



A Systematic Review of Pica and Geophagy in Japan and Korea

Christopher D. Golden ^{a,*}, Curie Ahn ^b, Yusuke Okubo ^c, Satowa Suzuki ^d, Young S. Yi ^{e, f}

^a Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA

^b Tufts University School of Medicine, Boston, MA, USA

^c Department of Epidemiology, Fielding School of Public Health, University of California, Los Angeles, CA, USA

^d National Institute of Infectious Diseases, Tokyo, Japan

^e Harvard School of Dental Medicine, Boston, MA, USA

^f Boston Children's Hospital, Boston, MA, USA

*Corresponding Author: golden@hsph.harvard.edu DOI: <https://doi.org/10.34256/ajir1947>

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Abstract: Pica, the craved and purposive consumption of non-food substances, is a globally widespread behavior that has critical connections to public health. Although there is a rich literature describing these behaviors from nearly every culture around the world, there is a dearth of English language literature reporting these behaviors in Japan and Korea. Here, we systematically reviewed the medical evidence of pica in Korean and Japanese language journals to confirm their presence in these cultures and to characterize culturally-specific factors associated with these behaviors. We used Ichusi-Web and KoreaMed with a broad variety of recombined search terms including “pica,” “geophagy,” “amylophagy,” and “trichobezoar” in Korean and Japanese characters. Our results confirm that pica is present in both of these cultures, with particularly frequent reports of trichobezoar (the consumption of human hair).

Keywords: Amylophagy, Geophagy, Global health, Pica, Public health nutrition, Trichobezoar.



Christopher D. Golden is an Assistant Professor of Nutrition and Planetary Health at the Harvard T.H. Chan School of Public Health. He received a PhD in Environmental Science, Policy, and Management and an MPH in

Epidemiology from the University of California, Berkeley.



Curie Ahn Graduated from California Institute of Technology in 2014 with honors in Biology. She is now a third year medical student at Tufts University School of Medicine and is interested in pursuing a career in academic medicine, combining

teaching and research.



Yusuke Okubo received his Master's of Public Health at the Harvard T.H. Chan School of Public Health and is currently a doctoral student at the UCLA Fielding School of Public Health.



Young S. Yi graduated with honors from Harvard School of Dental Medicine and completed his residency in pediatric dentistry at Boston Children's Hospital. He is board-certificated and holds a teaching appointment at Harvard School of Dental Medicine and Boston Children's Hospital.



Satowa Suzuki is a medical doctor and public health specialist by training, having received her MPH in Epidemiology from the University of California, Berkeley. She is currently a researcher at the National Institute of Infectious Diseases in Tokyo, Japan.

1. Introduction

Although the practice of geophagy, or earth-eating, has its origins in Africa, it has become a globally widespread behavior [1-3]. Nevertheless, according to systematic reviews of the literature, there are still several areas where the practice has been scarcely observed and remains enigmatic, including Japan, South Korea, and Madagascar [1]. The purpose of this brief report is to fill in gaps in our knowledge in the English language literature of the geographical coverage of pica (the craved and purposeful consumption of non-food substances [4]) and geophagy. In this report, we highlight evidence from medical case reports and population-based studies to confirm the presence of pica in South Korea and Japan. In addition to a recent study by Golden et al. [5] empirically confirming the presence of geophagy, amylophagy, and other forms of pica in Madagascar, this report will present evidence that there are likely no corners of the earth where pica is not prevalent.

2. Materials and Methods

We conducted a systematic review of the medical evidence of pica in Korean and Japanese languages from each of these regions to determine whether these behaviors had in

fact never been reported. We used Ichusi-Web managed by the Japan Medical Abstracts Society (<http://www.jamas.or.jp/>) and KoreaMed (<http://www.koreamed.org/SearchBasic.php>) with search terms including "pica" and "geophagy" in Korean and Japanese characters. We created a list of recombinations of search terms which produced an initial pool of results (Table 1). We then immediately excluded studies which had no abstract to review, then upon a deeper reading we excluded studies with a non-human focus and which had inadequate data for classification.

The search on Ichusi-Web for relevant Japanese cases yielded 370 results (of which 48 possessed enough data for classification). The search on KoreaMed for relevant Korean cases yielded 27 results (of which 11 possessed enough data for classification).

All search results were reviewed by a native Japanese and Korean speaker, respectively, scanning abstracts for relevancy to the study. All studies with a non-human focus or inadequate data for classification were excluded.

Table 1. Methodology and Results Yielded by Search Terms on Ichusi-Web and KoreaMed for Cases of Pica and Geophagy.

Database	Search Terms	No. of Search Results Before Exclusions	No. Studies Excluded (No Abstract)	No. Studies Excluded (Non-Human Focus)	No. Studies Excluded (Inadequate Data)	Supplementary References
Ichusi	Pica [ALL] AND Behavior [ALL]	37	22	6	2	1-7
Ichusi	Trichobezor [ALL] and pica [ALL]	45	19	0	0	8-18
Ichusi	Pica [ALL] and children [ALL]	114	0	0	10	2, 3, 6, 8, 12-14, 16-27
Ichusi	Trichobezoar [ALL]	165	131	0	2	8-11, 14-20, 28-48
Ichusi	Geophagy [ALL] and Pica [ALL]	1	0	0	0	30
Ichusi	Geophagy	1	0	0	0	30
Ichusi	Amylophagy	0	0	0	0	N/A
Ichusi	Geophagia	7	5	0	1	30
KoreaMed	Pica [ALL] AND behavior [ALL]	1	0	0	0	53
KoreaMed	Trichobezoar [ALL] AND pica [ALL]	3	0	0	0	49,50, 54
KoreaMed	Pica [ALL] AND children [ALL]	6	0	0	1	49, 50, 53-55
KoreaMed	Trichobezoar [ALL]	15	1	0	6	49, 50, 54, 56-60
KoreaMed	Geophagy [ALL] AND Pica [ALL]	0	0	0	0	N/A
KoreaMed	Geophagy	0	0	0	0	N/A
KoreaMed	Amylophagy	0	0	0	0	N/A
KoreaMed	Geophagia	2	0	0	2	N/A

3. Results

In the medical literature from Japan, the pica case reports included both sexes (though heavily skewed toward a female behavior) from 4 to 83 years of age. Pica items consumed ranged from incidences of geophagy and trichobezoar to the consumption of papers, plastics, and other items (Table 2). Nearly all of these patients were deemed to have

underlying diseases causing this behavior, such as autism, mental retardation, schizophrenia, iron-deficiency anemia, depression, myasthenia gravis, cerebral palsy, dementia, epilepsy, eating disorders and cancer (Table 1).

Table 2. Observations of pica and geophagy in Japan.

Age	Sex	Underlying or associated condition	Pica substance consumed	Reference
GEOPHAGY				
10	M	Iron deficiency anemia	Geophagy (general)	1
12	F	Intellectual disability	Limestone	2
26	F	Schizophrenia	Pottery and porcelain	2
54	F	Iron deficiency anemia, manic disorder	Pottery and porcelain	2
TRICHOBEZOAR				
Not specified (child)	F	Not specified	Hair	3
Not specified (child)	F	Not specified	Hair	4
4	F	Not specified	Hair	5
6	F	Not specified	Hair	6
7	F	Not specified	Hair	7
8	F	Not specified	Hair	8
8	F	Not specified	Hair	9
8	F	Anxiety disorder	Hair	10
8	F	Not specified	Hair	11
8	F	Unspecified psychiatric disorder	Hair	12
8	M	Mental Retardation	Hair	13
8	F	Not specified	Hair	14
9	F	Rapunzel Syndrome	Hair	16
10	F	Trichotillomania	Hair	17
11	F	Not specified	Hair	15
11	F	Psychiatric disorder	Hair	18
11	F	Adjustment Disorder	Hair	19
11	F	Not specified	Hair	20
12	F	Not specified	Hair	21
13	F	Not specified	Hair	22
13	F	Not specified	Hair	5
13	F	Not specified	Hair	23
14	F	Trichotillomania	Hair	24
14	F	Obsessive-compulsive disorder	Hair	25
15	F	Borderline personality disorder	Hair	26
15	F	Borderline personality disorder	Hair	27
15	F	Trichotillomania	Hair	13
15	F	Trichotillomania	Hair	28
17	F	Trichotillomania	Hair	29
18	F	Not specified	Hair	30

Continued

Table 2. Continued

22	F	Autism	Hair	31
29	F	Appendicitis	Hair	32
34	F	Not specified	Hair	33
34	F	Not specified	Hair	34
37	F	Not specified	Hair	35
49	F	Mental Retardation, Hypothyroidism	Hair	36
OTHER				
12	M	Autism	Lead	37
13	F	Panic disorder, Psychogenic Vomiting	Tissue paper	38
15	F	Mental Retardation, Epilepsy	Tissue paper	39
17	F	Chronic renal failure	Tape	40
30	F	Severe Mental Retardation	Surgical glove	41
37	N/A	Influenzae Encephalopathy	Surgical glove	41
37	M	Severe mental retardation	Surgical glove	42
40	M	Pervasive developmental disorder	Human feces	43
80	F	Alzheimer disease	Toilet paper	44
83	F	Alzheimer disease	Diaper	45
NOT SPECIFIED				
Adult	M	Autism	Not specified	46
30	M	Severe Mental Retardation, Cerebral Palsy	Not specified	47
30	M	Cerebral Palsy	Not specified	48

Results from a systematic review showing pica case studies in Japan. The table has been categorized into the types of pica behavior practiced and ordered by age within those categories. Underlying disease refers to clinical case reports where the physician reported an underlying condition that the physician believed to predicate the pica behavior. See Supporting Information for references.

Table 3. Observations of pica in South Korea.

Age	Sex	Underlying or associated condition	Pica substance consumed	Reference
3	F	Emotional disturbance and trichotillomania	Hair	49
6	F	Not specified	Hair	50
7	F	Not specified	Hair	49
8	F	Trichotillomania	Hair	51

Continued

Table 3. Continued

8	F	Depression	Hair	52
8	F	Not specified	Hair	53
9	F	Abdominal pain, vomiting	Hair	54
11	F	Not specified	Hair	55
11	F	Trichotillomania	Hair	56
14	F	Not specified	Hair	57
Mean: 27.1	92 women	Not specified	Uncooked rice	58
Range: 20-40	32 hospitalized pica patients	Severe mental retardation	Unspecified	59
11	F	Trichotillomania	Hair	56

Results from a systematic review showing pica case studies in South Korea, ordered by age. Underlying disease refers to clinical case reports where the physician reported an underlying condition that the physician believed to predicate the pica behavior. See Supporting Information for references.

Uchida and authors [6] presented the only population-level study of pica in Japan to our knowledge. The authors found that of 353 patients with iron-deficiency anemia, the prevalence of pica was 0.06%. As is evident from the story of the pawnshop's daughter and from these medical case reports, the Japanese perception of pica as a disease, or behavior induced from an underlying disease, may be partially responsible for the stigma associated with it and the lack of medical consultation and/or reporting that occurs.

In the medical literature from South Korea, eleven studies were found: nine case reports and two population-level studies (Table 3). In 92 otherwise healthy pregnant women, Kim [7] found that 5.2% consumed uncooked rice grains, a form of amylophagy. In another study, 32 hospitalized pica patients were observed to see if they had heightened lead exposure compared to healthy individuals. Pica patients showed biomarker

signals for anemia with low levels of hemoglobin, hematocrit, mean corpuscular volume and calcium and high levels of zinc protoporphyrin [8]. High zinc protoporphyrin is often indicative of lead poisoning as lead inhibits the absorption of iron. All ten case reports were childhood to early adolescent female incidences of trichobezoar, the consumption of hair (Table 2).

4. Discussion and Conclusion

The purpose of this report was to briefly review the prevalence of geophagy and pica behavior in Japan and South Korea so as to fill gaps in the research literature available in English. Past reviews had documented pica on nearly every corner of the globe with the exception of Madagascar, Korea, Japan and southern South America [1]. The literature on pica and geography in South Korea is scant. However, there is a long tradition of

observations of pica and geophagy in Japan. The written history of pica in Japan dates back to at least the Edo Period as evidenced by an 18th century story written by Tousaku Hedutsu, entitled *Shichiya no musume* (A daughter of the pawnshop). The story follows that a man who sells cosmetic oils fell in love with a beautiful girl who was the daughter of parents who owned a pawnshop. The salesman tried to sell the cosmetic oils very cheaply in order to gain favor with the young girl but she kept rejecting him. After a year, the pawnshop owners realized that their daughter used too much cosmetic oil but that she was drinking the vast majority of it. It was compulsive and the parents couldn't stop their daughter. Eventually, the poison caused pustules to erupt on her face, leading to her death and many centipede-like worms to crawl out of her head. The daughter's death was due to a disease called *gou-byou* which means "karma disease" as she rejected the oil seller's advances. However, the author is careful to note that there are other people who lick ashes or eat earthenware and this is not due to *gou-byou* but rather another type of disease.

It is likely that many reports or observations of these papers are within books or monographs from the anthropological literature and thus, not captured by this review. Nevertheless, this mini-review, in addition to the work of Golden et al. [5], serves to elucidate the truly comprehensive global nature of this behavior.

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