

* This English manuscript is a translation of a paper originally published in the *Psychiatria et Neurologia Japonica*, Vol.124, No.9 p.601-622 which was translated by the Japanese Society of Psychiatry and Neurology and published with the author's confirmation and permission. If you wish to cite this paper, please use the original paper as the reference.

Original Article

Anorexia Nervosa of Female Patients in a Medical Prison: First Report: Classification into Characteristic Groups

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Psychiatria et Neurologia Japonica 124: 601-622, 2022

Abstract

[Introduction] The number of eating disorder (ED) patients in Japanese correctional facilities has increased in recent years, creating difficulty for their on-site staff, especially those working at women's prisons. Patients in severe condition who cannot be dealt with adequately in regular prisons are transferred to a medical prison. Kitakyushu Medical Prison started accepting ED patients in severe condition who need intensive treatment in May of 2012. Most of them were suffering from anorexia nervosa (AN). Up to June of 2021, we treated 100 female prisoners with AN. [Purpose] To deepen our understanding of the pathology of the disease, we classified female patient with AN by their history of ED and methamphetamine abuse. [Methods] The patients were classified into four groups by their history of ED and methamphetamine abuse before their first imprisonment: (i) the "ED (+) Methamphetamine (-)" group consisted of patients with a history of ED without methamphetamine abuse; (ii) the "ED (-) Methamphetamine (-)" group consisted of patients without a history of ED without methamphetamine abuse; (iii) the "Methamphetamine (+) ED (+)" group consisted of patients with a history of ED with methamphetamine abuse; and (iv) the "Methamphetamine (+) ED (-)" group consisted of

patients without a history of ED and with methamphetamine abuse. Data were collected for comparison of various demographic, clinical, and psychosocial factors. [Results] The majority of our patients were in the "ED (+) Methamphetamine (-)" group (n=74). They generally developed typical ED at a young age, their ED was of very long duration, and they had the most serious severe and enduring AN. For the "ED (-) Methamphetamine (-)" group (n=13), the onset of ED was in middle-age and older in the wake of arrest or imprisonment. The "Methamphetamine (+) ED (-)" group (n=9) had their first ED symptoms after imprisonment and showed them almost only during incarceration. The members of the "ED (-) Methamphetamine (-)" and "Methamphetamine (+) ED (-)" groups showed non-typical ED features and their desire to be thin was comparatively mild. Although the "Methamphetamine (+) ED (+)" group (n=4) had a small number of patients, they had a pathological condition that was more deeply related to eating disorders than the "Methamphetamine (+) ED (-)" group. The rate of history of receiving ED treatment before the first imprisonment was low, even for patients of the "ED (+) Methamphetamine (-)" group. [Discussion] Our results suggest that female AN prisoners are not homogenous thus, treatment regimens and how patients are dealt with must be individualized to fit the features of each patient. These classifications will be useful in creating more effective interventions. The "ED (+) Methamphetamine (-)" group is especially of clinical importance because of the number of patients and the comparatively typical features and severity of their ED. We plan to do a systematic, multifaceted study of the pathology and treatment of AN patients in medical prisons.

Keywords: anorexia nervosa, eating disorders, theft, methamphetamine abuse, medical prison

Introduction

Eating disorders (EDs) are a fairly common condition today, particularly among young women. However, the causes of onset, the clinical profiles, severity, course, and prognosis vary widely, and it can be said that EDs are a diverse group of diseases that differ from case to case. It is not uncommon for

some patients to repeatedly commit crimes such as theft or violations of the Stimulants Control Law.^{17-19) 23) 25) 38) 39)} With regard to theft, there have been reports that: (i) more ED patients than members of the general population commit theft,¹¹⁾⁴⁰⁾ (ii) there is a strong link between theft and binge-eating,⁶⁾³⁵⁾⁴⁰⁾ (iii) theft is a marker of the

severity of ED,⁶⁾¹⁶⁾ and (iv) ED increase the risk of being convicted of a crime.⁴⁰⁾ In addition, with regard to the relationship with substance abuse, it has been reported that the frequency of comorbidity with substance abuse is high in patients with ED, particularly in those with bulimia nervosa (BN),¹⁾ and that the frequency of binge-eating/purging type anorexia nervosa (AN)¹⁾ is higher than that of the restrictive type.⁵⁾¹³⁾ There are few reports on the relation between methamphetamines and ED, but it has been reported that their appetite-suppressing effect is a motivation for their use.⁸⁾¹⁷⁾¹⁸⁾

These criminal acts are often habitual, and despite various forms of immunity from prosecution, many end up being sent to correctional facilities.²⁻⁴⁾³⁰⁾³⁴⁾³⁷⁾ The existence of these patients with severe ED who repeatedly commit crimes such as theft and are arrested again and again but cannot stop themselves has become a problem even for ED specialists.²³⁾²⁵⁾ However, even among such specialists, the detailed pathology of the condition is not well-known, and there is no consensus on the appropriate treatment or response.

In women's prisons in Japan, the number of inmates with ED has increased in recent years, and the difficulties of dealing with them and concerns about physical health crises

have become a significant burden on the facilities and staff.¹⁴⁾ There are no statistics based on academic diagnostic criteria for the actual number or frequency of ED patients among prisoners, but surveys have been conducted on female prisoners in women's and medical prisons nationwide, based on the definition of "those who are treated differently from other prisoners due to repeated abnormal eating behaviors (anorexia, eating and vomiting, etc.)." In a survey conducted in July 2014, 130 (3.2%) of the 4,027 female inmates surveyed fell under that definition.¹⁴⁾ There have also been a number of cases of death due to ED. A questionnaire survey conducted by the lead author and others found that there were 8 ED patients who died while incarcerated in women's and medical prisons nationwide over a 3-year period from the beginning of 2013.²⁰⁾

Reports of ED patients in prisons are rare even worldwide. Asami et al. retrospectively investigated the condition of 67 female ED patients who were transferred from general prisons to Hachioji Medical Prison (the predecessor of the East Japan Adult Orthodontic Medical Center, which was the largest medical prison in Japan) for psychiatric treatment between October 2002 and December 2011.³⁾ All had AN, and when classified by the crime for which they were sentenced, the most

common crime was theft (shoplifting) with 42 cases (63%), followed by drug-related offenses with 16 cases (24%). The shoplifting group had more severe ED pathology, but less antisocial and impulsive behaviors.

Because the number of inmates with ED increased and difficulties dealing with them became one of the biggest challenges facing women's prisons and the Correction Bureau nationwide, the Kitakyushu Medical Prison (hereafter, our facility) established a women's ward with the aim of expanding the acceptance of ED patients from general correctional institutions. We began accepting inmates in 2012. To date we have accepted a large number of ED patients and provided intensive treatment, taking advantage of the characteristics of medical prisons, such as being able to provide long-term treatment in an environment where avoidance is not an option.²⁷⁻³⁴⁾ Because we accept ED patients in order of severity with most cases involving a high degree of physical urgency, as requested by correctional facilities nationwide, almost all ED patients transferred to our facility have been cases of AN.

This study focuses on female patients with AN treated at our facility. It is aimed at deepening our understanding of the pathology of ED patients who commit crimes, which will be the basis

for, creating and establishing appropriate treatment and response methods. For each case, we obtained detailed information through surveys, interviews, and medical examinations conducted at our facility, in addition to information accumulated in previous detention facilities. The overall scope of the study is wide-ranging, covering topics such as: the patient's upbringing, condition, treatment program, treatment results and prognosis, psychopathology of ED and theft, and the relation between ED and crime. Because this involves a very large volume of data, we plan to report the data in a series papers, with this being the first.

EDs are generally considered to be difficult to treat. Among ED patients, those who are imprisoned for committing crimes and transferred to medical prisons are considered to be specially difficult to treat and deal with. Their ED is generally chronic and severe, with a long duration of illness, and they often have serious problems in terms of their upbringing and psychological state. In order to treat such patients, it is necessary to respond after fully understanding the condition and background of each individual patient. It is our hope that a classification is devised based on an accurate understanding of each characteristic, and that treatment

guidelines be devised in line with this, which will allow us to respond to them more effectively.³⁷⁾⁴¹⁾ We also agree with many of the findings and conclusions of the mentioned above report by Asami et al. However, in order to gain a better understanding, it will be necessary to continue with their pioneering research²⁻⁴⁾ and further discover characteristic groups, etc., in order to nurture a more multifaceted and comprehensive understanding.

While treating a large number of female AN patients in our medical prison, we came to the realization that there are two main types of medical history among these women. These two types are: (i) those with a long history of ED from before their first admission to a correctional facility, and (ii) those who did not have any noticeable ED symptoms before their first admission to a correctional facility, but who developed ED symptoms such as significant weight loss after admission. It was considered that these two groups had different characteristics, and that classifying them would contribute to a better understanding of their condition.

In addition, among the female AN patients transferred to our facility, there were those who had been sentenced to prison for violating the Stimulants Control Law, and those who had a history of methamphetamine abuse, although they were currently being

detained for other crimes. It is considered that ED patients with a history of methamphetamine abuse have different characteristics from typical ED patients in terms of their upbringing, personality, ED history, and symptoms. Asami et al. also reported³⁾ that their drug offense group exhibited higher rates of impulsivity, substance dependence, antisocial personality, and borderline personality disorder than their shoplifting group. Classifying and comparing patients according to whether they have a history of methamphetamine abuse may help us understand the characteristics of female ED patients with a history of methamphetamine abuse and allow us to obtain a better overall picture of female AN patients in correctional facilities.

Based on the above, we decided to classify female patients with AN admitted to our facility into four groups according to whether they had a history of ED^{*1} and history of methamphetamine abuse prior to being admitted to a correctional facility, and then compare them.

The aim of this report was to test the following hypotheses:

(i) Based on the presence or absence of histories of ED and methamphetamine abuse prior to the first admission to a correctional facility, female patients with AN admitted to our facility can be

classified into four groups with different characteristics.

(ii) The group of patients who "have a history of ED and no history of methamphetamine abuse" before their first admission to a correctional facility show a similar clinical picture to that which has been traditionally characterized as the typical clinical picture of ED.

(iii) The other three groups show atypical symptoms that differ from those of typical ED, but the group of patients who "had histories of ED and methamphetamine abuse" before their first admission to a correctional facility also shows aspects in common with patients in (ii).

I. Methods

1. Subjects

Female ED patients who were transferred to our facility for treatment were those judged to be in a physical crisis situation in a general prison and for whom it would be difficult to take action to improve the situation,^{*2} and almost all of them had AN.

From May 2012 to June 2021, a total of 110 female patients with AN were admitted to our facility, including those admitted multiple times. Of these, 91 were admitted only once, 8 were admitted twice, and 1 was admitted three times, with a total of 100 if we exclude those who were admitted

multiple times. The charge for all nine patients who were admitted to our facility more than once was theft when they were sentenced to prison.

The subjects of this report were the 100 patients who admitted to our facility first time, all of whom met the diagnostic criteria for AN in DSM-5¹⁾ at the time of admission. The diagnosis was made by the first author, who was the attending physician, but for patients who were not under his care, it was confirmed based on their medical records.

2. Classification and Comparison

As previously stated in the introduction, the patients were divided into four distinct groups based on their histories of ED and methamphetamine abuse: (i) patients who had a history of ED but no history of methamphetamine abuse prior to their first admission to a correctional facility ("ED (+) Methamphetamine (-)" group); (ii) patients who had no significant symptoms of ED prior to their first admission to a correctional facility, but the onset of ED symptoms was triggered, and who had no history of methamphetamine abuse ("ED (-) Methamphetamine (-)" group)^{*3}; (iii) patients who had a history of methamphetamine abuse and a history of ED prior to their first admission to a correctional facility

("Methamphetamine (+) ED (+)" group);
(iv) patients who had a history of methamphetamine abuse and no significant ED symptoms prior to their first admission to a correctional facility, but who had ED symptoms triggered by admission to the correctional facility ("Methamphetamine (+) ED (-)" group).

3. Evaluation Items and Scales

1) Demographic, clinical, and psychosocial data

Data such as age at the time of admission to our facility, age at onset of ED, duration of the illness, BMI and weight changes after entering the correctional facility, type of AN (restrictive, binge-eating/purging type), results of psychological and intelligence tests, number of admissions to a correctional facility, name of the crime for which they were sentenced to prison, marital status, final educational attainment, and history of visits to medical institutions prior to first admission to a correctional facility were collected from personal records (chronological record of the inmate's life history, criminal history, medical history, etc., prepared by the correctional facility) and medical records.

2) Psychological and intelligence tests

The following psychological and intelligence tests were performed. Because each test was administered as

soon as they were ready, the number of times they were administered differed.

(1) Zung Self-Rating Depression Scale (SDS)⁴²⁾

A self-administered psychological test that assesses symptoms of depression (20 items, 4-point scale).

(2) State-Trait Anxiety Inventory (STAI)²¹⁾

A self-administered psychological test that evaluates anxiety from both a state anxiety (STAI-S) and trait anxiety (STAI-T) perspective. Both state and trait anxieties are assessed using a 20-item, 4-point scale. In this study, we used trait anxiety, which indicates relatively stable individual personality tendencies.

(3) Eating Disorder Inventory-2 (EDI-2)¹⁰⁾

A self-administered psychological test that evaluates symptoms of eating disorders. It consists of 91 items rated on a 6-point scale. It is composed of 11 subscales.

(4) Wechsler Adult Intelligence Scale-Third Edition (WAIS-III)³⁶⁾

The Full Scale Intelligence Quotient (FSIQ), which indicates general intellectual ability, is calculated by dividing it into verbal IQ, which measures the ability to process information heard with the ears, and performance IQ, which measures the ability to process information seen with the eyes. The examiner gives the

examinee a task and evaluates their answers.

Higher scores on (1) to (3) are considered to indicate more severe symptoms. In principle, these tests are administered about one month after admission to a facility and before release. In this report, the results of the former were used.

With regard to the psychological and intelligence tests, the number of tests administered to the “Methamphetamine (+) ED (+)” group was particularly low, with only two people taking the tests, so it was considered that the data would not be representative of the actual situation. Therefore, the two groups with a history of methamphetamine abuse were combined into a single group called the “history of methamphetamine abuse” group, and it was decided to compare the results of the psychological tests and intelligence tests between the three groups: the “ED (+) Methamphetamine (-)” group, “ED (-) Methamphetamine (-)” group, and “history of methamphetamine abuse” group.

4. Comparison of the Two Groups with History of Methamphetamine Abuse

For patients with a history of methamphetamine abuse, there were significant problems with their upbringing, development, and lifestyle history, and it was considered that these

were likely to be related to methamphetamine abuse and ED. Therefore, we investigated whether these women had any of the following: significant problems in their original family, delinquent friends in their teenage years, a history of being placed in a juvenile correctional facility, history of visiting a psychiatrist as a teenager, and history of working in the sex industry. We also investigated the age at which they started using thinner and methamphetamines, and the age at which they were first placed in a correctional facility (including a juvenile facility), and compared data between the two groups.

5. Analysis Methods

Student's t-test was used to compare the two groups, and analysis of variance to compare three or more groups, with Tukey's test applied for multiple comparisons. A chi-squared test was administered to test categorical variables. The significance level was set at 0.05. Analysis was performed using JMP pro 14.1 (SAS Institute Inc., Cary, North Carolina, USA). Cohen's d was also calculated as an effect size to evaluate the extent of differences in the mean values for each group.

6. Ethical Considerations

The patients were given verbal and written explanations and their consent

to publication of the study was obtained. The study was conducted with consideration for the protection of personal information. The study was approved by the Ethics Review Committee of Kitakyushu Medical Prison and Okada Clinic.

II. Results

1. Overall Picture of Female AN Patients at Kitakyushu Medical Prison

Table 1 shows the demographic and clinical characteristics of the 100 female AN patients who were admitted to our facility for the first time. The age at admission was 42.9 ± 10.2 years (mean \pm standard deviation), age at onset of ED was 25.3 ± 12.7 years, and duration of ED was 17.2 ± 10.8 years. At the time of admission to our facility, BMI was 13.5 ± 1.7 kg/m² and body weight 33.2 ± 4.2 kg. By type of AN 26 (26.0%) had the restricting type, 72 (72.0%) the binge-eating/purging type, and for 2 (2.0%) the type was unknown.

The highest educational background was as follows: 26 (26.0%) had dropped out of high school or below, 31 (31.0%) had graduated from high school, and 43 (43.0%) had post high school education. The marital status was as follows: 44 (44.0%) were unmarried, 24 (24.0%) were married, and 32 (32.0%) were divorced. The average number of times they had been admitted to a correctional facility was 2.1 ± 1.6 , and the charges at

the time of sentencing (some charges were repeated) were theft for 87 (87.0%), violation of the Stimulants Control Law for 10 (10.0%), fraud (4.0%), violation of the Anti-Prostitution Act (1.0%), murder (1.0%), and injury (1.0%).

2. Comparison of Clinical Characteristics of Each Group

Of the 100 ED patients to enter our facility for the first time, 74 (74.0%) were placed in the "ED (+) Methamphetamine (-)" group, 13 (13.0%) in the "ED (-) Methamphetamine (-)" group, 4 (4.0%) in the "Methamphetamine (+) ED (+)" group, and 9 (9.0%) in the "Methamphetamine (+) ED (-)" group.

(1) Eating disorder symptoms, life history, and criminal history

Table 2 shows the ED symptoms, life history, and criminal history of each group, as well as comparisons among them. The age at admission to our facility was significantly older in the "ED (-) Methamphetamine (-)" group than in the "ED (+) Methamphetamine (-)" and "Methamphetamine (+) ED (-)" groups. The age at onset of the ED was significantly older in the "ED (-) Methamphetamine (-)" group than in the other three groups, and the "Methamphetamine (+) ED (-)" group was significantly older than the "ED (+) Methamphetamine (-)" group. The duration of ED was significantly longer

in the "ED (+) Methamphetamine (-)" and "Methamphetamine (+) ED (+)" groups than in the other two groups. BMI and body weight at the time of admission to our facility were significantly lower in the "ED (+) Methamphetamine (-)" group than in the "Methamphetamine (+) ED (-)" group. There were significant differences in the distribution of AN subtypes among the four groups. The proportion of the binge-eating/purging type was high in the "ED (+) Methamphetamine (-)" and "Methamphetamine (+) ED (+)" groups, while the other two groups had a high proportion of the restrictive type.

There was a significant difference in the highest educational background. In the "ED (+) Methamphetamine (-)" group, 12 (16.2%) had dropped out of high school or below, 26 (35.1%) had graduated from high school, and 36 (48.6%) had progressed to higher education. In the "ED (-) Methamphetamine (-)" group, 2 (15.4%) had dropped out of high school or below, 5 (38.5%) had graduated from high school, and 6 (46.2%) had progressed to higher education, showing that the two groups had a relatively high proportion of well-educated for inmates. In contrast, in the "Methamphetamine (+) ED (+)" group, 3 patients (75.0%) had dropped out of high school or below, and in the "Methamphetamine (+) ED (-)" group,

all 9 patients had dropped out of high school or below, indicating a high rate of low-level education. There was no significant difference in the marital status among the four groups, but the proportions of unmarried and divorced patients were large in all groups. In addition, one of the patients in the "Methamphetamine (+) ED (+)" group had been married three times, and three of the people in the "Methamphetamine (+) ED (-)" group had been married four (two people) or five (one person) times.

The number of times admitted to a correctional facility was significantly higher for the "Methamphetamine (+) ED (-)" group than for the "ED (+) Methamphetamine (-)" group or "ED (-) Methamphetamine (-)" group. In the "ED (+) Methamphetamine (-)" group, the most common charge (with some overlap) for those sentenced to prison in this study was theft, with 72 people (97.3%), and "Anti-Prostitution Act violation" and "murder" each accounted for 1 person (1.4%). In the "ED (-) Methamphetamine (-)" group, there were 11 cases of theft (84.6%), 3 cases of fraud (23.1%), and 1 case of bodily injury (7.7%). In the "Methamphetamine (+) ED (+)" group, there were 2 cases each of violations of the Stimulants Control Law and theft (50%), and 1 case of fraud (25.0%). In the "Methamphetamine (+) ED (-)" group, there were 8 cases of violations of

the Stimulants Control Law (88.9%) and 2 cases of theft (22.2%).

(2) BMI and weight changes and history of visits to medical institutions

Table 3 shows the changes in BMI and body weight for each group after entering the correctional facility, as well as the history of visits to medical institutions before the first visit to the correctional facility, and a comparison of these factors. BMI and the body weight at the time of admission to the detention center were significantly lower in the "ED (+) Methamphetamine (-)" group than in the "Methamphetamine (+) ED (-)" group. There was no significant difference in the decrease in BMI or weight in the detention center among the four groups, but while the other three groups showed decreases in their BMI and weight to some extent, the "Methamphetamine (+) ED (-)" group showed increases in these parameters. BMI at the time of admission to the women's prison was significantly lower in the "ED (+) Methamphetamine (-)" and "ED (-) Methamphetamine (-)" groups than in the "Methamphetamine (+) ED (-)" group. The weight of the "ED (+) Methamphetamine (-)" group was significantly lighter than that of the "Methamphetamine (+) ED (-)" group. The decrease in BMI in the women's prison was significantly greater in the "Methamphetamine (+) ED (-)" group than in the "ED (+) Methamphetamine

(-)" and "ED (-) Methamphetamine (-)" groups and the decrease in weight in the "Methamphetamine (+) ED (-)" group was significantly greater than that in the "ED (+) Methamphetamine (-)" group. At the time of admission to our facility, BMI and the body weight were significantly lower in the "ED (+) Methamphetamine (-)" group than in the "Methamphetamine (+) ED (-)" group. The decrease in BMI and body weight in the detention center and women's prison combined was significantly greater in the "Methamphetamine (+) ED (-)" group than in the "ED (+) Methamphetamine (-)" group.

There were significant differences among the four groups in terms of visits to medical institutions prior to the first admission to a correctional facility. In the "ED (+) Methamphetamine (-)" group, 30 patients (40.5%) had received treatment for their ED within 5 years of ED onset, and 6 (8.1%) received treatment for their ED after that time.*⁴ In the other three groups, no one received treatment for an ED except for one person in the "Methamphetamine (+) ED (+)" group, who received treatment 5 years after onset. In the "ED (-) Methamphetamine (-)" and "Methamphetamine (+) ED (-)" groups, the most common response was "no history of consultation with any department other than the physical

medicine department," followed by "Treatment for something other than ED at a psychiatric hospital or related facility (but not received treatment for ED).

Fifteen patient (20.3%) in the "ED (+) Methamphetamine (-)" group had received treatment for something other than ED at a psychiatric clinic or related facility (although they were not receiving treatment for an ED). Regarding the diagnoses at that time (as reported by the patients, the same applies below): eight had depression, four had anxiety disorders, two had insomnia, and one each had attempted suicide, alcohol dependence, post-traumatic stress disorder, and atypical psychosis (some patients had more than one diagnosis, the same applies below). In the "ED (-) Methamphetamine (-)" group, 5 patients (38.5%) had received treatment for something other than ED at a psychiatric clinic or related facility, and in those cases, the diagnosis was depression in 5 patients and anxiety disorder in 2 patients. In the "Methamphetamine (+) ED (+)" group, 2 patients (50.0%) had received treatment for something other than an ED at a psychiatric clinic or other facility, and in those cases, the diagnosis was depression in 1 patient and alcohol dependence in 1 patient. In the "Methamphetamine (+) ED (-)" group, 3 patients (33.3%) had received treatment

for something other than ED, with diagnoses of: depression in 1 patient, anxiety disorder in 2 patients, and methamphetamine psychosis in 1 person.

(3) Psychological and intelligence tests

As mentioned in "I. Methods", the number of psychological and intelligence tests administered to the "Methamphetamine (+) ED (+)" group was very low, so the "Methamphetamine (+) ED (+)" group and the "Methamphetamine (+) ED (-)" group were combined into a "history of methamphetamine abuse" group and compared with the other two groups. Table 4 shows the results of the three groups and comparisons among them.

In the psychological and intelligence tests, due in part to the small number of cases in the groups other than "ED (+) Methamphetamine (-)" group, there were no significant differences among the three groups, except that the "ED (+) Methamphetamine (-)" group scored significantly higher than the "history of methamphetamine abuse" group on the Ineffectiveness (sense of powerlessness) subscale of EDI-2. However, the "ED (+) Methamphetamine (-)" group had the highest total EDI-2 score and in 10 of all 11 subscales of EDI-2 other than Impulse regulation (difficulty controlling impulses), and the lowest score for the subscale of Impulse regulation. The "history of

methamphetamine abuse” group had the lowest total EDI-2 score and lowest score on 8 subscales, but the highest score for Impulse regulation. The "ED (-) Methamphetamine (-)" group showed intermediate scores on the EDI-2 total score and 9 subscales compared with the "ED (+) Methamphetamine (-)" and “history of methamphetamine abuse” groups, but had the lowest scores on Drive for thinness (desire to be thin) and Body dissatisfaction (dissatisfaction with one's body). The “history of methamphetamine abuse” group scored the lowest on all tests of WAIS-III, including Full-scale IQ, Verbal IQ, and Performance IQ.

The effect size (Cohen's d) on comparison between the "ED (+) Methamphetamine (-)" group and "ED (-) Methamphetamine (-)" group was 0.51 for Drive for thinness and 0.64 for Body dissatisfaction on EDI-2, and there was a tendency for the "Methamphetamine (+) ED (-)" group to score higher on these. In addition, the effect sizes on comparison between the "ED (+) Methamphetamine (-)" group and “history of methamphetamine abuse” group were 0.62 for the total score on EDI-2, 0.93 for Ineffectiveness, 0.54 for Maturity fears, 0.65 for Asceticism, 0.82 for Social insecurity (social anxiety), 0.71 for Full-scale IQ on WAIS-III, 0.79 for Verbal IQ, and 0.61 for Performance IQ, with the "ED (+)

Methamphetamine (-)" group tending to score higher in these areas. In addition, the effect sizes for the comparison between the "ED (-) Methamphetamine (-)" group and “history of methamphetamine abuse” group were 0.51 for Body dissatisfaction, 0.66 for Ineffectiveness, and 0.70 for WAIS-III's Full-scale IQ and 1.05 for Verbal IQ, and it was found that the "ED (-) Methamphetamine (-)" group tended to score lower on Body dissatisfaction and higher on the other three items.

(4) Comparison between the "Methamphetamine (+) ED (+)" and "Methamphetamine (+) ED (-)" groups

A comparison of the two groups is shown in Table 5.

In both groups, the proportion of significant problems in the original family and delinquent teenage friendships was marked, and the majority of them started to abuse thinner at around the age of 15. However, the rate of having a history of admission to a juvenile correctional facility or history of engaging in the sex industry was significantly higher in the "Methamphetamine (+) ED (-)" group. In addition, the "Methamphetamine (+) ED (-)" group tended to start abusing methamphetamines at a younger age, and the age on first admission to a correctional facility (including juvenile facilities) was significantly younger. On the other hand, the "Methamphetamine

(+) ED (+)" group tended to have a younger age at onset of ED, and the duration of the disease was significantly longer. Regarding the type of AN, the "Methamphetamine (+) ED (+)" group had a significantly higher rate of the binge-eating/ purging type. There was no significant difference in age at admission to our facility as determined by analysis of variance, but the effect size (Cohen's *d*) was 1.22, indicating a tendency for the "Methamphetamine (+) ED (-)" group to be younger.

There was no significant difference in the change in BMI or body weight from the time of admission to the detention center to that of admission to our facility, but the effect size was 0.71 for weight at the time of admission to the detention center, 0.81 for BMI and 0.87 for weight at the time of admission to the women's prison, and 0.84 for BMI and 0.65 for weight at the time of admission to our facility, and in all cases, the "Methamphetamine (+) ED (+)" group tended to show lower values. In addition, the effect size for BMI reduction in the detention center was 0.78, 0.67 for weight loss, showing a trend toward a difference between the two groups. The effect size for BMI reduction in the women's prison was 0.58, and 0.61 for weight loss, showing a trend toward a greater reduction in the "Methamphetamine (+) ED (-)" group.

In both groups, the majority of crimes for which the prisoners were sentenced to prison time, including those from previous incarcerations, were violations of the Stimulants Control Law, but other crimes such as theft and fraud were also noted.

III. Discussion

1. Overview of Female AN Patients at Kitakyushu Medical Prison

The female patients with AN who were admitted to and treated at this prison generally had a very long history of ED, were severely underweight, and had marked ED, with the majority (72.0%) being of the binge-eating/purging type. While many had a higher level of education for most prisoners, the proportion of unmarried and divorced patients was high. The average number of times they had been admitted to a correctional facility was over two, and the most common charge was theft (87.0%), followed by violations of the Stimulants Control Law (10.0%). As a whole, this shows that AN is a serious problem, both in terms of its tendency to become prolonged and severe, and in terms of its tendency to recur, and that it poses significant problems both as ED and in terms of social adaptation.

However, ED are diverse disorders. The subjects of this report also exhibited the above-mentioned characteristics as a whole, but there was a mixture of

cases and a wide range of disease presentations, from relatively typical ED cases to less typical ones. In order to conduct an accurate classification that reflects the diversity of individual patients, we classified 100 female AN patients who were admitted to our facility for the first time into four groups based on whether they had a history of ED and whether they had a history of methamphetamine abuse, prior to their first admission to a correctional facility.

2. Patients With a History of ED but no History of Methamphetamine Abuse Prior to Their First Admission to a Correctional Facility ("ED (+) Methamphetamine (-)" Group)

Most patients (74 of 100) in the 4 groups were in the "ED (+) Methamphetamine (-)" group.

The average age at onset of ED was young, at 21.0 years old, the average duration of ED was very long, for 20.9 years, and the average age at the time of admission to our facility was 41.9 years old. BMI and body weight were consistently significantly low from the time of admission to a detention center to admission to our facility, and the binge-eating/purging type accounted for a large proportion (approximately 80%) of the AN types. Although they had relatively high levels of education, the proportion of unmarried and divorced individuals was high. These findings

are generally consistent with the typical characteristics of AN, such as early onset, persistently significantly underweight, being unmarried, and having a relatively high level of education, which have been reported to date.⁹⁾²²⁾²⁴⁾ In addition, the disease duration was long, proportion of the binge-eating/purging type was high,^{*5} and there were also clear signs of the characteristics of prolongation and aggravation of ED, such as the habitual carrying out of crimes like theft. The most common charge was theft, which we believe indicates a close connection between habitual theft and the prolongation and worsening of ED, and we plan to examine this in detail in the second report and beyond.

The results of the psychological and intelligence tests showed that there were limited significant differences due to the small number of participants in the "ED (-) Methamphetamine (-)" and "history of methamphetamine abuse" groups (the "Methamphetamine (+) ED (+)" + the "Methamphetamine (+) ED (-)" groups), but the total score and most of the subscales of EDI-2 showed the highest scores of the three groups. In addition, the effect size (Cohen's *d*) showed a tendency toward higher scores in the subscales Drive for thinness and Body dissatisfaction than in the "ED (-) Methamphetamine (-)" group, and higher scores in the total score,

Ineffectiveness, Maturity fears, Asceticism, and Social insecurity than in the "history of methamphetamine abuse" group. Based on these results, the "ED (+) methamphetamine (-)" group had the most typical psychological characteristics of ED among the three groups.

The characteristics of the "ED (+) Methamphetamine (-)" group described above are similar to the overall profile of the female AN patients admitted to our facility as described in the previous section, but these characteristics are even more distinct. Regarding the "ED (+) Methamphetamine (-)" group, those groups showing atypical symptoms were excluded, so the density of typical ED patients became higher, and their characteristics became clearer.

Asami et al. classified female AN patients admitted to Hachioji Medical Prison into two groups: "shoplifting group" and "drug crime group", and compared them.³⁾ The "shoplifting group" tended to have a high level of education and solid job history, but they had a long history of ED, a marked lack of interpersonal relationships in society, and a high dropout rate from ED treatment. The proportion of underweight and restrictive types (29%) and the rate of compulsive behavior and obsessive-compulsive personality were also higher in the shoplifting group. We will not go into the details of the

personality issues in this report (we will cover them in the second report and beyond), but in other respects, the "ED (+) Methamphetamine (-)" group in our study and Asami et al.'s "shoplifting group" show good agreement regarding many items. The majority of crimes in the "ED (+) Methamphetamine (-)" group were theft (shoplifting), and the findings for female AN patients committing theft-related crimes in different medical prisons were almost identical in many respects.

One of the few differences from this report is that Asami et al. stated that the rate of the restrictive type of eating disorder was higher in the shoplifting group than in the drug offense group. In this report, the proportion of restrictive types was larger among patients with a history of methamphetamine abuse overall than in the "ED (+) Methamphetamine (-)" group. This will be discussed in "4. Patients with History of Methamphetamine abuse."

One of the most notable findings was that even among patients in the "ED (+) Methamphetamine (-)" group who had presented with severe ED symptoms for a long time when living within the general society, only about 40% had received ED treatment relatively early after the onset of ED (within 5 years), and even including those who received

treatment later, only about half had actually received treatment. About half of them had not received any treatment for ED before their first admission to a correctional facility. The main reasons for this lack of a treatment for ED are considered to be factors that are characteristic of ED patients, such as a lack of disease awareness and strong resistance to treatment. In addition to this, other potentially important factors were: there was insufficient understanding of ED as a disease or the importance of treatment in Japanese society and healthcare as a whole, and there were few opportunities to receive specialist treatment.

Another important finding was that 15 (20.3%) of the women had never received treatment for ED, but had visited a psychiatrist or related specialist for other diagnoses. This may be due to the tendency of ED patients to avoid confronting the underlying problem (i.e., ED). However, it is also possible that their problems were more widespread, and they were seeking treatment to escape their suffering. They may have been diagnosed with depression, anxiety disorders, or other conditions, and were simply trying to get through each day by complaining about their symptoms and receiving related medication (antidepressants, anti-anxiety drugs, sleeping pills). There were also 21 patients (28.4%) who

had never visited a doctor other than a physical medicine specialist, but it is possible that some of these patients visited a doctor to request a prescription for the drugs they wanted, such as laxatives, diuretics, or sleeping pills. Looking back on the medical history of patients in the "ED (+) Methamphetamine (-)" group, it is a reminder of the importance of understanding and responding to each patient as a whole person. If ED treatment is simply aimed at improving ED symptoms (such as regaining weight or improving eating habits), or if psychiatric treatment is limited to diagnosis and symptoms, then for ED patients with serious problems and difficulties in their lives, treatment will not be able to facilitate true recovery. It is suggested that these women will lose their way and be forced to follow a course of chronicity and worsening.

Asami et al. reported that the rate of having a psychiatric treatment history among female AN patients in Hachioji Medical Prison was 71% for the shoplifting group and 36% for the drug crime group.³⁾ If Asami's report refers to a lifetime history of psychiatric consultations, then it is consistent with the results of this study, assuming that Asami's "shoplifting group" corresponds to the "ED (+) Methamphetamine (-)" group in this report, and that the "drug crime group" corresponds to the "history

of methamphetamine abuse” group. However, this survey focused primarily on whether the visits to the psychiatric clinic, etc., were for the purpose of ED treatment, and whether the treatment was early after the onset of ED, which is considered relatively effective. As a result, even in the "ED (+) Methamphetamine (-)" group with a clear history of ED symptoms, only around 40% of patients visited a doctor for early ED treatment, and even when combined with treatment that could be considered belated after ED had become chronic, only around half of patients received treatment. Patients who have a poor prognosis and end up being admitted to our facility have such a poor history of ED treatment, and from the perspective of secondary prevention to prevent chronicity and reduce severity, it is necessary to seriously consider the low rate of visits as ED patients and content of treatment from the early stages of ED onset.

In recent years, the term "severe and enduring anorexia nervosa (SEAN)" has been used to refer to severe cases of prolonged anorexia nervosa, and the difficulty of treating such cases has been emphasized.⁷⁾¹²⁾²⁶⁾ The definition of SEAN varies between researchers, but the most commonly used criteria are the duration of the patient's illness and failure of previous treatments. The most common criterion for the duration of

illness is 7 years or more, followed by 10 years or more. In the "ED (+) Methamphetamine (-)" group in this report, the average duration of illness was 20.9 years (4-41 years), and the majority of cases markedly exceeded this criterion.

However, in terms of past treatment failure, around half of the patients had not even received treatment for ED before being admitted to a correctional facility for the first time, and the consultation rate was even lower for cases that occurred early after onset, which are said to be relatively straightforward to treat. The item of treatment failure may have been added as an indicator to objectively show the severity of AN. However, AN is characterized by a strong refusal to receive treatment, and it is considered that there are many cases where people do not receive treatment because they are seriously ill with ED. If treatment is not provided in the first place, there is no such thing as failure. It can be argued that the indicator of treatment failure does not align with the current landscape of ED treatment in Japan. It is considered that the synergistic effect of the fact that patients are more likely to refuse treatment because their ED were severe from the beginning, and the fact that there was no environment in which they could receive appropriate treatment early on, is one mechanism

that gives rise to the condition known as SEAN. While there are a small number of patients in the "ED (+) Methamphetamine (-)" group who have visited multiple hospitals and received successive treatments from specialists, many of them are not even aware that they have ED and have never received any kind of treatment. All of these are cases of severe and prolonged AN, and it may be necessary to recognize them as SEAN, gain a deeper understanding of their condition, and consider effective treatments and responses.

3. Group of Patients With no Significant ED Symptoms and no History of Methamphetamine Abuse Prior to Their First Admission to a Correctional Facility ("ED (-) Methamphetamine (-)" Group)

The "ED (-) Methamphetamine (-)" group (n=13) had the oldest age at ED onset and age at admission to our facility among the four groups, and the shortest duration of illness. In their younger years, when ED is most common, they did not show any noticeable symptoms of ED, but in middle-aged and older, following events such as arrest and detention, symptoms of ED such as anorexia and weight loss appeared. They were slightly underweight when they entered the detention center, but their BMI and weight decreased further in the

detention center and women's prison, after which they were transferred to a medical prison. The binge-eating/purging type of AN showed the lowest rate among the four groups, at 38.5%. The most common charge (with some overlap) was theft, involving 11 cases (84.6%), while the remaining cases involved fraud (3 cases, 23.1%) and assault (1 case, 7.7%). As with the "ED (+) Methamphetamine (-)" group, there was a tendency toward relatively high levels of education, while the proportion of unmarried and divorced people was large. The fact that none of the patients had a history of ED treatment prior to admission to the correctional facility is to be expected, as they did not have any noticeable symptoms of ED from the beginning. The results of the psychological test showed that EDI-2 Drive for thinness and Body dissatisfaction subscales had the lowest scores, and the effect size (Cohen's *d*) also showed a tendency toward lower scores than the "ED (+) Methamphetamine (-)" group. These are core psychological characteristics of ED, and even though there were physical and behavioral symptoms such as reduced food intake and weight loss, it is considered that psychological characteristics of ED were relatively absent.

So why did people who had not previously exhibited ED symptoms

develop prominent ED symptoms such as anorexia and weight loss after entering a correctional facility? As a factor in weight loss, patients in the "ED (-) Methamphetamine (-)" group often state that they naturally stopped eating due to the stress of relationships within prison and psychological shock of being arrested and incarcerated. Prisons are, in a sense, a world of the survival of the fittest, where bullying of the weak is a common occurrence, and it may be a very difficult environment for those who have difficulty with human relationships or low stress tolerance. Under such stressful conditions, it is not uncommon for inmates to become mentally overwhelmed, lose their appetite, and consequently lose weight. It is also likely that this will attract the attention of staff and others around them, and the interaction between the patient's symptoms and responses of those around them will reinforce and make ED-like behaviors and symptoms more pronounced. For these women, exhibiting ED-like symptoms may also be a way of sending out an SOS, and a coping strategy to escape the harsh reality of prison life and foster a more livable environment. Being exempted from prison work due to ED-like symptoms, moved from a shared room (multi-person cell) to a single room (single-person cell), and receiving special treatment in the form of medical

care helped them avoid the harsh conditions and was a relief for them.

However, such interactions are unlikely to occur in typical ED patients (most of the "ED (+) Methamphetamine (-)" group). For typical ED patients, pursuing and maintaining thinness is of the greatest importance above all else, and it is more convenient for them to be treated as ordinary inmates in order to protect that. Even with their emaciated bodies, they will compulsively engage in prison work, during exercise time they will over-exercise, and they will not want to give up the freedom of being able to dispose of food or vomit when the staff are not looking. Therefore, the special consideration of their surroundings as described above will be strongly avoided and rejected as unacceptable, as it will deprive them of these freedoms. In general prisons, there are often barren struggles over bodyweight that could lead to medical intervention.

Patients in the "ED (-) Methamphetamine (-)" group are generally middle-aged or older, unmarried or divorced, and tend to be financially disadvantaged, often with few prospects for the future. It is not uncommon for people in such vulnerable positions to develop ED under circumstances that further push them into a corner. Regardless of age, vulnerable people with poor

adaptability may find it easier to receive help from those around them by showing their vulnerability, and this is when the ED-like symptoms form. ED are considered to be multifactorial diseases, but in patients where such factors are predominant, SOS transmission and avoidance of reality as factors that cause ED are considered to be significant, and the strength of the obsession with thinness seen in typical ED is thought to be relatively weak.

However, not all patients in the "ED (-) Methamphetamine (-)" group are vulnerable. For example, the two people who repeatedly committed insurance fraud among those who were charged with fraud were also cunning, deliberately losing weight to obtain a comfortable and advantageous lifestyle. In addition, it is not uncommon for male prisoners to go on hunger strikes in an attempt to get their point across or demands met, and our facility has been sometimes required for "ED treatment" due to their stubborn refusal to eat or weight loss. In this case, it is unlikely that the desire to lose weight is involved, so it is not considered to be ED. However, the possibility cannot be ruled out that some female prisoners may also have a similar mentality to some extent. It is hypothesized that the "ED (-) Methamphetamine (-)" group encompasses a diverse array of conditions. We intend to continue

accumulating cases and expanding our understanding in the future.

Furthermore, symptoms such as reduced food intake and weight loss are also common in depression, so it is necessary to differentiate between depression and ED. However, there was almost no difference in SDS scores between this and the other groups, and no one was clinically diagnosed with depression. Although no antidepressants were used at all, treatment for ED facilitated sufficient food intake, psychological stability, and steady recovery in weight. Originally, the SDS score for ED patients tends to be high, and a score of around 50 points is not considered particularly high for ED. However, a relatively large number of patients in this group (5 people, or 38.5%) had visited a psychiatric clinic or other facility for a diagnosis of depression prior to their first admission to the correctional facility. The details are unknown, but it is possible that at that point in time, although it was different from the traditional melancholic-affiliated depression, it was a condition that could be included in the expanded concept of depression (so-called new-type depression). The avoidant personality traits may have been a factor in the development of atypical ED after admission to the correctional facility. Depression can be a way of avoiding reality in society, but

the circumstances in a correctional facility may require more tangible means of avoidance, which may have led these women to choose weight loss as a means of avoiding reality. One factor that may have contributed to the fact that no significant depressive tendencies were observed in these women at our facility is the fact that our ED treatment does not allow or reinforce avoidance, which is a fundamental stance. In other words, it is possible that such a treatment characteristic prevented the manifestation of not only ED but also depressive symptoms in patients in the "ED (-) Methamphetamine (-)" group, who have a strong tendency to avoid.

4. Patients with History of Methamphetamine Abuse ("Methamphetamine (+) ED (+)" and "Methamphetamine (+) ED (-)" Groups)

Both the "Methamphetamine (+) ED (+)" (n=4) and "Methamphetamine (+) ED (-)" groups (n=9) had relatively high BMI and body weight when admitted to the detention center, but they had significantly reduced their BMI and body weight in the women's prison and were subsequently transferred to our facility. The fact that both groups had an average of more than three admissions to correctional facilities reflects the significant recidivism of methamphetamine-related crimes.

Both groups had a low level of education, but most had lived their lives in poor family environments from childhood, showed poor academic performance at elementary and junior high school, and had spent most of their time playing with delinquent peers, so it can be said that they had lived their lives in a world with little connection to studying.

Both groups shared some common characteristics in terms of the family environment and life history, such as significant problems with the original family, delinquent peer associations in their teens, and a high rate of a history of thinner abuse. However, in the "Methamphetamine (+) ED (+)" group, the clinical picture of ED that had become prolonged and severe was relatively clear, including a young age at onset of ED, long duration of illness, low body weight, and a predominantly binge-eating/purging type of illness. In contrast, the "Methamphetamine (+) ED (-)" group had more pronounced characteristics as methamphetamine abusers who deviated from the norms of society, such as a younger age at the time of starting methamphetamine abuse and first admission to a correctional facility (including juvenile correctional facilities), and a higher rate of having a history of being admitted to a juvenile correctional facility and history of engaging in the sex industry. The "Methamphetamine (+) ED (-)"

group was the only group to show increases in their BMI and weight in the detention center. It is likely that they tended to buy and consume more food because they were able to purchase food on their own in the detention center.

As mentioned above, due to the small number of cases, the results of the psychological and intelligence tests were combined for both groups and compared with the other two groups as the "history of methamphetamine abuse" group. The results suggest that the impact of the "Methamphetamine (+) ED (-)" group is significant, based on the ratio of the number of cases conducted, but EDI-2 shows a trend toward weaker psychological characteristics of typical ED, suggesting that the pathology of ED in this group is relatively mild on average. In WAIS-III, there was a tendency for Full Scale IQ, Verbal IQ, and Performance IQ to be low in the three groups, but this result may have been influenced by disposition, environment, and the aftereffects of methamphetamine use.

Among the AN patients with a history of methamphetamine abuse, 9 out of 13 patients were in the "Methamphetamine (+) ED (-)" group. These patients developed ED while in a correctional facility, but after the onset of ED, they stated that they had almost no ED-like behavior or symptoms outside the correctional facility. They

said that they had never been particularly concerned about their weight or body shape in the general community (outside the correctional facility), and that they had never deliberately taken any action to lose weight. It is only natural to be cautious regarding judging the truth of stories about the past that cannot be directly verified. However, in terms of attitudes within the medical prison, they did not exhibit much of the same strong fixation on being thin that was evident in many patients in the "ED (+) Methamphetamine (-)" group. Even in the treatment of ED, within the therapeutic framework that encourages behavioral change, it was often relatively easy to modify their behavior and help them regain weight. Even if they had the same desire to be thin as normal women, they were probably satisfied with the fact that they were naturally losing weight due to the high frequency of methamphetamine use before being admitted, and the resulting loss of appetite. For these women, methamphetamine use seemed to be a convenient and easy way to lose weight naturally, killing two birds with one stone. We tend to imagine that they would be so serious that they would not be able to stop using the "forbidden medicine," even if it meant throwing away their lives, for the ultimate goal of

losing weight. However, we do not get that impression from these women.

Matsumoto et al. classified 21 female methamphetamine abusers with ED into two groups (ED-preceding and ED-subsequent types) based on the temporal relationship between the onset of ED and start of methamphetamine use, and investigated the differences in the background and triggers of ED onset and the motivation for methamphetamine use, as well as clinical characteristics, between the two groups.¹⁷⁾ As a result, they stated that in all cases of the ED-subsequent type, the rebound increase in appetite when methamphetamine use was discontinued was the trigger for the onset of BN, suggesting that methamphetamine may induce BN. In the "Methamphetamine (+) ED (-)" group in this report, ED onset occurred after methamphetamine abuse in all 9 patients, and this can be considered to be the ED-subsequent type described by Matsumoto et al.

According to Matsumoto et al.'s theory that a rebound increase in appetite can trigger ED, the course of ED onset in the "Methamphetamine (+) ED (-)" group would be as follows: (i) Discontinuation of methamphetamine use due to incarceration in a correctional facility → (ii) Rebound increase in appetite → (iii) Weight gain due to purchasing and

consuming food items at the detention center at one's own expense → (iv) Desire to lose weight → (v) Dieting (including purging) in prison (where food intake is controlled) → (vi) Significant weight loss. The progression of the "Methamphetamine (+) ED (-)" group, showing slight increases in BMI and body weight in the detention center, followed by significant decreases in the women's prison, may be consistent with the above (iii) to (vi).

In this way, it is possible that the increased appetite and weight gain in the detention center activated a previously unacknowledged desire to lose weight, and this became a motivating factor for dieting in prison. However, as mentioned above, their attitudes in the medical prison and reactions to ED treatment were not as marked as those in the "ED (+) Methamphetamine (-)" group. When we asked these women why they were trying to lose weight in the women's prison, many of them said that they had started dieting for a casual reason, saying: "Everyone is dieting, so I thought I'd try it too." In fact, many inmates in women's prisons try to lose weight.

However, there is a difference between the "Methamphetamine (+) ED (-)" group and ED-subsequent type of Matsumoto et al. in that the former developed in a correctional facility and

all cases were AN, whereas the latter developed in the general community and all cases were BN. One possible reason for these variations is the difference in the degree of methamphetamine abuse. As reflected in their repeated stays in correctional facilities, the "Methamphetamine (+) ED (-)" group exhibited more severe methamphetamine use, and as a result, their appetite was continuously suppressed and body shape was under control, so it is thought that they did not develop ED in the general community. There may also be a personality trait involved whereby a person acts without thinking, and uses "dangerous drugs" almost without any resistance. On the other hand, in the ED-subsequent type group of Matsumoto et al., the rate of experience with guidance and arrest was high, but there were no entries for admission to correctional facilities, and the degree of methamphetamine use was probably less severe and less frequent than in the "Methamphetamine (+) ED (-)" group. While they may feel some guilt or resistance towards using methamphetamines, they may also be struggling with the fact that they cannot stop using them. In this way, ED may have been induced in general society due to the repeated loss of appetite and rebound increase in

appetite caused by the use of methamphetamines.

The two cases differ in the location of ED onset, and it is considered that this may have also been a factor in determining the type of ED. In the ED-subsequent type, the patient develops ED in a normal social environment where both food and methamphetamines are readily available. Konuma proposed the concept of "cyclical use" as one form of methamphetamine use.¹⁵⁾ Within the cycle of "overeating (weight gain) ⇔ purging/methamphetamine use", the weight will fluctuate but not decrease to an extreme degree, and the type of illness will remain BN (with a normal weight range). On the other hand, in the "Methamphetamine (+) ED (-)" group, it is likely that they developed AN by concentrating on behaviors such as not eating and losing weight in prison, where they could not obtain either methamphetamines or food for binge-eating, and were aided by such an environment.

However, while most female inmates who try to lose weight give up without achieving any significant results, it is likely that patients in the "Methamphetamine (+) ED (-)" group were able to lose an average of 12.5 kg in general prison for their own personal reasons. In society, these women gain a

sense of "being alive" by living a hedonistic lifestyle, dependent on things such as drugs, people (the opposite sex, etc.), objects, and money, and it may be that they have survived a difficult life by doing so. However, in prison, they are not allowed to rely on these things. Therefore, in order to fill the void, they may turn to other addictive behaviors. ED has the aspect of filling the void in the mind, and it is considered that this is why these women become "addicted" to ED-like behaviors.

They stated: "Losing weight became fun, and I started competing with other inmates on a diet." Striving to lose weight gives them a goal and purpose in prison life, which otherwise seems pointless and unwanted. By winning over other inmates on a diet, they can feel a sense of affirmation towards themselves and their own lives. By becoming superior to other inmates, they can get "one-up" on them. Perhaps disobeying the instructions of staff gives them a sense of being proactive in their lives. Their dieting in prison seems less about their relentless obsession with losing weight, and more like a compensatory act that replaces their dependence on society.

According to Asami et al., BMI at the time of a prison sentence for drug crime groups was $17.6 \text{ kg} \pm 3.1/\text{m}^2$, but BMI at the time of admission to a medical prison was extremely low, at 11.5 ± 0.7

kg/m^2 , and the disease was the binge-eating/purging type of AN in all cases.³⁾ The extremely low BMI at the time of admission to the medical prison may suggest the presence of a genuine desire to lose weight. However, the reason for the extremely low BMI was that the period when Asami et al.'s subjects were admitted to the medical prison (2002-2011) was a time when the capacity of medical prisons to admit ED patients was extremely limited, with it only being possible to be admitted if there was a serious threat to life. In that respect, the subjects of this report were assessed from after treatment had begun at our facility, and the capacity for accepting ED patients in medical prisons had expanded to a certain extent, so it is possible that a wider range of conditions were included. The "Methamphetamine (+) ED (-)" group had characteristics of methamphetamine abusers that were more prominent than ED-like factors, and it may be that the condition was different from the drug crime group in the report by Asami et al. On the other hand, the "Methamphetamine (+) ED (+)" group had a mean BMI of $17.7 \text{ kg}/\text{m}^2$ at the time of admission to the detention center and a mean BMI of $13.4 \text{ kg}/\text{m}^2$ at the time of admission to the medical prison, and all cases were of the binge-eating/purging type of AN. They had a similar profile to the drug crime group

in the report by Asami et al., and ED-like factors were significant among patients with a history of methamphetamine abuse. BMI at the time of admission to the medical prison was slightly higher than that of the drug crime group reported by Asami et al., but if transfer to the medical prison had been delayed, there may have been a similar decrease in BMI to that of the drug crime group.

As mentioned above, comparison of the proportions of AN subtypes in the shoplifting and drug crime groups in the report by Asami et al.³⁾ conflicts with the comparison between the "ED (+) Methamphetamine (-)" group in this report and all patients with a history of methamphetamine abuse. The rate of the binge-eating/purging type in AN patients with a history of methamphetamine abuse was higher than in the shoplifting group in the report by Asami et al., but lower than in the "ED (+) Methamphetamine (-)" group in this report. This may be because the present report included many patients in the "Methamphetamine (+) ED (-)" group, who had a different clinical picture from the drug crime group reported by Asami et al. If we limit analysis to the "Methamphetamine (+) ED (+)" group, which has a profile similar to Asami et al.'s drug crime group, the binge-eating/purging type is 100%, which is

consistent with Asami et al.'s drug crime group.⁶ The pathology of AN patients with a history of methamphetamine abuse is not uniform, and by classifying them into groups with distinctive characteristics and comparing them, we were able to advance our understanding of the condition. Further investigation is needed due to the limited number of cases.

5. Significance of This Report

Among female AN patients transferred to a medical prison for treatment, there was a group of cases that showed atypical symptoms of ED with characteristics specific to correctional facilities, but the majority of cases involved people who had developed relatively typical ED in their youth and this had become prolonged and severe over the course of their long disease history ("ED (+) Methamphetamine (-)" group). We believe that this grouping is clinically significant as it helps us to understand the individual conditions and overall profile of female AN patients who have committed crimes, and facilitates appropriate treatment and responses.

There was marked agreement between the "ED (+) Methamphetamine (-)" group in this report and the shoplifting group in the previous study by Asami et al. in basic terms. It was shown that

there were no significant differences in the clinical profile of the main group of female AN patients between different medical prisons, and it was possible to confirm the basic clinical profile of ED patients in correctional facilities.

The "ED (+) Methamphetamine (-)" group had a very long history of ED and was in a very difficult state to treat, and is considered to be serious group even among SEAN. A number of years have passed since the onset of ED cases worldwide, and ED patients who have not been cured and become more serious have accumulated as SEAN, and dealing with the large number of these patients is becoming an increasingly difficult issue. However, we may not be able to say that the condition of the disease has been fully clarified. One of the reasons for this is that patients with SEAN are generally reluctant or even refuse to visit medical institutions, and even if they do visit, they tend to easily drop out of treatment, so the information obtained tends to be partial and limited. In this regard, the current report is based on detailed information collected through continuous treatment and observation in an environment from which there is no escape, i.e., a medical prison, and is considered to be a valuable resource for information on SEAN.

The "ED (-) Methamphetamine (-)" and "Methamphetamine (+) ED (-)" groups

are groups of ED patients that clinicians themselves are unlikely to encounter outside of correctional facilities, but who are considered to exist in a certain proportion within correctional facilities. ED are multifactorial disorders, and from that perspective, it is considered that the "ED (-) Methamphetamine (-)" group plays a major role in terms of SOS transmission, avoidance, and means of survival of vulnerable people, while the "Methamphetamine (+) ED (-)" group plays a major role in terms of the alternative dependence of people who have made dependence their way of life. It is also an interesting resource when considering the diversity of ED.

We plan to cover treatment and results/outcomes in more detail in future reports, but we would like to briefly discuss the treatment strategies that we believe to be effective for each group. Patients in the "ED (+) Methamphetamine (-)" group are the most severely affected by ED, and in order to improve their condition, it is necessary to provide them with comprehensive treatment for ED, which will also help to prevent reoffending and readmissions. Their ED are very severe and intractable, and they are highly resistant to treatment, so it is very difficult to improve their condition with typical treatment environments and approaches. However, medical prisons have significant advantages when it

comes to treating patients with severe ED: they have an absolute physical framework (an environment that does not allow avoidance but at the same time protects them), they can receive treatment for relatively long periods of time (they can receive treatment for the full length of their sentence), and they have access to abundant manpower (prison officers, nurses, psychologists, social workers, etc.). By utilizing these, it is possible to achieve significant results that would not normally be possible through a strong treatment program.*7

The "ED (-) Methamphetamine (-)" and "Methamphetamine (+) ED (-)" groups have lower ED severity than the "ED (+) Methamphetamine (-)" group, but each group had its own unique difficulties. Therefore, even if ED symptoms improve in a medical prison, there is a strong possibility that they will reoffend and be readmitted to the facility after re-entering society. In addition to providing treatment and support for ED, it is important to provide effective treatment and support that is specific to each individual's difficulties. For the group with a history of methamphetamine abuse, treatment and support for methamphetamine dependence is key to improving the prognosis, while for the "ED (-) Methamphetamine (-)" group, detailed administrative support for financial and

living conditions after release is key to improving the prognosis.

As mentioned above, the conditions of patients in each group differ, and so it is desirable to adapt treatment and response strategies accordingly. If the classification presented here can be used as a guideline for understanding the conditions of each patient, and if this can lead to appropriate treatment and responses, then it may be of marked clinical significance.

6. Limitations of This Study and Future Issues

The "ED (+) Methamphetamine (-)" group, comprising the majority of the subjects, showed a relatively consistent clinical picture, but when viewed in more detail, it was a heterogeneous group that included various elements, and so we believe that further classification is possible. However, in this report, we focused on distinguishing among "ED (-) Methamphetamine (-)", "Methamphetamine (+) ED (+)", and "Methamphetamine (+) ED (-)" groups, and limited ourselves to identifying the "ED (+) Methamphetamine (-)" group and showing its overall characteristics. As future issues, we would like to further classify the "ED (+) Methamphetamine (-)" group based on psychosocial backgrounds and the results of various psychological scales,

etc., and advance our understanding of the pathology. In addition, the rates of problems such as adverse experiences, developmental disorders, and personality disorders are also high, and we would like to advance our investigations of these aspects as well.

As there were some groups with fewer cases or tests conducted, the comparison was limited to the three groups, particularly regarding the psychological tests. For this reason, it was often not possible to show significant differences. The effect size suggested differences between the groups, but it would be desirable to clarify the differences with more cases. Due to the nature of the cases, it is not easy to significantly increase the number, but we would like to continue to accumulate cases, with the implementation of multicenter collaborative research in mind.

There are very few detailed reports on methamphetamine abusers with ED, and our understanding of the actual situation is still insufficient. In this study, we attempted to understand the pathology of the "history of methamphetamine (+) ED history (-)" group admitted to our facility by comparing it with the ED-subsequent type group described by Matsumoto et al. However, it may be that the pathology presented here is a special one that can only be seen in the unique environment of a medical prison. In the

future, we hope to gain a more comprehensive understanding of the overall profile of ED patients with a history of methamphetamine abuse by accumulating a wider range of clinical experiences.

Conclusion

We classified and compared 100 female patients with AN who had been transferred from a general correctional facility to medical prison for treatment, according to whether they had a history of ED and/or a history of methamphetamine abuse before their first admission to a correctional facility, into the following groups: "ED (+) Methamphetamine (-)" group, "ED (-) Methamphetamine (-)" group, "Methamphetamine (+) ED (+)" group, and "Methamphetamine (+) ED (-)" group, and different clinical presentations were observed in each group.

The "ED (+) Methamphetamine (-)" group developed ED at a young age, and it was the most severe SEAN, becoming chronic and worsening with an extremely long history. It is the most clinically important group due to its large number, comprising about three-quarters of the total, as well as its typicality and severity as ED.

In the "ED (-) Methamphetamine (-)" group, it was considered that ED was a way for vulnerable people to send out

SOS signals and avoid problems in the harsh environment of the prison. Among the group of female AN patients with a history of methamphetamine abuse, the "Methamphetamine (+) ED (-)" group, who developed ED after their first admission to a correctional facility, had more elements of methamphetamine abusers than ED patients, and it was considered that the factors that led to the development of ED were severe methamphetamine abuse and the environment of being admitted to a correctional facility. The number of cases in the "Methamphetamine (+) ED (+)" group was limited, precluding a definitive assessment of the clinical profile. However, the ED-like elements were more pronounced than in the "Methamphetamine (+) ED (-)" group.

This report is part of a study aiming to deepen our understanding of the pathology of ED patients who commit crimes, and create and establish appropriate treatment and response methods based on that understanding, with this being the first. We plan to continue this research in a multifaceted and systematic manner.

There are no conflicts of interest to disclose in relation to this paper.

Acknowledgements

We would like to express our sincere gratitude to all patients who cooperated in providing information for this study, to the staff of Kitakyushu Medical Prison who were involved in treatment and information-gathering, and to Dr. Takehiro Nozaki of Nakamura Gakuen University Graduate School, as well as Dr. Shu Takakura and Dr. Hiromi Urabe of the Department of Psychosomatic Medicine at Kyushu University Hospital, who provided valuable advice on the research and manuscript.

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- Notes
- *1. If a patient's medical history was confirmed to meet the DSM-5 diagnostic criteria for ED¹⁾ prior to their first admission to a correctional facility, based on a medical history interview, a personal history form, or a medical record, it was recorded as "ED history (+)."
- *2. The general process for transferring a patient from-admission to correctional facility to medical prison

was as follows: admission to a detention center → (after the sentence is finalized) transfer to a general prison → ED problems become apparent and are assessed as difficult to deal with → (based on consultation with a medical prison) transfer to a medical prison. There were no clear criteria for transfer, and the assessment of difficulty in dealing with the situation depended on the approach and situation of the facility, as well as BMI of the patient. In response to requests from general prisons, medical prisons would assess the severity of patients as objectively as possible, taking into account their own capacity, and decide on which patients to accept, prioritizing those who were considered to be in the most critical condition and most difficult to treat. (Since 2019, consultations on the transfer of ED patients between women's and medical prisons are no longer held, with transfer decided by the Bureau of Corrections.) In addition, in many general prisons, it was rare to find doctors who fully understood ED and could provide effective treatment, with the reality being that they were struggling greatly with how to deal with patients for whom usual medical treatment was not effective.

*3. A small number of people were also found to have developed ED symptoms

(first onset) while in detention center in police after arrest (sometimes serving the role of a detention center as a substitute penal institution) or while out on bail, and these cases were also included in the “ED (-) Methamphetamine (-)” group.

*4. Even if they had a history of ED treatment, many had dropped out and lost touch with the treatment institution. The main reasons for relatively long-term treatment were being forced to be hospitalized due to a physical crisis, or being obliged to receive counseling as a compromise with those around them (seeking treatment). On the other hand, 14 people visited a medical institution as a legal measure after being arrested (to avoid a prison sentence), at the recommendation of a judicial official, and 7 of these people had no previous history of ED treatment.

*5. Generally, the natural course of AN is often a transition from the restrictive type to binge-eating/purging type, and patients with the binge-eating/purging type tend to have a longer disease duration than patients with the restrictive type. In the “ED (+) Methamphetamine (-)” group, many cases were observed in which binge-eating and purging behaviors appeared over time, and it is considered that

there is a strong link between the high rate of binge-eating and purging and the long duration of the disease.

*6. As the reason why the proportion of the binge-eating/purging type was large in the “Methamphetamine (+) ED (+)” group and in the drug crime group reported by Asami et al., it was recognized that the “Methamphetamine (+) ED (+)” group had the binge-eating/purging type from the early stages of ED, and in Asami et al.'s drug crime group, the duration of ED was relatively short at 6.7 ± 5.9 years (15.7 ± 6.7 years in the shoplifting group), suggesting that the psychological characteristics of methamphetamine abusers, such as impulsivity, may be more involved than the length of the disease history.

*7 While the above factors could offer a significant advantage in the treatment of severe ED, there were also specific difficulties in providing comprehensive medical treatment in correctional institutions, which have a different mission and purpose from medical treatment. In other words, there were

many problems that needed to be overcome, such as the difficulty of obtaining consensus on treating ED as diseases, and the need to balance the basic principles of correctional facilities, such as the rights and equality of inmates, with medical treatment which is based on the premise of individuality. In addition to gaining understanding within the institution and completing the treatment program, we continued to make efforts to promote ED awareness throughout the correctional system, including contributions to the Japan Correctional Association journal,²⁷⁻²⁹⁾ ³¹⁻³³⁾ ED-related training sessions, and on-site training for female prison staff at our institution. The training sessions were held annually at our institution from 2014 to 2018, with more than 100 staff members from correctional institutions across Japan participating each year.

Table 1: Demographic and Clinical Characteristics of Female Patients with Anorexia Nervosa at Kitakyushu Medical Prison

n	100
Age at admission (years old)	42.9 ± 10.2 (22-73)
Age at onset of eating disorder (years old)	25.2 ± 12.5 (12-67)
Duration of eating disorder (years)	17.3 ± 10.8 (0-41)
BMI at admission (kg/m ²)	13.5 ± 1.7 (10.0-17.4)
Body weight at time of admission (kg)	33.2 ± 4.2 (23.6-41.0)
Type of anorexia nervosa	
Restrictive type (persons)	26 (26.0%)
Binge-eating/purging type (persons)	72 (72.0%)
Unknown (persons)	2 (2.0%)
Highest level of education	
Junior high school graduate (persons)	6 (6.0%)
High school dropout (persons)	20 (20.0%)
High school graduate (persons)	31 (31.0%)
Vocational school/Junior college/University dropout (persons)	7 (7.0%)
Vocational school/Junior college graduate (persons)	19 (19.0%)
Graduated from university (persons)	17 (17.0%)
Marital status	
Never married (persons)	44 (44.0%)
Married (persons)	24 (24.0%)
Divorced (persons)	32 (32.0%)
Number of times admitted to a correctional facility (times)	2.1 ± 1.6 (1-9)
Crime name (There are some cases of overlap)	
Theft (persons)	87 (87.0%)
Violation of the Stimulants Control Law (persons)	10 (10.0%)
Fraud (persons)	2 (2.0%)
Violation of the Anti-Prostitution Law (persons)	1 (1.0%)
Homicide (persons)	1 (1.0%)
Assault (persons)	1 (1.0%)

Table 1: Demographic and Clinical Characteristics of Female Patients with Anorexia Nervosa at Kitakyushu Medical Prison

Table 2: Comparison of the Clinical Characteristics of the Four Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse
-Part 1: Eating disorder symptoms, life history, and criminal history -

	"ED (+) Methamphetamine (-)" group ① n=74 (74.0%)	"ED (-) Methamphetamine (-)" group ② n=13 (13.0%)	"Methamphetamine (+) ED (+)" group ③ n=4 (4.0%)	"Methamphetamine (+) ED (-)" group ④ n=9 (9.0%)	p	Multiple comparisons (Tukey's test)	Effect size (Cohen's d)
							①vs② ①vs③ ①vs④ ②vs③ ②vs④ ③vs④
Age at admission (years old)	41.9 ± 8.2 (22-62)	52.0 ± 10.6 (39-73)	43.0 ± 9.4 (33-52)	37.8 ± 11.6 (24-54)	0.0029	①④<③	1.07 0.12 0.43 0.87 1.29 0.47
Age at onset of eating disorder (years old)	21.0 ± 8.7 (12-51)	48.3 ± 9.5 (38-67)	20.5 ± 4.4 (16-26)	32.8 ± 10.9 (19-48)	<0.0001	①③④<②, ①<④	3.10 0.06 1.32 3.19 1.54 1.28
Duration of eating disorder (years)	20.9 ± 8.6 (4-41)	2.0 ± 1.5 (0-5)	22.5 ± 10.4 (11-34)	5.0 ± 8.2 (0-24)	<0.0001	①③>②④	2.32 0.18 1.86 4.23 0.56 1.98
BM at time of admission (kg/m ²)	13.3 ± 1.6 (10.0-17.4)	14.0 ± 1.4 (11.7-16.5)	13.4 ± 1.4 (12.2-15.4)	14.9 ± 2.0 (10.3-16.9)	0.0204	①<④	0.44 0.06 0.98 0.43 0.56 0.84
Body weight at time of admission (kg)	32.6 ± 3.9 (24.4-40.4)	35.1 ± 4.0 (27.8-40.2)	31.6 ± 6.0 (23.6-38.0)	36.5 ± 4.4 (26.0-41.0)	0.0121	①<④	0.64 0.25 0.99 0.78 0.34 1.00
Type of anorexia nervosa							0.0011
Restrictive type (persons)	13 (17.6%)	8 (61.5%)	0 (0.0%)	5 (55.6%)			
Binge-eating/purging type (persons)	59 (79.7%)	5 (38.4%)	4 (100.0%)	4 (44.4%)			
Unknown (persons)	2 (2.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
Highest level of education							<0.0001
Junior high school graduate (persons)	2 (2.7%)	0	0	4 (44.4%)			
High school dropout (persons)	10 (13.5%)	2 (15.3%)	3 (75.0%)	5 (55.6%)			
Graduated from high school (persons)	26 (35.1%)	5 (38.5%)	0	0			
Vocational school/Junior college/University dropouts (persons)	7 (9.5%)	0	0	0			
Vocational school/Junior college graduates (persons)	14 (18.9%)	4 (30.8%)	1 (25.0%)	0			
Graduated from university (persons)	15 (20.2%)	2 (15.4%)	0	0			
Marital status							ns
Never married (persons)	34 (45.9%)	5 (38.5%)	1 (25.0%)	4 (44.4%)			
Married (persons)	17 (23.0%)	3 (23.1%)	1 (25.0%)	3 (33.3%)			
Divorced (persons)	23 (31.1%)	5 (38.5%)	2 (50.0%)	2 (22.2%)			
Number of admissions to correctional institutions (times)	1.8 ± 1.2 (1-7)	2.1 ± 1.5 (1-5)	3.3 ± 2.2 (1-6)	3.9 ± 3.0 (1-9)	0.0009	①②<④	0.24 1.20 1.42 0.72 0.81 0.21
Offense for which the defendant was sentenced to prison this time (some cases are repeated)							
Theft (persons)	72 (97.3%)	11 (84.6%)	2 (50.0%)	2 (22.2%)			
Violation of the Stimulants Control Law (persons)	0	0	2 (50.0%)	8 (88.9%)			
Fraud (persons)	0	3 (23.1%)	1 (25.0%)	0			
Violation of the Anti-Prostitution Law (persons)	1 (1.3%)	0	0	0			
Homicide (persons)	1 (1.3%)	0	0	0			
Assault (persons)	0	1 (7.7%)	0	0			

0.3=Effect size (Cohen's d) Small < 0.5, 0.5=Effect size Medium < 0.8, 0.8=Effect size Large

Table 2: Comparison of the Clinical Characteristics of the Four Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse -Part 1: Eating disorder symptoms, life history, and criminal history-

Table 3: Comparison of the Clinical Characteristics of the Four Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse
-Part 2: BMI/Body weight trends and history of visits to medical institutions-

	"ED (+) Methamphetamine (-)" group ① n=74 (74.0%)	"ED (-) Methamphetamine (-)" group ② n=13 (13.0%)	"Methamphetamine (+) ED (+)" group ③ n=4 (4.0%)	"Methamphetamine (+) ED (-)" group ④ n=9 (9.0%)	p	Multiple comparisons (Tukey's test)	Effect size (Cohen's d)
							①vs② ①vs③ ①vs④ ②vs③ ②vs④ ③vs④
BMI and weight changes after entering a correctional facility (in relation to the current sentence)							
BM at time of admission to detention center (kg/m ²)	14.4 ± 1.6 (10.1-27.0) (n=73)	16.4 ± 1.0 (14.0-20.0) (n=12)	17.7 ± 3.8 (15.5-27.0) (n=3)	15.2 ± 3.1 (12.9-25.0) (n=8)	<0.0001	①②<④	0.80 1.24 1.85 0.54 1.38 0.48
Decrease in BMI in detention center (kg/m ²)	0.8 ± 1.8 (4.8-8.7) (n=51)	0.4 ± 1.4 (2.1-2.0) (n=11)	0.7 ± 1.4 (0.8-1.0) (n=3)	-0.9 ± 2.2 (4.2-2.0) (n=8)	ns		0.23 0.06 0.92 0.21 0.75 0.78
BMI at time of admission to women's prison (kg/m ²)	14.1 ± 2.7 (10.4-28.0) (n=57)	15.8 ± 2.5 (13.4-21.0) (n=11)	16.5 ± 4.3 (13.7-22.0) (n=4)	20.0 ± 4.3 (11.7-25.0) (n=8)	<0.0001	①②<④	0.67 0.85 2.01 0.20 1.22 0.81
Decrease in BMI in women's prison (kg/m ²)	0.8 ± 2.6 (5.9-32.0) (n=52)	1.8 ± 2.8 (1.4-7.0) (n=11)	3.2 ± 2.9 (1.4-7.0) (n=4)	5.1 ± 3.4 (1.4-10.4) (n=8)	0.0003	①②<④	0.46 0.99 1.66 0.50 1.08 0.98
BM at time of admission to Kitakyushu Medical Prison (kg/m ²)	13.3 ± 1.6 (10.0-17.4) (n=74)	14.0 ± 1.4 (11.7-16.5) (n=13)	13.4 ± 1.4 (12.2-15.4) (n=4)	14.9 ± 2.0 (10.3-16.9) (n=9)	0.0094	①②<④	0.44 0.06 0.98 0.43 0.56 0.84
Decrease in BMI for the total of detention centers and women's prisons (kg/m ²)	1.1 ± 2.5 (3.9-8.0) (n=73)	2.2 ± 2.3 (0.3-6.0) (n=12)	4.3 ± 2.1 (2.8-6.7) (n=3)	4.4 ± 2.8 (1.7-10.0) (n=8)	0.0012	①②<④	0.44 1.29 1.30 0.92 0.87 0.94
Body weight at time of admission to detention center (kg)	36.8 ± 7.0 (24.9-59.7) (n=73)	42.7 ± 6.5 (33.0-54.0) (n=12)	41.3 ± 12.3 (30.1-54.0) (n=3)	41.1 ± 6.7 (26.0-57.0) (n=8)	<0.0001	①②<④	0.76 0.24 1.55 0.01 0.90 0.71
Weight loss in detention center (kg)	23.9 ± 6.8 (18.0-30.7) (n=51)	13.3 ± 4.1 (8.7-16.0) (n=11)	1.3 ± 3.1 (2.0-3.0) (n=3)	23.1 ± 5.5 (18.0-30.0) (n=8)	ns		0.20 0.15 0.84 0.06 0.78 0.67
Body weight at time of admission to women's prison (kg)	35.2 ± 7.2 (25.0-48.0) (n=57)	39.7 ± 6.9 (31.7-52.0) (n=11)	39.4 ± 12.5 (28.4-56.0) (n=4)	46.5 ± 9.7 (29.5-61.7) (n=8)	0.0002	①②<④	0.65 0.58 1.79 0.04 1.09 0.87
Weight loss in women's prison (kg)	1.6 ± 6.6 (13.6-31.0) (n=52)	4.5 ± 6.9 (3.5-17.0) (n=11)	7.7 ± 7.2 (2.8-18.0) (n=4)	12.5 ± 8.1 (3.5-25.0) (n=8)	0.0006	①②<④	0.44 0.92 1.60 0.46 1.08 0.61
Body weight at time of admission to Kitakyushu Medical Prison (kg)	32.6 ± 3.9 (24.4-40.4) (n=74)	35.1 ± 4.0 (27.8-40.2) (n=13)	31.6 ± 6.0 (23.6-38.0) (n=4)	36.5 ± 4.4 (26.0-41.0) (n=9)	0.0121	①②<④	0.64 0.25 0.99 0.78 0.34 1.00
Weight loss in total for detention centers and women's prisons (kg)	23.1 ± 6.4 (18.0-30.0) (n=73)	5.7 ± 6.5 (0.7-15.3) (n=12)	10.0 ± 5.8 (8.0-18.0) (n=3)	10.6 ± 6.4 (6.0-27.0) (n=8)	0.0016	①②<④	0.44 1.11 1.20 0.77 0.79 0.93
History of visits to medical institutions prior to first admission to a correctional facility							0.0011
Early treatment for eating disorders (within 5 years of onset) (persons)	30 (40.5%)	0	0	0			
Subsequent 10 years after onset of eating disorder treatment for eating disorder (persons)	6 (8.1%)	0	1 (25.0%)	0			
Treatment for something other than an eating disorder at a psychiatric hospital, etc. (persons)	15 (20.3%)	5 (38.5%)	2 (50.0%)	3 (33.3%)			
No history of consultation other than with a physical medicine specialist (persons)	29 (39.6%)	8 (61.5%)	1 (25.0%)	6 (66.7%)			
Unknown (persons)	2 (2.7%)	0	0	0			

0.3=Effect size (Cohen's d) Small < 0.5, 0.5=Effect size Medium < 0.8, 0.8=Effect size Large

Table 3: Comparison of the Clinical Characteristics of the Four Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse -Part 2: BMI/Body weight trends and history of visits to medical institutions-

Table 4: Comparison of the Clinical Characteristics of the Three Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse - Psychological and Intelligence Tests -

	"ED (+) Methamphetamine (-)" group ①	"ED (-) Methamphetamine (-)" group ②	"History of methamphetamine abuse" group ③	p	Multiple comparisons (Tukey's test)	Effect size (Cohen's d)		
	n=74 (74.0%)	n=13 (13.0%)	n=13 (13.0%)			①vs②	①vs③	②vs③
SDS	49.4±11.7 (22-72) (n=62)	51.8±12.3 (35-71) (n=12)	48.2±13.2 (28-68) (n=9)	ns		0.20	0.10	0.29
STAI-T	57.5±14.8 (23-79) (n=62)	58.7±13.1 (38-78) (n=12)	52.6±19.1 (20-80) (n=9)	ns		0.08	0.34	0.43
EDI-2								
Total score	87.1±41.3 (31-204) (n=64)	73.1±42.5 (14-143) (n=12)	62.1±33.1 (29-113) (n=10)	ns		0.34	0.62	0.29
Drive for thinness (desire to be thin)	4.8±4.9 (0-17) (n=64)	2.4±3.6 (0-11) (n=12)	3.1±3.5 (0-12) (n=10)	ns		0.51	0.36	0.16
Interceptive awareness (lack of awareness of the internal world)	6.2±6.5 (0-26) (n=64)	5.4±7.1 (0-20) (n=12)	4.4±7.6 (0-24) (n=10)	ns		0.12	0.27	0.14
Bulimia (binge-eating)	4.5±5.7 (0-21) (n=64)	3.0±5.3 (0-16) (n=12)	2.6±4.6 (0-14) (n=10)	ns		0.27	0.34	0.08
Body dissatisfaction (dissatisfaction with one's body)	12.0±5.9 (2-27) (n=64)	8.3±5.1 (0-15) (n=12)	11.2±6.3 (2-24) (n=10)	ns		0.64	0.13	0.51
Ineffectiveness (sense of powerlessness)	14.3±7.4 (0-30) (n=64)	12.3±8.1 (1-23) (n=12)	7.6±5.8 (0-17) (n=10)	0.0392	①>③	0.27	0.93	0.66
Maturity fears	8.3±5.6 (1-23) (n=64)	7.8±6.7 (0-21) (n=12)	5.4±2.8 (2-10) (n=10)	ns		0.09	0.54	0.24
Perfectionism	5.1±4.0 (0-15) (n=64)	4.3±3.6 (0-11) (n=12)	3.4±3.7 (0-9) (n=10)	ns		0.20	0.43	0.25
Interpersonal distrust	7.6±5.3 (0-19) (n=64)	6.0±4.0 (1-12) (n=12)	5.3±4.4 (0-14) (n=10)	ns		0.31	0.45	0.17
Asceticism	8.1±3.8 (0-20) (n=64)	7.8±5.1 (3-18) (n=12)	5.6±4.3 (2-14) (n=10)	ns		0.07	0.65	0.46
Social insecurity (anxiety about interpersonal interactions)	10.2±5.2 (1-23) (n=64)	8.5±5.9 (0-17) (n=12)	6.0±4.6 (0-13) (n=10)	0.0557		0.32	0.82	0.47
Impulse regulation (difficulty with impulse control)	6.0±6.3 (0-29) (n=64)	7.2±10.7 (0-29) (n=12)	7.5±7.7 (2-25) (n=10)	ns		0.17	0.21	0.03
WAIS-III								
Full-test IQ	93.0±18.4 (56-133) (n=62)	90.7±17.4 (64-114) (n=12)	80.6±8.8 (69-99) (n=9)	ns		0.13	0.71	0.70
Verbal IQ	95.4±18.5 (55-134) (n=61)	95.7±16.3 (68-121) (n=12)	81.4±8.6 (71-99) (n=9)	0.0827		0.02	0.79	1.05
Performance IQ	91.6±17.4 (64-132) (n=61)	86.0±18.0 (59-120) (n=12)	83.3±12.9 (65-105) (n=9)	ns		0.32	0.61	0.31

0.3≤Effect size (Cohen's d) Small < 0.5, 0.5≤Effect size Medium < 0.8, 0.8≤Effect size Large
 "History of methamphetamine abuse" group = "Methamphetamine (+) ED (+)" group + "Methamphetamine (+) ED (-)" group
 SDS: Zunk Self-Rating Depression Scale, STAI-T: Trait Anxiety Scale of the State-Trait Anxiety Inventory, WAIS-III: Wechsler Adult Intelligence Scale-Third Edition.

Table 4: Comparison of the Clinical Characteristics of the Three Groups Classified According to the Presence or Absence of a History of Eating Disorders and Methamphetamine Abuse -Psychological and Intelligence Tests-

Table 5: Comparison of Various Factors (medical history, life history, criminal history, etc.) in the Two Groups with a History of Methamphetamine Abuse

	"Methamphetamine (+) ED (+)" group n=4	"Methamphetamine (+) ED (-)" group n=9	p	Effect size (Cohen's d)
Significant problems in the original family* (persons)	3 (75.0%)	7 (77.8%)	ns	0.03
Bad friendship in their teens (persons)	3 (75.0%)	8 (88.9%)	ns	0.17
History of being placed in a juvenile correctional facility (persons)	0 (0.0%)	5 (55.6%)	0.0260	0.62
History of psychiatric visits during adolescence (persons)	1 (25.0%)	1 (11.1%)	ns	0.17
History of working in the sex industry (persons)	0 (0.0%)	5 (55.6%)	0.0260	0.62
Age at which they started using paint thinner (years old)	15.0±1.0 (n=3)	14.6±1.5 (n=7)	ns	0.29
Age at which methamphetamine abuse began (years old)	23.8±6.1 (n=4)	18.9±3.7 (n=9)	0.0976	1.09
Age at first admission to a correctional facility (including juvenile facilities) (years old)	32.0±4.9 (n=4)	21.0±4.9 (n=9)	0.0100	2.24
Number of times admitted to a correctional facility (times)	3.3±2.2 (n=4)	3.9±3.0 (n=9)	ns	0.21
Age at onset of eating disorder (years old)	20.5±4.4 (n=4)	32.8±10.9 (n=9)	0.0568	1.28
Duration of eating disorder (years)	22.5±10.4 (n=4)	5.0±8.2 (n=9)	0.0071	1.98
Age at admission to Kitakyushu Medical Prison (years old)	43.0±5.5 (n=4)	37.8±3.7 (n=9)	ns	1.22
Type of anorexia nervosa			0.0260	
Restrictive type (persons)	0 (0.0%)	5 (55.6%)		
Binge-eating/purging type (persons)	4 (100%)	4 (44.4%)		
BMI at time of admission to detention center (kg/m ²)	17.7±3.8 (n=3)	19.3±3.1 (n=9)	ns	0.49
Decrease in BMI in detention center (kg/m ²)	0.7±1.4 (n=3)	-0.9±2.2 (n=8)	ns	0.78
BMI at admission to women's prison (kg/m ²)	16.5±4.3 (n=4)	20.0±4.3 (n=8)	ns	0.81
Decrease in BMI in women's prison (kg/m ²)	3.2±2.9 (n=4)	5.1±3.4 (n=8)	ns	0.58
BMI at time of admission to Kitakyushu Medical Prison (kg/m ²)	13.4±1.4 (n=4)	14.9±1.9 (n=9)	ns	0.84
Decrease in BMI for the total of the detention center and women's prison (kg/m ²)	4.3±2.1 (n=3)	4.4±2.8 (n=9)	ns	0.04
Body weight at time of admission to detention center (kg)	41.3±12.3 (n=3)	47.1±6.7 (n=9)	ns	0.71
Weight loss in detention center (kg)	1.3±3.0 (n=3)	-2.1±5.5 (n=8)	ns	0.67
Body weight at time of admission to women's prison (kg)	39.4±12.5 (n=4)	48.6±9.7 (n=8)	ns	0.87
Weight loss in women's prison (kg)	7.7±7.2 (n=4)	12.5±8.1 (n=8)	ns	0.61
Body weight at time of admission to Kitakyushu Medical Prison (kg)	31.6±6.0 (n=4)	36.5±4.4 (n=9)	ns	0.65
Weight loss in total for detention centers and women's prisons (kg)	10.0±5.6 (n=3)	10.6±6.4 (n=9)	ns	0.10
Number of times incarcerated in a penal institution (adult correctional facility) (times)	3.3±2.2	3.9±3.0	ns	0.21
Offense for which the person was sentenced to prison (including previous incarceration)				
Violation of the Stimulants Control Law + theft + fraud (persons)	0 (0.0%)	2 (22.2%)		
Violation of the Stimulants Control Law + theft (persons)	2 (50.0%)	2 (22.2%)		
Violation of the Stimulants Control Law + fraud (persons)	1 (25.0%)	0 (0.0%)		
Violation of the Stimulants Control Law only (persons)	1 (25.0%)	4 (44.4%)		
Theft only (persons)	0 (0.0%)	1 (11.1%)		

0.3≤Effect size (Cohen's d) Small < 0.5, 0.5≤Effect size Medium < 0.8, 0.8≤Effect size Large
 Significant problems in the original family*: Significant dysfunction in the original family from childhood (e.g., parents' divorce or bereavement)

Table 5: Comparison of Various Factors (medical history, life history, criminal history, etc.) in the Two Groups with a History of Methamphetamine Abuse