bağırsak paraziti görüldü ve poliparazitizm oranı %27.5 idi. Demir eksikliği ve aneminin ağırlığı ile pika süresi ve poliparazitizm arasında önemli bir ilişki bulundu. Demir eksikliği olan çocukların %79'unda demir preparatları ile tedaviden sonra pika kayboldu. Bu çalışma, okul öncesi pikalı çocuklarda demir eksikliği ve aneminin oldukça yaygın bulunduğunu ve belki de pikanın en önemli sebebi olduğunu, fakat tek sebebi olmadığını göstermiştir.

Anahtar Kelimeler: Pika, Demir eksikliği, Anemi, Bağırsak paraziti

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dependent on admixture of social, cultural, psychological, biological and behavioral factors (1-7).

Although an important association was found between pica and iron deficiency (3,4,7,8), it is controversy whether iron deficiency causes pica or the dietary irregularities engendered by the pica produce iron deficiency (1,4). Pica may be one of the important causes of lead poisoning (9-11), toxocariasis (12,13), poor growth (3,14), intestinal obstruction and perforation (15,16), intestinal para-

sitic infection (3,17,18) and anemia (1,3,4,19,20). A geophagia syndrome characterized by severe anemia, dwarfism, hypogonadism and hepatosplenomegalia has been reported in Turkey and Iran (14,21,22). The alterations of intestinal and gastric mucus, and decreased iron and zinc absorption has been detected in this syndrome (14,22-24). Persistent pica cases associated with underlying celiac diseases were also reported (25). The disorder appears to be more prevalent in the low socio-economic classes and in children with psychological and mental problem (2,4,5,26).

In this study, we investigated the relationships of iron deficiency, anemia, and intestinal parasitic infection with pica.

Materials and Methods

One hundred seven preschool children who were brought to Harran University Medical Faculty Hospital with complaints of eating nonnutritive substances were taken as study group. In the history; type of eating substances, duration, frequency, family history of pica, economic situation of family and psychological stress on child, such as separation from parents and problems with members of family, were recorded. All of the children were examined systematically; weight, height and head circumference measurements were done, and the children who were smaller and lighter than 10th percentile according to percentile value for Turkish children (27) were regarded as poor growth. Complete blood counts were performed with automatic cell counter, blood smears were examined by a pediatrician, serum iron and unsaturated iron binding capacities were measured with colorimetric method, and transferrin saturations were calculated. Hemoglobin levels below 11 g/dl were accepted as anemia. Stool and cellophane tape examination for ova and cyst of parasites were performed three times.

Sixty children between 1-6 years old who were brought to hospital with other complaints, and without pica history were taken as control group.

Children who had iron deficiency were treated with iron preparations (5-6 mg/kg/day, in three divided doses) orally for two-three month period. Children who had intestinal parasitic infection received oral antiparasitic drugs according to type of parasites. Patients were followed and inspected with one-month intervals whether pica is continued.

Statistical analyses were performed by using Chi-square and Correlation analyses methods.

Results

The distribution of patients according to age and sex was given in Table 1. The mean age was 29.54 ± 12.73 months and the overall male to female ratio was 1.43:1. The mean pica duration was 9.69 ± 6.43 months.

Twenty-one percent of the cases were found to ingest more than one substance. Soil was the most frequently ingested substance; followed by wall plaster, coal, sand and stone, ashes, and less frequently; brick, paper, wood, dung, pencil and color pencil, piece of cloth, plastic material and waste were found as ingested substances. The list and rate of substances ingested are shown in Table 2.

In 16 (15%) of the patients, there were a positive pica history of father, mother, or a sibling. We could not find an important relationship between pica and socio-economic situation, but psychological stress such as separation of parents, mother's disease, and parental problem in house were found in 19 (17.8%) of the patients.

Iron deficiency was found in 82 (76.6%) of pica children. There was anemia in 61 (57%) of the patients and 13.1% had hemoglobin values less than 7 g/dl. The distribution of anemic children accor-

Table 1. The distribution of children with pica according to age and sex

	12-24 month	25-36 month	37-48 month	49-72 month	Total
Male	21	26	11	5	63
Female	19	14	8	3	44
Total (%)	40 (37.4%)	40 (37.4%)	19(17.8%)	8 (7.4%)	107

Table 2. The types and rates of ingested substances

Substances Ingested	Number of Cases*	Rates (%)*
Soil	91	85.9
Wall plaster	17	15.9
Coal	10	9.3
Sand and stone	8	7.5
Ashes	6	5.6
Brick	5	4.7
Paper	5	4.7
Wood	5	4.7
Dung	4	3.7
Pencil-color pencil	4	3.7
Piece of cloth	2	1.9
Waste	2	1.9
Plastic material	2	1.9

*Twenty one percent of the cases were found to ingest more than one substance.

ding to hemoglobin values is shown in Table 3. In control group without pica, there were iron deficiency in 21 (35.0%) and anemia in 13 (21.7%) of the children, and these differences were statistically significant ($p < 0.01$ and $p < 0.01$). Iron deficiency rate in anemic patients with pica was 85.2% and there were significant relationship between anemia severity and pica duration ($p < 0.05$, $r = 0.35$).

Microscopic investigation of stools showed positive results for intestinal parasites in 66 (62%) of the pica children. Polyparasitism were found in 18 (27.5%) of the children (two different parasites in 13 (19.7%) and three different parasites in five (7.8%) of the patients). The most prevalent intestinal parasite was *Ascaris lumbricoides*; followed by *Enterobius vermicularis*, *Trichuris trichiura*, *Entamoeba histolytica*, *Giardia intestinalis*, and *Hymenolepis nana*, respectively. (Table 4). In control group, intestinal parasitic infections were found in 16 (26.7%) of the children and the difference was significant ($p < 0.01$). Anemia rate was 65.2% in children with intestinal parasitic infection and there were anemia in 83.2% of patients with polyparasitism (all of the patients who had three different parasites, and 76.6% of the patients who had two different parasites had anemia). This rate was statistically higher than the rates of others who had not or one type parasite in their stool ($p < 0.01$).

Thirty-one (29%) of the children with pica had poor growth. In control group, poor growth was

Table 3. The distribution of anemic children according to hemoglobin values

Hemoglobin values	Number of Patient	Rate (%)
Hb < 7g/dl	8	13.1
Hb between 7-9g/dl	17	27.9
Hb between 9-11g/dl	36	59.0
Total	61	100

Table 4. The number and rates of intestinal parasites that found in children with pica

Parasite name	Number	Rates (%)
<i>A. lumbricoides</i>	54	60.7
<i>E. vermicularis</i>	16	18
<i>T. trichiura</i>	7	7.9
<i>E. histolytica</i>	6	6.7
<i>G. intestinalis</i>	4	4.5
<i>H. nana</i>	2	2.2
Total	89	100

found in eight (13.3%) of the children. This difference was also statistically significant ($p < 0.01$).

Treatment with iron supplements led to cessation of pica in 79% of children with pica and iron deficiency; but in 21% of this group, pica continued after iron therapy, and required psychotherapy and other supporting therapies.

Discussion

This study showed that anemia, iron deficiency, and intestinal parasitic infections are more prevalent in preschool children with pica, like previously reported studies in bigger children (14,20).

Pica may be a manifestation of iron deficiency. This opinion is supported by that pica can be treated rapidly and effectively by iron therapy in a high proportion of cases (1,4,8,28). But also, pica may be a predisposing factor and an important cause of iron deficiency, because soil and clay can bind dietary iron complexes and decrease absorption of iron through the intestinal wall (1,14,25,28). The cessation of pica with iron supplement therapy in 79% of children with pica and iron deficiency showed that iron deficiency is an important cause of pica in our region's preschool children. But there were not iron deficiency in 23.4% of all children

and 14.8% of anemic children; so, other reasons should be investigated. Arcasoy et al. (24) and Çavdar et al. (14) reported that pica was also associated with malabsorption and zinc deficiency. Unfortunately we could not investigate whether the children had zinc deficiency, and it is possible that some of our patients had zinc deficiency. In anemic children without iron deficiency, the causes of anemia may be zinc or other nutritional deficiencies and lead poisoning resulted by pica (1,9,29).

Intestinal parasitic infections were determined in 62% of the patients, and this rate was more than two times than in control group. The most prevalent parasites: *A. lumbricoides*, *E. vermicularis*, and *T. trichiura* are soil-transmitted parasites, and can easily infect the child by ingestion of soil (30,31). Geissler et al. (18) reported a significant association between geophagy and parasitic infection intensity. Our results showed an association between parasitic infection intensity (polyparasitism) and severity of anemia. Sometimes, parasitic infection may cause to appetite deviation, and so, may cause to pica (32).

Family history of pica has been reported previously (1,3,4). Fifteen percent of our patients had family history of pica. We also found important psychological stress history in 17.8% of cases. This study is also indicated that psychological stress may be a predisposing factor for pica and should be investigated in all cases.

Çavdar et al (14) reported that the most common clinical finding in patient with geophagia were growth retardation. Although mean age of our patients was small and so, pica duration were short, 29% of them had growth retardation. Soil and other non-nutritive substances may cause malabsorption in intestine. The possible causes of poor growth in children with pica are nutritional deficits, iron and zinc deficiency, anemia, and parasitic infections due to pica (2,3,14).

In conclusion, pica is an important problem among 1-6 years old children because it may be the cause of anemia, iron and zinc deficiency, intestinal parasitic infection and growth retardation. Prophylactic use of iron supplements in infants and young children may be beneficial to prevent pica.

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