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DETRIMENTAL CONSEQUENCES OF THE HABIT OF GEOPHAGY IN CHILDREN UNDER THE AGE OF FIVE YEARS

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Abstract:- Geophagy is a form of Pica. It is customary in the poverty-stricken population. Children under the age of five, are inclined towards soil eating. It leads to various diseases such as anemia, helminthes infection and diarrhea. Prospective, observational study was designed to observe the prevalence of Geophagy in children under five and its impact on their health. Study had 440 children, selected by multi stage sampling method in city of Fazilka in Punjab. Soil eating was found in 20.2% of children in (2y- 3y) of age group, whereas, 1.6% of children in (>3y -<5y) of age group. Pallor and Geophagy were significantly, ($p<0.0001$) associated in children.

Keywords: Geophagy, Soil eating, Clay eating, Pica, Pallor.

INTRODUCTION

Pica is an insist of eating non-edible substances like, soil, clay, hair, wood. There is no universal definition of Pica in texts. Further, Geophagy is a specific category of Pica, by Cynthia, (2004), in which an individual ingests soil, clay or mud. In human beings, this behavior is most prevalent in poor population, which is confined to villages and in slim areas, have slightest access to medical facility, illiterate and least motivated to adopt good hygiene practices.

Many theories have been proposed to explain Geophagy. But two constrains for Geophay are most noteworthy, as, these are functional and cultural drives. The functional drive stresses on the physiological need of an individual, whereas, the latter drive works on the traditions and sociological urges in an individual. Khan & Tisman, (2010), described the patho-physiology in Geophagy.

Children under age of five, generally consume soil to fulfill the minerals deficiency in their body. The soil particles interefere in absorption of iron in the intestine. Thus children suffer from anemia and malnutrition.

Soil eating is ubiquitous in rural areas in India, some regions of United states and in African tribal population. According to Abraham, (2003), Geophagy is associated with the customs and traditions, prevalent in their families.

It is believed, in some tribal belts that soil eating might sustain fertility. Soil is ingested to treat nausea and vomiting, while others believe that clay eating gratify the calcium demands in pregnancy.

2. RATIONALE

Abnormal habits of children, below the age of five years, effect their overall health. Prevalence of Geophagy is not well researched either at the national level or at regional level. Therefore, the present study was performed to explore prevalence of Geophagy at regional level and its effect on health of children. It was assumed that regional data could deliver valuable information on this aspect.

3. AIM & OBJECTIVES

Aim

Study conducted to explore prevalence of Geophagy and its ill effects on health of children under age of five years.

Objectives

1. To assess prevalence of Geophagy in children under five.
2. To assess association of Age and Geophagy in children.
3. To observe ill effect of Geophagy on health of children in terms of Pallor.

4. MATERIALS & METHODS

4.1 Research Design

Cohort, Descriptive and Prevalence Study.

4.2 Sampling Design

A. Study Area

Study was conducted in and around the city, Fazilka in Punjab. This city is located on Indo-Pak border in Punjab. As per census report of 2001, Fazilka has a population of 67,424, comprising 52% males and 48% females. In Fazilka, 13% of the population is under 6 years of age.

B. Sample Source and Sampling Units

Children between two years to below the age of five years, residing in and around Fazilka, constituted the sample frame. The sampling units were the children as described by sample selection criteria, mentioned below.

C. Sample Selection Criteria

A. Inclusion Criteria

1. Children in age group between 2 years to below five years.
2. Physically and mentally fit children, who could participate in physical examination & anthropometric measurements.

B. Exclusion Criteria

1. Critically weak children.
2. Un-cooperative children.
3. Children below 2 years and above 5 years of age.

D. Sampling Method

Samples were selected by Random sampling, Multi-stage method, described, as:

In the first stage, the city was divided into three strata, as:

1. Elementary schools
2. Anganwadi (child care centres)
3. Slum areas.

In the second stage, Schools, Anganwadi and Slum areas were selected randomly from the sample frame.

In the third stage, all the children between two years to below five years of age, were selected as per the above stated sample selection criteria.

E. Sample Size Determination

Sample size was determined according to the following formula:
Sample size (n) = $Z2 \times p \times q / d 2$
Z= value of 1.96 was used at 95% of confidence interval
p= 47% prevalence of malnutrition in india
q= (1- p)
d= 5% margin of error
Sample size of 382 was calculated by the above formula. To this sample size, non response rate of 15% was added, hence, after final adjustment, sample size of 440 was determined.

4.3 Data Collection Design

Type of data

Primary data, collected by techniques, as:

A. Data Collection Instruments

Observation schedule and interview schedule

These were used for recording of demographic characteristics, anthropometric values and clinical signs & symptoms.

B. Data Collection Methods

1. Direct observation and interview method

General physical appearance
Age, Geophagy habit and dietary habits of children.

2. Inspection

Four Anatomical sites, as:
Conjunctiva
Crease of palm
Oral mucous membrane
Nail beds

3. Palpation

Abdomen was Palpated to find out presence of hepatomegaly/spleenomegaly, if any.

4. Anthropometric measurements

A. Height measurement

Height of children was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of board.
The child's head, shoulders, buttocks, knees and heels touching the board.
Height was recorded in Cm.

B. Weight measurement

Weight was measured by electronic digital weighing scale.
Children were made to stand on scale with light clothing and no shoes.
Calibration was done before weighing every child by setting it to zero.
Weight was recorded in Kg.

C. Data measurement Scales

1. Interval scale was used for recording Age, number of participants.
2.Nominal scale was used for recording binary variables as, Pallor, Geophagy, hepatomegaly/spleenomegaly. Responses were recorded as (Y) & (N).
3. Prevalence of Pallor was described, as:

(Prevalence of Pallor) = Number of participants affected / total number of participants × 100

4.4 Statistical Design

A. Descriptive analysis of Pallor, Geophagy and other characterictics was done in percentage scale, as:
Prevalence of a characterictics = number of participants affected with characterictics / total number of participants × 100
B. Odd ratio with 95% C I was computed.
C. Hypothesis was verified by non-parametric, Chi square test of independence.
D. p value of ≤ 0.05 was implied as statistically significant.

5. RESULTS

1. Children between 2 years to below 5 years, were selected randomly from different strata of city, Fazilka in Punjab. The study population covered 240/440, 127/440 and 73/440 children from schools, anganwadi and slum areas, respectively, as shown in table 1.

Table 1. Distribution of children in different Strata

Strata	Children (n/N)
Schools	240/440
Anganwadi(child care centre)	127/440
Slum residents	73/440

2. Descriptive analysis of Geophagy was performed. It delivered overall prevalence of Geophagy, 9.4% (41/440), in children under age five years.

Furthermore, analysis of the prevalence of Geophagy was performed in different Age groups of children. It revealed differential prevalence of Geophagy. This was 20.2% (34/169) in age group, (2y to 3y) and 1.6% (7/271) in another age group, (>3y -<5y), as shown in table 2.

Table 2. Prevalence of Geophagy in different Age groups in children

Age	Geophagy (n%)	Normal (n%)
2 years to 3 years	20.2% (34/169)	79.8% (135/169
>3 years to < 5 years	1.6% (7/271)	98.4% (264/271)

Odd ratio between Geophagy and Age of children
O. R. = (0.2519/0.0265)
O. R. = (9.498)
95% C. I. (4.1025- 21.99)

Table 3. Inferential analysis between Geophagy and Age group of children

Characteristics	(2 y to 3 y)	(>3 y to < 5 y)	Chi square value χ^2	P value
Geophagy	34	7	37.88	<0.0001
Non- Geophagy	135	271		

Inferential analysis to verify the odd ratio between Geophagy and Age group, was performed by Chi square test of independence. It provided value (χ^2=37.88, df=1) at ($p<0.0001$) level of significance. This value was

contested with table value ($?^2$= 3.84, df=1) at (p=0.05). The Null hypothesis was rejected at 5% significance level, as shown in table 3.

3. Binary out-come variable, Pallor was explored by computing odd ratio. This compared the odd of Pallor in the presence of Geophagy, predictor variable and with that of absence of the Geophagy.

Odd ratio between Geophagy and Pallor
O. R. = 0.527/0.0062
O. R. = (85.64)
95% C. I. (20.22- 362.6)

The hypothesis was tested with non-parametric, Chi square test of independence. It furnished a value, ($?^2$ = 114.2, df=1), at significance level, (p<0.0001) as shown in table 4. This value was matched with the table of chi square test, ($?^2$ = 3.84, df=1), at significance level of 5%. Hence, Null hypothesis was rejected at 5% significance level.

Table 4. Inferential analysis between Geophagy and Pallor in children

Characteristics	Pallor	Non-pallor	Chi square value χ^2	P value
Geophagy	39	2	114.2	<0.0001
Non-geophagy	74	325		

6. DISCUSSION

1. In the present study, 9.4% (41/440), overall prevalence of Geophagy was observed in children in city, Fazilka in Punjab. Geophagy is a eating disorder. The scientific data regarding its causes and consequences on the body, are inadequate. Generally, the nutritional deficiency of minerals like iron, zinc, calcium, predisposes to the habit of Geophagy. An individual takes to soil eating, probably to accomplish deficiency. Nevertheless, Geophagy in older children is considered as abnormal behavior.

In a prior study by Gupta & Gupta, (2005), on the clinical profile of Pica in children, 32% prevalence of Geophagy was observed in the children.

In the present study, the prevalence of Geophagy, (9.4%) was found to be less in comparison to earlier study by Ismail & Hill, (1996), on children in three district of Kazakhstan, they reported a prevalence of 23.8% of Geophagy. The plausible explanation could be the sample size, literacy rate, sampling site and socio-economic status of parents.

The facts obtained in present study related to prevalence of Geophagy in children under age of five years, are additionally, substantiated by the literature available in National Library of medicine, U.S.A. According to it, 10% to 32% of all children between the ages of one and six, exhibited pica behaviors.
In another study, by Vermer & Frate, (1979), Geophagia was found in 57% of the women and 16% of the children, but it was not observed among adult males or adolescents.

Above past studies, showed different prevalence of Geophagy in comparison to the present study. It is obvious, because the Geophagy is dependent on multiple factors like, socio-economic status of parents, type of houses, literacy rate, weaning habits, medical facilities.

2. In the present study, the prevalence of Geophagy was diverse in different Age groups of children. It was noted to be 20.2%, in (2y -3y) age group, was higher in comparison to prevalence of 1.6%, in age group, (> 3y -<5y).

Odd ratio, (9.49) and chi square value, (χ^2=37.88, p<0.0001) confirmed that the children in lower age group have more than 9 times, higher probability of acquiring soil eating habit in contrast to children in upper age group.

These facts are authenticated by the literature provided by Tracy,(2014), stated that Pica habit is present in 2nd and 3rd years of child life and there is a linear relation between the two. Habit of Geophagy is considered abnormal, if it persists in children older than three years.

3. Soil eating is injurious to the health of children. In present study, it has been proved by (O.R.= 85.9,) that children with habit of soil eating have much higher probability, 85 times, to develop Pallor than those, who are not inclined to habit of soil eating. This association was found significant, (p<0.0001, $?^2$=114.2).

This data of present study, has been endorsed by the work of Karoui & Karoui, (1993), on Tunisian

children, which showed the association of Geophagy with Anemia among 63 children, all were in the age group of 10-59 months.

Another, former study by Lanzkowskyt, (1958) amongst 12 children from department of child health, Red Cross war memorial children's hospital, Cape Town, South Africa, showed that all children had deficiency of iron. Association between soil eating and Anemia is again supported by the previous research of Moore & Sears, (1994).

Reasonable explanation, between Geophagy and Pallor in children, is the impaired absorption through intestine. Soil particles interfere in the absorption of dietary iron from the alimentary canal. According to Prasad et al. (1983), the chemical components of soil damage the intestinal mucosa, that lead to poor absorption, diminished food intake, poor appetite.

7. CONCLUSION

Good health is an out-come of balanced diet and good hygiene habits. Geophagy is ubiquitous in poverty dependent environment. It divests health of child, especially during formative period of child age. Remedial measures, educative, interceptive, corrective be adopted to defeat it to save our future of mankind.

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