THE EFFECT OF REHABILITATION DURATION ON SERUM CORTISOL LEVELS IN NARCOTICS ABUSER PATIENTS AT MUTIARA SUKMA MENTAL HOSPITAL

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Abstract

Narcotic abuse has been demonstrated to induce physiological disorders, typified by elevated cortisol levels in response to stress. Rehabilitation has been identified as a critical strategy for mitigating stress responses by restoring the functionality of the neuroendocrine system. The objective of this study is to ascertain the impact of rehabilitation duration on serum cortisol levels in individuals struggling with substance use disorder. The study design employed was an observational analytical cross-sectional approach, involving two groups of patients: the detoxification phase (rehabilitation ≤ 2 weeks) and the social rehabilitation phase (> 2 weeks). The measurement of cortisol levels was conducted using the ELISA (enzyme-linked immunosorbent assay) method, followed by statistical analysis employing the Mann-Whitney U test. The results indicated that the mean cortisol level in the detoxification group, which ranged from 2 to 14 days, was 114.07 ng/mL, with a single sample (7.7%) exceeding the normal range. The social rehabilitation group exhibited an average cortisol level of 38.89 ng/mL, with 33% falling below the standard reference range. A subsequent statistical analysis yielded a p-value of 0.000 ($p < 0.05$), thereby indicating a significant difference in cortisol levels based on the duration of rehabilitation. These results suggest that a prolonged rehabilitation phase plays a role in reducing cortisol levels through the body's stress system adaptation. The objective evaluation of rehabilitation progress in patients who abuse drugs can be facilitated by cortisol monitoring, which serves as an objective indicator.

Keywords: Cortisol, “Rehabilitation Duration”, “Narcotics Abusers”

1. INTRODUCTION

Narcotic abuse represents a multifaceted, global problem that persists in its escalation over time. According to the World Drug Report 2024, approximately 292 million individuals worldwide used narcotics in 2022 [1]. As the most populous country in Southeast Asia, Indonesia is also affected, with a prevalence of abuse reaching 1.73% in the productive age group (15–64 years), or approximately 3.3 million people (BNN, 2024). In West Nusa Tenggara Province, there were 518 cases of narcotic abuse in 2023 [2]. Narcotic abuse is defined as the uncontrolled use of addictive substances without valid medical indications. Prolonged use has been demonstrated to induce dependence, which can result in a range of adverse

physical, psychological, and social consequences. In the absence of adequate intervention, this condition can result in overdose or even death. Consequently, rehabilitation emerges as a pivotal component in the recovery process for individuals struggling with substance use disorder [3].

Drug rehabilitation is a multidisciplinary process that includes medical and social stages. The initial phase, detoxification, aims to overcome withdrawal symptoms through intensive care. Social rehabilitation, meanwhile, focuses on psychosocial recovery and reintegration into society. The physiological response to stress during this process, particularly during the detoxification phase, involves the activation of the neuroendocrine system through the HPA (hypothalamic-pituitary-adrenal) axis, leading to increased cortisol levels [4].

Cortisol, the primary biomarker in the stress response, has the potential to serve as a physiological indicator in assessing the effectiveness of rehabilitation. A number of studies have previously examined cortisol in the context of drug rehabilitation, albeit with varying foci. For instance, study [5] demonstrated differences in cortisol levels between rehabilitation and non-rehabilitation groups; however, the study only compared the two groups without examining progress during rehabilitation. Conversely, another study found that rehabilitation duration correlates with reduced stress and improved quality of life. However, the study did not use biological biomarkers like cortisol as an indicator [6].

The objective of this study is to examine the impact of rehabilitation duration on serum cortisol levels in individuals suffering from substance use disorder at Mutiara Sukma Hospital. The objective of this study is to provide a foundation for the design of duration-based rehabilitation interventions, while also contributing to the existing body of literature on the use of stress biomarkers in addiction recovery evaluation.

2. METHODOLOGY

The present study employed an analytical observational approach, utilizing a cross-sectional design. The subjects of the study were drug abusers at Mutiara Sukma Hospital who were undergoing rehabilitation in two phases: the detoxification phase (medical rehabilitation ≤ 2 weeks) and the social rehabilitation phase (> 2 weeks). The present study employed a purposive sampling method, and cortisol levels were measured using the ELISA (enzyme-linked immunosorbent assay) method with venous blood serum samples. The data obtained were then subjected to analysis using the Mann-Whitney U test, a statistical method designed for the assessment of differences in cortisol levels based on the duration of rehabilitation undergone.

3. RESULTS

The present study involved 28 male drug abusers aged 17-37 years undergoing rehabilitation at Mutiara Sukma Mental Hospital. The rehabilitation process was segmented into two distinct groups: the detoxification group, which encompassed 13 individuals (46.4%), and underwent a duration of 1–14 days, and the social rehabilitation group, comprising 15 patients (53.6%), who underwent a duration of 3–6 months. Blood samples were collected in the afternoon. The duration of rehabilitation was ascertained from the patients' medical records, and serum cortisol levels were measured through blood tests using the ELISA method at the Immunoserology Laboratory of the Mataram Public Health Polytechnic. The results of cortisol level measurements in the detoxification group are shown in Table 1.

Table 4. *Duration of rehabilitation on cortisol levels in the detoxification group*

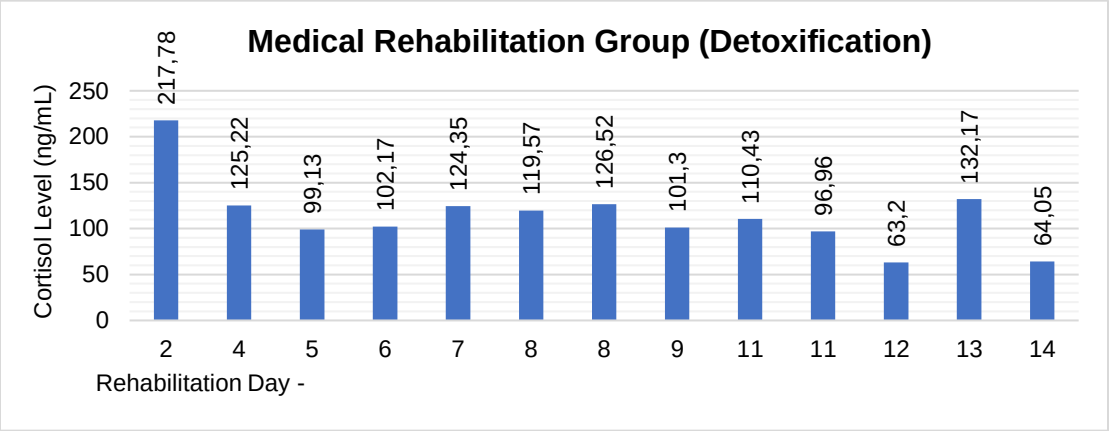

Table 1. Shows 13 samples undergoing medical rehabilitation for 14 days, with patients receiving therapy for 2–14 days and serum cortisol levels between 63–218 ng/mL. One sample (7.7%) had levels above the normal range (30–150 ng/mL), while the remaining 12 samples (92.3%) were within the normal range of 63–132 ng/mL. Elevated levels above the normal range were found in patients who underwent rehabilitation for only 2 days.

Another group consisted of patients who underwent medical rehabilitation and participated in social rehabilitation. The cortisol levels of patients undergoing social rehabilitation are presented in Table 2 below:

Table 5. *Duration of rehabilitation on cortisol levels in the social rehabilitation group*

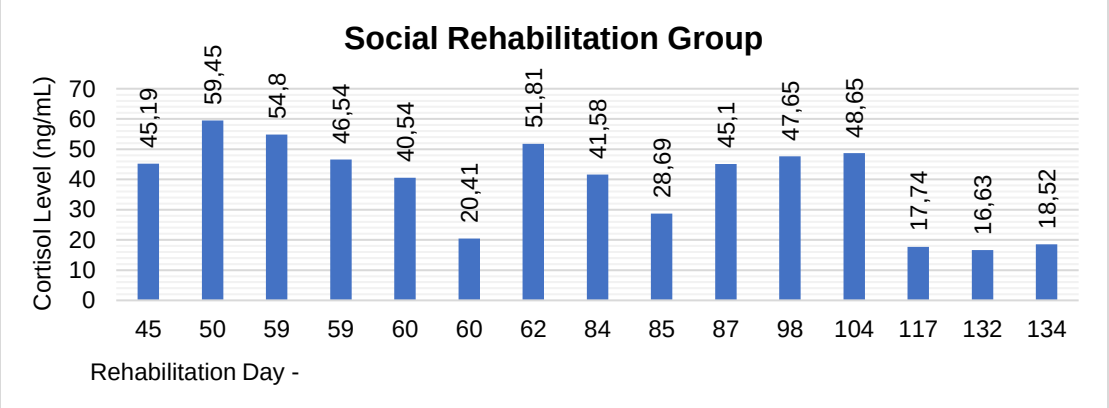

Table 2 shows serum cortisol levels in 15 patients undergoing social rehabilitation for 45 to 134 days, with serum cortisol levels ranging from 17 to 60 ng/mL. Five samples (33%) had serum cortisol levels below normal, i.e., 17–29 ng/mL, while the remaining 10 samples (67%) were still within the normal range, albeit at the lower end of the normal range.

1.1 DESCRIPTIVE STATISTICS AND DATA DISTRIBUTION

Descriptive statistics of serum cortisol levels based on rehabilitation groups are presented in Table 3. The mean cortisol level in the detoxification group was 114.07 ng/mL, with a minimum value of 63.20 ng/mL and a maximum value of 217.78 ng/mL. Meanwhile, in the social rehabilitation group, the mean cortisol level was 38.89 ng/mL, with a range from 16.63 ng/mL to 59.45 ng/mL..

Table 6 *Descriptive statistics of serum cortisol levels by rehabilitation group*

Rehabilitation Group	n	Average (ng/mL)	Min	Max
Detox (≤14 days)	13	114,07	63,20	217,78
Social Rehabilitation (>14 days)	15	38,89	16,63	59,45

1.1.1 INTERPRETATION RESULTS

The results of the study showed that the average serum cortisol level in the medical rehabilitation (detoxification) group was 114.07 ng/mL, while in the social rehabilitation group it was 38.89 ng/mL. The Mann-Whitney U test yielded a p-value of 0.000 < α (0.05), indicating a significant difference between the two rehabilitation groups. These findings reinforce previous research on cortisol dynamics in addiction recovery. Study [5] found high cortisol levels (292 ng/mL) in patients who had not undergone rehabilitation. This is similar to the results of a single-sample study involving therapy over two days (217.78 ng/mL). At the end of medical rehabilitation, cortisol levels were around 100 ng/mL, although two samples were at the midpoint, around 60 ng/mL.

High cortisol levels in the detoxification group were due to withdrawal syndrome that occurred when drug use was stopped. Activation of the HPA (hypothalamic-pituitary-adrenal) axis also occurs as a result of withdrawal syndrome. This syndrome is characterized by physical symptoms such as tremors and sweating, as well as psychological symptoms such as anxiety, restlessness, and depression that can last for several weeks [7].

Acute stress during withdrawal syndrome activates the HPA axis. Long-term drug use leads to neurotransmitter dysregulation in the brain, particularly the dopaminergic system, which is hyperactive during substance use but depressed during withdrawal. Research [8] confirms this neurotransmitter imbalance as the cause of increased cortisol. This imbalance contributes to increased anxiety and excessive activation of the HPA axis. Sudden cessation of narcotics triggers a massive stress response through the release of CRH (Corticotropin Releasing Hormone) from the hypothalamus, which stimulates the release of ACTH (Adrenocorticotropic Hormone) from the anterior pituitary and increases cortisol production from the adrenal cortex [9]

The decrease in cortisol levels in the social rehabilitation group (38.89 ng/mL) aligns with findings [9].regarding the benefits of a structured rehabilitation environment. The decrease in cortisol levels reflects the neuroendocrine system's adaptation to a stable and supportive environment. Active patient involvement in therapeutic activities and social support are key factors in recovery success through stress hormone normalization, demonstrating that cognitive-behavioral therapy effectively reduces stress biomarkers, consistent with the results of this social rehabilitation group ini [10]. Psychological interventions such as cognitive-behavioral therapy have been shown to reduce cortisol levels through improved coping skills [11]. A structured environment helps the HPA axis adapt from a state of high alert to a more calm state.

Extreme findings were observed in patients with cortisol levels of 217.78 ng/mL on the second day of medical rehabilitation (detoxification). Compared to findings in [5] of 292 ng/mL in patients without rehabilitation, this value indicates that detoxification provides stabilization but remains within the high-stress range. This suggests that the body is still in an unstable state of stress with highly active HPA axis activation.

Five patients in the social rehabilitation group showed very low cortisol levels below the normal range (Table 2) with a range of 16.63–28.69 ng/mL. Extremely low cortisol levels may indicate adrenal fatigue due to excessive HPA stimulation in the previous phase. According to [12], a decrease in cortisol can also

be caused by a cortisol-binding protein disorder, which reduces the amount of active cortisol in the blood. A history of childhood trauma or prolonged stress can also lead to HPA system hyporesponsiveness [13].

The main contribution of this study is to show the cortisol trajectory from the detoxification phase to social rehabilitation. The study results indicate that longer rehabilitation duration and a supportive environment play a crucial role in neuroendocrine function recovery, providing biological evidence of stress reduction. Individual variability in cortisol responses highlights the need for a social rehabilitation approach tailored to each patient's specific condition. It is advisable to measure cortisol levels in social rehabilitation groups at the beginning, middle, and end of the rehabilitation period to assist patients with HPA system hyporesponsiveness.

Monitoring stress biomarkers such as cortisol can serve as an objective tool to evaluate rehabilitation progress and adjust therapeutic interventions. This aligns with recommendations [14] for a comprehensive and biologically based rehabilitation approach. Detoxification groups require intensive medical management to stabilize physiological responses, while social rehabilitation groups need continuous monitoring to optimize recovery.

4. CONCLUSIONS

The results of the study indicate that there is a significant difference in serum cortisol levels between drug abusers undergoing medical rehabilitation (detoxification) and those undergoing social rehabilitation. The detoxification group had higher average cortisol levels, reflecting acute stress responses during the withdrawal phase. Conversely, the social rehabilitation group exhibited lower cortisol levels, indicating a more stable neuroendocrine state. The duration of rehabilitation and supportive environmental conditions play a crucial role in the recovery of biological stress function. Monitoring cortisol levels can serve as an objective indicator for evaluating the effectiveness of drug rehabilitation programs and adjusting therapeutic approaches based on individual patient conditions during the rehabilitation period.

ACKNOWLEDGEMENTS

We would like to express our gratitude to:

1. The Director of Mutiara Sukma Hospital and staff for the permission and facilities provided during the data collection process.
2. The Director of the Mataram Ministry of Health Polytechnic, the Head of the Laboratory Technology Department, and the staff of the Mataram Ministry of Health Polytechnic Immunology Laboratory for granting permission for research and serum cortisol level testing.

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