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The Effect of Nursing and Rehabilitation Measures on Quality of Life and Expression of Bax/Bcl2 Genes in Patients with Stroke

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ABSTRACT

Stroke is the leading cause of neurological problems and the third leading cause of death globally, leading to various neurological defects. Due to the importance of applying nursing and rehabilitation measures to reduce complications in these patients, a study was conducted to determine the effect of nursing and rehabilitation measures on the quality of life of patients with stroke. This two-stage experimental study (before and after) was performed on 20 patients with stroke admitted to the internal medicine department. Patients were selected by sampling method, which had inclusion criteria. Data were collected using a questionnaire based on the quality of life in four areas of physical, mental, general health, and social functioning before and after the intervention. Real-Time PCR measured the expression of Bcl2 / Bax genes. Descriptive and inferential statistics analyzed the data. The results showed that the mean quality of life scores in physical function, psychological, social position, and general health after nursing and rehabilitation measures increased significantly ($p = .05$). Also, the quality of life score after these measures had a significant increase compared to before ($p = .05$). Also, a significant increase was observed in the expression ratio of the Bcl2 / Bax genes in the study group compared to the control group, which indicates the effect of nursing and rehabilitation measures on cerebral ischemia. The findings showed that the application of nursing and rehabilitation measures positively affects various aspects of patients' quality of life with stroke. These programs should be provided while educating patients and their families to help them achieve greater independence in the future.

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Introduction

Stroke is the first cause of cerebrovascular disease in the United States and worldwide (1). Despite international efforts to prevent the disorder in recent years, it is still the third leading cause of death (2). Statistics show that about 500,000 people have a new stroke and 100,000 have recurrent attacks, of which 160,000 die from stroke, and the annual cost of caring for stroke patients in the United States is about $ 21.8 billion (3). A joint study by the World Health Organization in 12 countries showed that the incidence of stroke in the study population varies from 0.2 to 2.5 per thousand, while the standardized rate for men was 4 to 8 per thousand in most European countries, and it was 15 per thousand in Akita, Japan. The incidence among women was, on average, 30% lower than among men (4).

A stroke is a neurological disorder that alters the function of a part of the body and the physical perception of the body. The results show that the resulting problems change over time; about 30% of people recover, and 40% stay disabled (5).

In stroke, the amount of oxygen decreases, followed by the release of free radicals, and the amount of reactive oxygen species increases. Overproduction of reactive oxygen species and disruption of antioxidant defenses are the main mechanisms of oxidative stress in cells (6). Oxidative stress can activate various cellular responses, such as abnormal protein expression and mitochondrial dysfunction, leading to apoptosis or cell death (7). The critical elements of apoptosis, which are highly expressed and regulated in the brain, are controlled by the Bcl2 (B-Cell Lymphoma 2) family, which consists of pro-apoptosis and anti-apoptosis (8). Pro-apoptotic factors such as Bax (BCL2 Associated X) and Bak (Bcl-2 Homologous Antagonist/Killer) cause permeability of the outer membrane of the

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mitochondria, followed by the release of cytochrome c into the cytosol. As a result, the caspase-dependent apoptotic pathway is activated. Bcl2, on the other hand, as an anti-apoptotic agent, can block apoptosis by inhibiting Bax or Bak activation (9).

Studies have shown that one of the complications of stroke is a disability. Therefore, efforts should be made to treat, care for and return the patient to his previous physical, mental and social condition. One of the effective ways to achieve this goal is to teach the patient proper care and rehabilitation (10). The objectives of care and disability are to help sufferers achieve and maintain maximum independence and perform daily life activities properly (11, 12). Care and rehabilitation programs are an important therapeutic goal to help patients become independent, avoid hospitalization, and reduce staggering costs. Therefore, by emphasizing the remaining abilities, they should strengthen their sense of independence as much as possible and help them to be self-sufficient in self-care (13). Hopman *et al*. (14) also found in their research that rehabilitation, especially physical rehabilitation, positively affects these patients' lifestyles and quality of life. Lifestyle is a combination of behavioral patterns and personal habits throughout life formed during the socialization process and include nutrition, rest, exercise, and work. These factors are important factors affecting health that can also play a role in maintaining and promoting health (15). People play an essential role in controlling their lifestyle because these behaviors can be changed. Nurses can be effective in changing behaviors through education and counseling of the individual or family (16). Therefore, considering the positive effects of rehabilitation and proper care on patients' quality of life and the lack of accurate information about these patients, the present study was conducted to investigate the effect of nursing and rehabilitation measures on the quality of life of patients with stroke.

Materials and methods

Studied patients

This study was a quasi-experimental study of before and after type. In this study, 20 patients with stroke were gradually selected by a one-year sampling method based on the research samples' characteristics. The study conditions were: definitive diagnosis of stroke according to the symptoms and paraclinical tests by a neurologist, patients' full knowledge of their diagnosis, age over 40 years, muscle strength on the side of the lesion two-fifths to four-fifths, willingness and motivation to participate in rehabilitation and care program.

Lifestyle Assessment Questionnaire

The data collection tool was adapted from the Lifestyle Assessment Questionnaire (LAQ), which included demographic characteristics and questions in 4 areas: physical, psychological, general health, and social functioning. The answers to the questions were scored on a 4-point Likert scale. These scores were defined between one and four (rarely: one point; decrease: 2 points; often: 3 points; and maximum: 4 points), and the respondent could obtain between a minimum of 80 and a maximum of 32 points from the questionnaire, and based on this quality Life was divided into four classes. A score of 80-139 meant a poor quality of life, 140-199 meant relatively good, 200-259 meant good, and 260-320 meant Perfect.

Care and rehabilitation program

The modern care and rehabilitation program was implemented from the second day of hospitalization with the permission of the treating physician and the relevant ward by the ward nurses and a physiotherapist.

Before starting this program, we evaluated patients' quality of life. Then during the hospitalization, the program was performed three times a week for 30 to 50 minutes each time, and the patient was asked to do a range of motion exercises three times a day. Do. In this program, patients were introduced to self-care measures in various fields, including daily activities of life, how to overcome multiple problems caused by the disease, and the frequency of exercise. Finally, the quality of life questionnaire study was completed again, and the results were compared before and aftercare and rehabilitation.

Genetic evaluation

First, 5 ml of peripheral blood was obtained from 20 patients participating in the study before and after the test. Also, 5 ml of peripheral blood was obtained from 20 volunteer stroke patients (as a control) who did not have care and rehabilitation program. The

extraction was performed according to the instructions using the RNA extraction kit protocol (Qiagen, South Korea).

After extracting the sample RNA, the cDNA synthesis kit protocol (Qiagen, South Korea) was used according to the instructions. The cDNA was used to prepare the primers. Based on gene information in the NCBI and IDT Gene Bank, primer design indices were between 20 and 25 nucleotides, primer melting point between 55 °C and 56 °C, cytosine to guanine content percentage between 40 and 60, and amplifiable fragment length between 127 and 141 nucleotides.

Forward and reverse primers were selected based on the gene encoding sequence. The polymerase chain reaction was used to construct the expression of Bcl2 / Bax genes. GAPDH was used as internal control, and the accuracy of PCR tests using the GAPDH gene was confirmed. The sequence of primers is given in Table 1.

Table 1. The sequence of used primers for gene expression

Gene	Sequence (5'-3')	Production size	Annealing temp.
Bcl2	F: CACATCTCAGTTCCCTTGGC R: TCTTCTCCCTCTAGCACACC	136	56°C
Bax	F: GCTACAGGGTTTCATCCAGG R: TTGTTGTCCAGTTCATCGCC	141	55°C
GAPDH	F:CAACTTTGGCATCGTGGAAGG R:AGGGATGATGTTCTGGGCTG	127	56°C

Statistical analysis

The content validity method was used to determine the scientific validity of the data collection tool. Descriptive (mean and standard deviation) and inferential statistical methods (paired t-test and independent t-test) were used to analyze the data. Genetic data analysis was performed based on threshold cycle comparison (Ct). The Cts related to the reactions were extracted by Real-time PCR software and finally, the mean Cts were recorded three times. Thus, ΔCT was calculated by Ct difference obtained from the tested samples. Then, it was calculated using the formula $2^{-\Delta\Delta CT}$.

Results and discussion

The results showed that 63% of the samples were female, and 37% were male. 80% were ischemic, and 20% were hemorrhagic. 20% of the samples were 40 to 50 years old, 20% were 55 to 75 years old, and the rest were over 75 years old. About the research objectives, the rehabilitation program has caused a significant increase in the average quality of life scores in physical, psychological, and social function and general health. Life scores in stroke patients based on paired t-test showed a significant difference in the mean total quality of life scores before and after rehabilitation (P = 0.05). The results showed that rehabilitation improves visual impairment (P = 0.05), reduces motor impairment (P = 0.05), and walks without assistance (P = 0.05), which leads to optimal physical function estimation. This study also showed that it improves personal performance (P = 0.05) and has a positive effect on indoor activity (P = 0.05), a positive impact on interpersonal communication (P = 0.05), and improves social functioning. Examining the effect of rehabilitation measures on psychological performance using statistical tests showed that rehabilitation enhances the patient's understanding of the disease (P = 0.04), improves the person's emotional well-being for the future (P = 0.05), increases self-confidence, and reduces Anxiety (P = 0.05). Table 2 compares the mean and standard deviation of different dimensions of the life of stroke patients before and after the intervention.

Table 2. Different dimensions of the life of stroke patients before and after the intervention

Dimensions of life quality	Before intervention (mean ± SD)	After the intervention (mean ± SD)	P-value
Physical function	57.7 ± 25.3	78.9 ± 10.8	0.032
Psychological function	65.3 ± 10.4	38.8 ± 13.5	0.024
Social Performance	48 ± 7.5	54.6 ± 6.6	0.041
Public health performance	12.5 ± 3.4	13.7 ± 2.8	0.048

Genetic analysis

The accuracy of RNA extraction was assessed by gel electrophoresis (Figure 1).

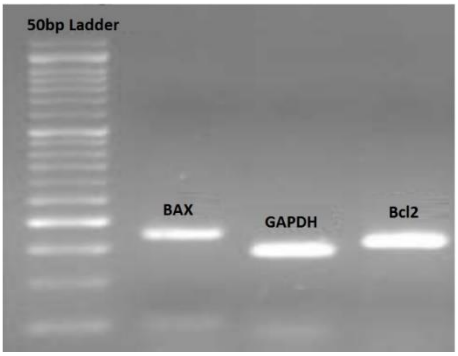

Figure 1. Accuracy of Real-time PCR studies using agarose gel electrophoresis

The results of Bcl2 / Bax genes expression showed that the relative expression of these two genes in the study group increased significantly after the intervention (Figure 2).

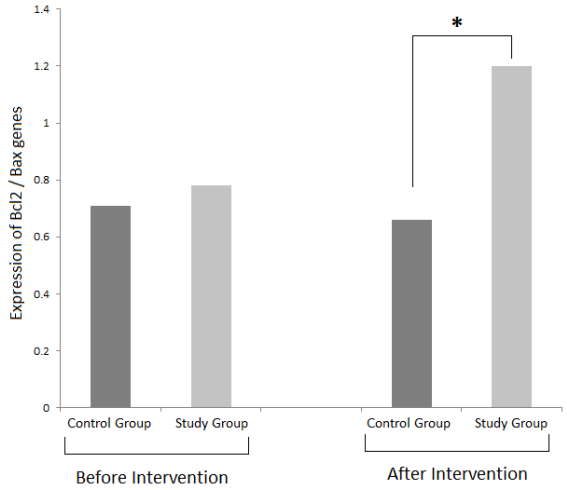

Figure 2. Bcl2 / Bax genes expression in control and study groups, before and after intervention

This study showed that the rehabilitation program had improved patients' quality of life with stroke in all aspects of physical, mental, social functioning, and general health. Gelaw *et al*. (17) found that patients could improve their physical function during rehabilitation courses, especially physical exercises. The findings of Chi *et al*. (18) indicate that their quality of life was more favorable after educating the patient than patients who did not receive this training. The positive effect of nursing and rehabilitation measures on patients' physical condition with stroke was reported in studies by Chen *et al*. (19), Nir *et al*. (20), and Poslawsky *et al*. (21).

The present study's findings showed that rehabilitation and care program improves psychological performance. It seems that patients' participation in self-care behaviors informs them about understanding the disease and its symptoms and enhances the patient's ability to perform. Daily activities help the person feel about his future, increase the patient's self-confidence and psychological recovery, reduce anxiety and fear, and ultimately improve the quality of life. The findings showed that nursing and rehabilitation measures enhance social functioning and maximize cognitive function improvement from the onset of the disease to three months later. This study also showed that the progress of physical function following rehabilitation programs positively affects the perception of a person with stroke about health and social position and will lead to improved social function after the programs. Rehabilitation allows them to resume their personal, social, and work activities.

Also, another result of the present study was a significant increase in the expression ratio of the Bcl2 / Bax gene in the study group compared to the control group, which indicates the effect of nursing and rehabilitation measures on cerebral ischemia. In many brain-related diseases, especially stroke, an increase in apoptosis is possible. Its obvious symptoms are an increase in Bax neurons and a decrease in Bcl2 neurons, which intensifies apoptosis and eventually leads to neuronal death (22). Consistent with the present study results, Zhang *et al*. (23) showed that three weeks of nursing and rehabilitation measures on quality of life could increase BDNF expression and increase the Bcl2 / Bax ratio. Because BDNF protein expression is increased, therefore, BDNF may reduce oxidative stress and apoptosis and repair injury.

Conclusions

Overall, the research findings showed that rehabilitation measures improve the overall quality of life in patients with stroke. This improvement is seen in physical function, general health, psychological, and social functioning. Therefore, conditions should be provided for patients and its continuation should be guaranteed with the guidance and supervision of the treatment team members. Therefore, nursing officials are advised to monitor all the effects of the disease and consider the necessary measures and facilities to create special rehabilitation wards. Indeed, providing more facilities for preparing educational booklets, preparing the clinical environment for rehabilitation care for hospitalized patients, and holding specialized retraining courses related to patient rehabilitation for nurses will improve patients' quality of life.

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Authors' contribution

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Interest conflict

The authors declare that they have no conflict of interest.

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Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon request.

Statements and Declarations

The author declares that no conflict of interest is associated with this study.

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