



UNRAVELLING THE IMPACT OF RELIGIOUS THERAPY ON STRESS BIOMARKERS IN ICU PATIENTS - A TRUE EXPERIMENTAL STUDY

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ABSTRACT

Elevated stress biomarkers, such as cortisol, in response to stress conditions, can impede the healing process, prolong hospitalization, and escalate healthcare costs. This research examines the influence of religious therapy on cortisol levels in Intensive Care Unit (ICU) patients. Employing a true experimental design, 40 ICU patients were randomly assigned to the intervention or control group, comprising 20 participants each. Salivary cortisol samples were collected before and after the intervention and analyzed using the ASSAY method.

The intervention group received religious therapy consisting of 15-minute sessions of listening to Quranic recitations, while the control group received no treatment. Statistical analysis involved an independent t-test to assess mean differences in cortisol level reduction between the two groups. Homogeneity testing confirmed that both groups had similar demographic characteristics regarding gender and age ($p > 0.05$).

The results showed a significant difference in mean cortisol level reduction between the intervention group (16.3 ± 25.3 ng/ml) and the control group (-0.4 ± 18.2 ng/ml) ($p = 0.021$). Additionally, Cohen's d-test indicated a substantial effect size of 0.71, highlighting the notable impact of religious therapy on cortisol level reduction. In conclusion, religious therapy effectively reduced cortisol levels among critically ill patients in the ICU.

Keywords: Intensive Care Unit, cortisol, critically ill patients, stress, religious therapy.

ABSTRAK

Kondisi stres yang ditandai dengan peningkatan biomarker stres (kortisol) dapat menghambat proses penyembuhan, memperpanjang masa perawatan, dan meningkatkan biaya perawatan. Penelitian ini bertujuan untuk mengidentifikasi pengaruh terapi religius terhadap kadar kortisol pasien ICU. Penelitian ini merupakan true experimenta study yang melibatkan 40 orang pasien ICU. Responden secara random dibagi menjadi dua kelompok, yaitu intervensi dan control dengan jumlah masing-masing 20. Pengambilan sampel kortisol saliva dilakukan sebelum dan sesudah perlakuan. Analisa kadar kortisol saliva menggunakan metode ASSAY. Kelompok intervensi mendapatkan terapi religius berupa mendengarkan bacaan Al Quran selama 15 menit sedangkan kelompok kontrol tidak mendapatkan perlakuan apapun.

Uji statistik menggunakan uji t independent untuk mengidentifikasi perbedaan rerata penurunan kadar kortisol pada kelompok intervensi dan control. Uji homogenitas menunjukkan bahwa kedua kelompok memiliki karakteristik jenis kelamin dan usia yang sama (nilai $p > 0.05$). Terdapat perbedaan rerata penurunan antara kelompok intervensi ($16,3 + 25,3$ ng/ml) dengan kelompok kontrol ($-0,4 \pm 18,2$) yang signifikan (nilai $p = 0,021$). Uji Cohen's $d = 0.71$ menunjukkan bahwa terapi religius memiliki effect size yang besar terhadap penurunan kadar kortisol. Kesimpulannya adalah terapi religius dapat menurunkan kortisol secara efektif.

Keywords: ICU, kortisol, pasien kritis; stress, terapi religius.

INTRODUCTION

Stress is the most prevalent condition encountered among patients receiving treatment in the Intensive Care Unit (ICU). It can arise from both internal and external factors in patients. Internal factors that trigger stress include the threat of death, disability, loss of meaning in life, and disruption of autonomy and self-control. Additionally, several external factors contribute to stress in ICU patients, such as unfamiliar and overwhelming environments, a noisy atmosphere, painful treatment procedures, and separation from family (Urden et al., 2014).

One of the indicators of stress is an elevation in the level of the cortisol hormone. This stress hormone possesses a low molecular weight and is lipophilic, enabling it to pass through cell membranes via passive diffusion. Consequently, free cortisol can be detected in various body fluids, including saliva (Adisty et al., 2015).

Elevated stress hormones, such as cortisol and aldosterone, are often accompanied by an increase in heart rate and respiration frequency, elevated blood pressure, and heightened systemic resistance. These physiological responses can impose additional strain on the heart and diminish systemic blood circulation, potentially exacerbating the conditions of patients in the Intensive Care Unit (ICU). Poorly managed stress may lead to delayed healing processes, increased complications, and prolonged hospital stays, all of which are common consequences (Urden, Stacy, and Lough 2014; Puntillo, Miaskowski, and Summer 2003).

Nevertheless, the management of stress in ICU patients has not been optimized. The predominant emphasis on the physical aspects of ICU care has led to a relative neglect of patients' psychological well-being. However, psychological and spiritual aspects play a crucial role in how ICU patients cope with stress. Hence, the implementation of complementary and alternative medicine (CAM) with a holistic approach becomes imperative (Koenig et al., 2012).

Religious therapy is one form of CAM that can be employed. This therapeutic approach utilizes religious beliefs or spirituality to achieve clients' mental and physical health goals. Examples of religious therapy include activities such as prayer, meditation, reading sacred texts, and visiting sacred places (Koenig et al., 2012).

The implementation of Complementary and Alternative Medicine (CAM) in the ICU faces challenges due to limited staffing and time for therapy. The high workload has resulted in ICU nurses having limited motivation to provide CAM, particularly spiritual care in the ICU (Urden et al., 2014) (Ristianingsih, Septiwi, and Yuniar 2014; Ristianingsih, Septiwi, and Yuniar 2014). This fact emphasizes the need for simple and easily applicable CAM interventions that do not require specific time and effort.

Religious therapy, such as Quranic recitation (Murottal), is one form of CAM that involves specific religious practices believed to have therapeutic effects. Reading or listening to the Quran is an essentially religious activity for Muslims, renowned for providing tranquillity and believed to offer healing effects (Al-Kaheel, 2011).

Listening to Murottal has been widely used as a therapeutic approach to address various health issues. Benefits of Quranic recitation include its potential to manage sleep disorders, pain, and anxiety (Ghiasi and Keramat 2018; Saniyah and Ekawati 2014; Wirakhmi, Utami, and Purnawan 2018; Oktora, Purnawan, and Achiriyati 2016).

The use of Murottal as a therapy for ICU patients has been studied several times. Research conducted by Yadak et al. (2017) demonstrated that listening to Murottal could be performed during the process of weaning mechanical ventilators for ICU patients. Other studies showed that Murottal had no significant effect on the intensity of pain experienced by ICU patients (Purnawan, Hidayat, et al., 2021). This might be attributed to ICU patients already receiving pain relievers, muscle relaxants, and sedatives. However, other studies have shown that listening to Murottal could reduce pain intensity in cancer and hypertensive patients (Mulyani et al., 2019; Wirakhmi, Novitasari, et al., 2018).

Research on the impact of listening to Murottal on anxiety or stress in ICU patients has been conducted, but none have utilized stress biomarkers (cortisol hormone) as a research variable (Hudiyawati et al. 2022; Faradina 2017; Purnawan et al. 2021). Therefore, this study aims to investigate the influence of listening to Murottal on cortisol levels in ICU patients.

METHODS

Study Design

The research design employed in this study is a true experiment utilizing a pretest and posttest control group design. Participants were divided into two groups: the treatment and control groups. Data were collected both before and after the intervention.

Sample

The target population of the study comprises ICU patients, while the accessible population consists of patients in the ICU of Margono Soekarjo Hospital in Purwokerto. The sampling technique used in this study is consecutive sampling, wherein all patients who meet the inclusion and exclusion criteria are sequentially included as respondents until the minimum required sample size is attained.

The sample size was calculated based on the standard deviation and the minimum significant difference between the variables under study (Choi & Lee, 2012). The calculation resulted in an equal number of 20 respondents for both the intervention and control groups.

The inclusion criteria for the study are as follows: (a) age between 18 and 65 years; (b) Muslim; (c) within the first 48 hours of ICU care; (d) hemodynamically stable; (e) responsive to sound stimulation; and (f) obtaining family consent. The exclusion criteria are (a) receiving any of the following medications: norepinephrine > 0.1 µg/kg/minute, dopamine > 10 µg/kg/minute, or dobutamine > 10 µg/kg/minute; and (b) having ear injuries causing pain when wearing headphones. No dropouts were observed among the selected participants during the course of the study. All initially chosen participants completed the study without any issues.

Initially, there were 100 patients during the data collection process, but only 40 eventually met the inclusion and exclusion criteria. The division of the groups into treatment and control groups was conducted using a block randomization system, ensuring equal distribution of participants in each group. The sample selection process can be seen in Chart 1.

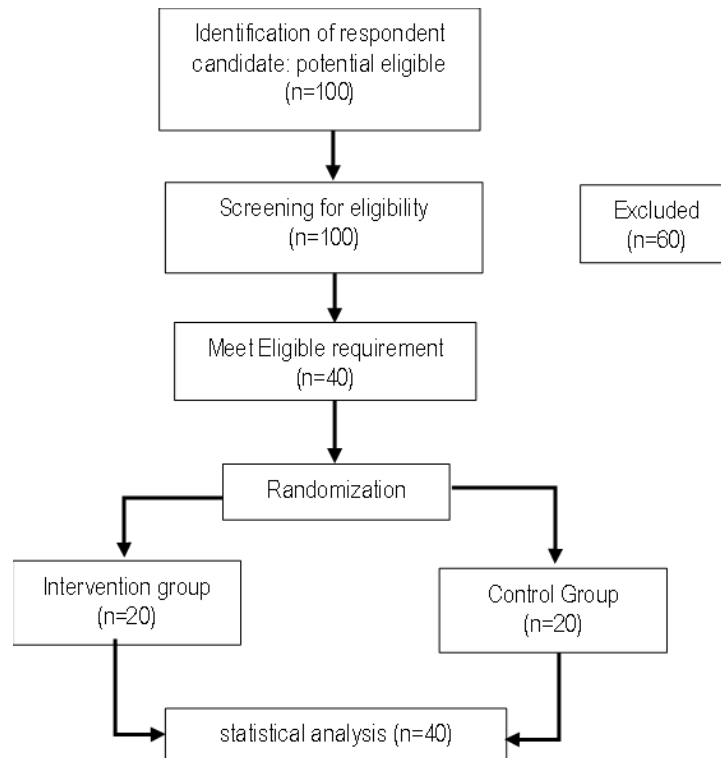


Chart 1. Respondents Selection

Instrument

The instrument used for saliva cortisol sampling consists of an absorber paper point and a 1.5 ml Eppendorf tube filled with phosphate-buffered saline (PBS). Saliva cortisol levels are analyzed using the enzyme-linked immunosorbent assay (ELISA) technique. The ELISA kit employed for this study is the human cortisol ELISA kit produced by Bioassay Technology Laboratory in Shanghai, China. The ELISA test is conducted using the Elisa Reader Labotron LB-6200, also manufactured in China.

Intervention

The intervention involves religious therapy, where participants are exposed to Murottal recitations through headphones for 15 minutes. The Quranic recitation used is Surah Ar Rahman recited by Qori Muzamil Hasbalah. The Murottal recording has been validated in the laboratory of the Faculty of Culture and Arts at Semarang State University, with characteristics such as timbre medium, pitch 44 Hz, harmony regular and consistent, rhythm mandate, volume 60 decibels, medium intensity, and tempo 95.99 (Wirakhmi et al., 2021). The intervention is administered by a nurse who has worked in the ICU of RS Margono Soekarjo Purwokerto for more than 3 years.

Data Collection

Saliva samples are collected from the intervention group one minute before and 15 minutes after the religious therapy session. For the control group, no additional intervention is administered, and saliva samples are taken within a 30-minute range, covering both pre and post-samples. This aligns with the saliva sampling time range for the intervention group, which is also 30 minutes (15 minutes before and 15 minutes after the intervention). The saliva sampling is conducted by a nurse with more than 3 years of experience in the ICU of Margono Soekarjo Hospital.

The data collection is conducted between 11:00 AM to 4:00 PM and 8:00 PM to 10:00 PM. These specific periods are chosen because cortisol levels during these periods are relatively stable, reducing bias in the research results (Stephoe and Serwinski 2016).

Saliva sampling starts with cleaning the mouth area, especially where the paper point will be placed. The paper point is inserted into the gingival sulcus for at least 30 seconds to obtain an adequate amount of saliva. The saliva sample is then placed in the labelled Eppendorf tube filled with phosphate-buffered saline

and temporarily stored in a freezer at -18°C. The cortisol level examination is performed in a certified laboratory for ELISA testing.

Data Analysis

Statistical analysis is conducted using statistical software on a computer. Univariate statistical analysis includes frequency distribution, while the difference in the magnitude of cortisol level reduction is assessed using the ANCOVA test.

Ethical Consideration

This research has undergone ethical review and approval from the Ethics Committee and Research of RS Margono Soekarjo. This is evident from the issuance of the Research Ethics Approval with the number: 420/12260/X/2019 on October 4, 2019.

RESULTS AND DISCUSSION

Demographic Data

Table 1 shows the demographic data of the respondents in both groups based on age and gender.

Table 1.

Demographic Data

No	Demographic Data	Intervention		Control		p-value ^{*)}
		Σ	%	Σ	%	
1	Age					
	a. Early Adolescence (12-16 years old)	4	20	1	5	
	b. Late Adolescence (17-25 years old)	1	5	2	10	
	c. Early Adulthood (26-35 years old)	2	10	3	15	0,66 ^{**)}
	d. Late Adulthood (36-45 years old)	2	10	2	10	
	e. Early Elderly (46-55 years old)	5	25	6	30	
	f. Late Elderly (56-65 years old)	3	15	3	15	
	g. End-stage elderly (≥ 65 years old)	3	15	3	15	
	Total	20	100	20	100	
2	Gender					
	a. Male	7	35	6	30	1,00 ^{***)}
	b. Female	13	65	14	70	
	Total	20	100	20	100	

*) uji homogenitas; **) mann-whitney; ***) chi square

Table 1 indicates that both groups share similar characteristics in terms of age and gender. The majority of respondents in both groups belong to the early elderly age category, and there is a

higher proportion of female participants. The homogeneity of demographic characteristics in both groups is supported by p-values greater than 0.05 for both age and gender.

Age and gender indirectly influence cortisol production. Both factors influence pain perception and anxiety. Meanwhile, cortisol production is affected by pain and anxiety (Maendra *et al.*, 2014; El Tumi *et al.*, 2017; Mogil, 2012; & Sussex, 2015; Purnawan, Setiyarini, et al. 2021).

According to Roelfsema *et al.*, (2017), gender has a direct influence. Men tend to exhibit higher cortisol levels compared to women, except during menopause. However, the influence of gender on cortisol is also influenced by circadian rhythm. Specifically, cortisol levels in men and women are relatively similar during the nighttime

The variation in age and gender between the intervention and control groups is homogenous, as indicated by p-values greater than 0.05 in the homogeneity test. Consequently, both age and gender in this study do not introduce bias to cortisol levels.

The Effect of Religious Therapy on Cortisol Levels

The impact of religious therapy on cortisol levels was analyzed using two statistical tests: the Wilcoxon test and the independent t-test. The Wilcoxon test was conducted to identify differences in the median cortisol levels between pre and post-intervention for both the control and intervention groups. Graph 1 displays the results of the Wilcoxon test.

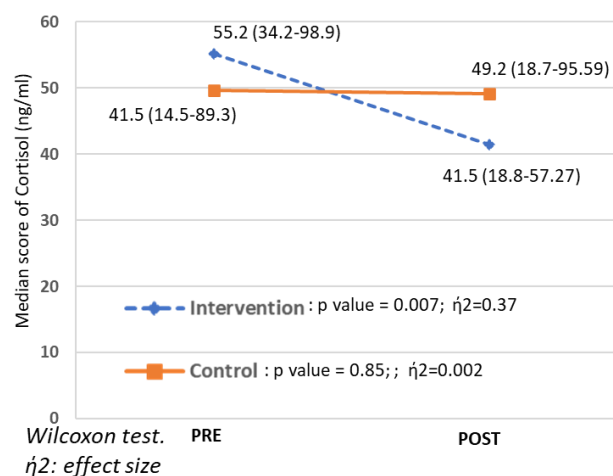


Figure 1. Comparison of Median Cortisol Levels Before and After Intervention in Both Groups

The Wilcoxon test reveals a significant difference (p-value = 0.007) between pre-intervention cortisol levels and post-intervention cortisol levels in the intervention group, with a small effect size ($\eta^2=0.37$). However, in the control group, no significant difference (p-value = 0.85) was found between pre-intervention and post-intervention cortisol levels.

The evidence of the impact of listening to Quranic recitation on respondents' cortisol levels is further supported by the independent t-test, which compares the magnitude of cortisol level reduction between the intervention and control groups. The results of this statistical test can be observed in Figure 2

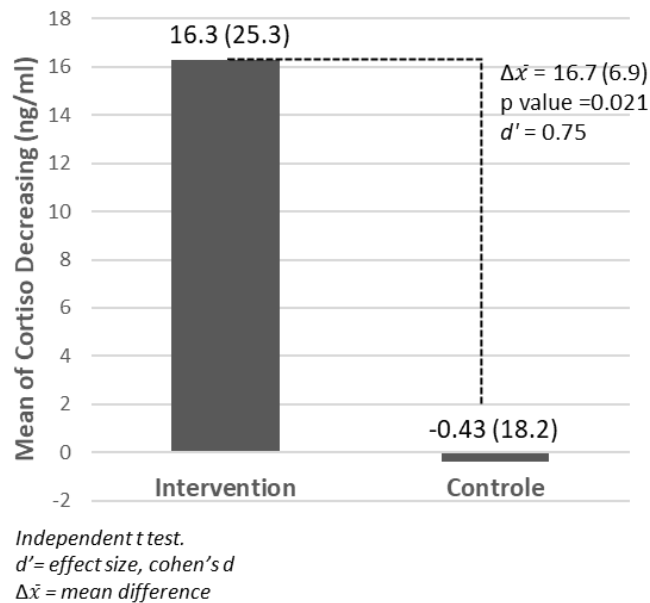


Figure 2. Comparison of Cortisol Level Reduction Magnitude in the Two Groups

The independent t-test indicates a significant difference (p-value = 0.021) in the mean reduction of cortisol levels (16.7 ng/ml) between the intervention and control groups. Cohen's d effect size of 0.75 indicates that listening to Quranic recitation has a substantial impact on reducing cortisol levels.

The calming effect of listening to Quranic recitation contributes to the reduction of cortisol levels (Che Wan Mohd Rozali et al., 2022). Relaxation and tranquillity conditions can decrease stressors, thus inhibiting or reducing cortisol production. A study conducted by Oleh John, Verma & and Khanna, (2010) on professional shooting athletes showed that the use of music therapy can significantly lower cortisol levels.

The decrease in cortisol levels in the intervention group can be attributed to the reduction in anxiety resulting from listening to Quranic recitation. ICU patients may experience anxiety due to their medical condition, various medical procedures, and the unfamiliar and noisy environments in the ICU. Anxiety triggers the activation of the sympathetic nervous system and the production of stress hormones, including cortisol (Urden et al., 2014).

The influence of listening to the Quran on anxiety has been proven in previous studies. Research conducted by Shafiei *et al.*, (2011) on 180 preoperative patients demonstrated that listening to Quranic recitation significantly reduces anxiety. Furthermore, it has been observed that listening to Quranic recitation combined with prayers can reduce anxiety in patients undergoing hemodialysis (Alivian *et al.*, 2019).

The reduction in cortisol levels in the control group may be attributed to the alleviation of pain resulting from listening to Quranic recitation. Pain is the most common type of stressor encountered by ICU patients, arising not only from the pathological processes of the disease but also from various medical procedures and treatments. Sources of pain for ICU patients include the use of mechanical ventilators, patient repositioning, injections, and side effects of medications. Similar to anxiety, pain can trigger sympathetic nervous system responses and cortisol production (Rianti 2017; Urden, Stacy, and Lough 2014).

The effectiveness of listening to Quranic recitation on pain has been studied in various conditions. It has been proven to reduce pain during labour and delivery (Frouhari et al., 2011;

Handayani et al., 2014); pain caused by hypertension (Wirakhmi, Utami, et al., 2018); pain related to mechanical ventilator use (Kyavar et al., 2016) and pain during blood sampling (Marofi et al., 2018).

The Quranic recitation used in this study employs the murottal technique. This recitation technique features a slow tempo and harmonious rhythm, making it commonly utilized in religious rituals, such as prayer (Fajar, 2016) The characteristics of murottal are similar to relaxation music, which has gentle and harmonious tones with a slow tempo (Nilsson, 2014).

Reciting the verses of the Quran in a measured and accurate manner can provide inner peace (Shafiei et al., 2011). The state of relaxation is indicated by the dominance of alpha waves in the brain when individuals listen to murottal (Shekah *et al.*, 2013). The relaxation experienced while listening to Quranic recitation is a result of the production of endorphins. Research conducted by Wahida, Nooryanto, and Andarini (2015) demonstrated that listening to Quranic recitation can increase the production of the β -endorphin hormone and reduce pain during the first stage of labour. The increase in β -endorphin hormone and pain reduction can decrease stressors, ultimately leading to the reduction and inhibition of cortisol production (Purnawan, Setiyarini, et al., 2021).

LIMITATIONS OF THE STUDY

One limitation of this study is the relatively small sample size, which consisted of only 40 individuals. A larger sample size is required to increase the research power and ensure a more robust representation of the target population.

CONCLUSIONS AND SUGESTION

The intervention group exhibited a larger mean reduction in cortisol levels compared to the control group, suggesting that religious therapy through listening to the Quran can serve as a valuable non-pharmacological approach to addressing stress among ICU patients. Importantly, this method demonstrated safety in critically ill patients, as no harmful effects were observed during the study.

Further research is needed to strengthen these findings, particularly by increasing the sample size and involving multiple hospitals (multicenter). Additionally, ICU nurses can consider employing this method as a form of spiritual support for patients.

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ETHICAL CONSIDERATIONS

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Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this research in any journal

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