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Vital Exhaustion: an Alarm for the Quality of Life of Patients after Successful Cardiopulmonary Resuscitation

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Abstract

Cardiopulmonary resuscitation (CPR) is a critical intervention aimed at restoring the vital functions of the heart, lungs, and brain. While CPR can prolong life, it may adversely affect the quality of life (QOL) and lead to vital exhaustion (VE) in survivors. This study investigated VE as a potential warning sign of changes in QOL among patients following successful CPR.

To assess the relationship between vital exhaustion and quality of life in post-CPR patients and to determine whether VE can serve as an early indicator of compromised QOL.

This analytical cross-sectional study was conducted on 76 patients with a history of successful CPR at Shahid Rahnamon and Shahid Sadoughi Hospitals, Yazd, Iran, in 2023. Participants were selected using convenience sampling, and data were collected via telephone interviews using a demographic questionnaire, the SF-12 QOL questionnaire, and the Maastricht Vital Exhaustion Questionnaire. Data were analyzed using SPSS version 21 with descriptive statistics, Mann-Whitney test, Kruskal-Wallis test, and Spearman correlation.

The mean VE score (38.93 ± 10.58) indicated a moderate level of exhaustion. No significant differences in QOL were found across demographic variables ($p > 0.05$), while VE varied significantly based on education, fear of disease recurrence, and ability to perform daily activities ($p < 0.05$). A significant negative correlation was observed between VE and QOL ($r = -0.522$, $p < 0.001$), indicating that higher VE is associated with lower QOL.

Post-CPR patients experience notable changes in QOL, often accompanied by increased VE. As QOL is a crucial measure in cardiovascular care, addressing VE through rehabilitation and supportive interventions should be a clinical priority.

Keywords: Quality of life, Vital exhaustion, Cardiopulmonary resuscitation, Nursing

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Introduction

Cardiopulmonary arrest refers to the sudden cessation of effective cardiac activity, which can occur unexpectedly in any setting (1). Cardiopulmonary resuscitation (CPR) is the first action during cardiopulmonary arrest to restore the vital functions of the heart and lungs (2).

While CPR often restores immediate heart and lung function, its effectiveness is limited. True success, measured by long-term survival and good quality of life rather than permanent organ dysfunction, is still uncommon (3). In a study conducted on 250 resuscitated patients in three hospitals in Tehran, 64.4% of resuscitation cases were associated with death, 28.4% with temporary recovery, and only 2.7% with long-term patient survival (4). Therefore, CPR, while life-saving, can also have long-term complications (5).

Although the field of high-quality CPR is developing globally, the predicted survival rate after CPR has remained around 10% for decades. Therefore, during CPR, the patient should pay attention not only to short-term survival but also to long-term survival in the sense of quality of life (QOL). So, for a resuscitation to be classified as successful, not only survival but also QOL should be evaluated (6).

QOL is a comprehensive concept that includes all the factors affecting a person's life and is also an important part of general health that includes physical, psychological, and social aspects of life that can give the patient a sense of well-being (7, 8). Health-related QOL reflects the effects of the disease and its treatment on the views and experiences of patients. Poor QOL is associated with disease progression, lower survival, longer hospital stays, and reduced performance (9).

The adverse effect of the disease on human health and well-being can cause vital exhaustion (VE) by changing lifestyles and worsening the QOL in patients. VE is defined as feeling overly tired, exhausted, irritable, and listless. Over the past decade, VE has attracted the attention of many researchers due to its adverse effects on health and well-being. The cause of VE is not yet fully understood. VE is hypothesized to result from a failure to adapt to chronic stress. People experiencing periodic or long-term stress are more likely to manifest unhealthy behaviors, such as undereating or overeating, low physical activity, and alcohol abuse, which in turn negatively affect their QOL (10). Also, VE can accelerate the occurrence of diseases by setting up special pathophysiological mechanisms (11). Moreover, the relationship between VE and quality of life appears to be bidirectional, where not only can VE reduce QOL, but a lower QOL may also exacerbate feelings of exhaustion. Therefore, the QOL and VE affect the physical, mental, and social conditions of the patient. So, it seems necessary to clarify the different dimensions of the QOL and the concept of VE in resuscitated people based on multiple definitions and using special tools for patients with cardiovascular disorders. For this reason, a study aimed at investigating VE seems necessary as an alarm for the QOL of patients after successful CPR.

Methods

Study design

This analytical cross-sectional study was conducted on 76 individuals with a history of CPR at Shahid Rahnamon and Shahid Sadoughi Hospitals in Yazd, Iran, in 2023. The sample size of this study was calculated according to the following formula, considering $\alpha = 0.05$ (95% confidence level) and an estimation error of 4 points (d), taking into account a 10% dropout (12). Finally, 76 samples were selected by the sampling method. Participants were selected using convenience sampling and those available were included in the study.

$$n = \frac{z_{1-\alpha/2}^2 \sigma^2}{d^2} \qquad \sigma = 17$$

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The inclusion criteria included a willingness to participate in the research, having minimal literacy, and survival after successful CPR and tracheal intubation in the last 6–12 months. Also, the exclusion criteria included the death of relatives in the last six months, patients under the age of 18, and patients with mental illnesses and cognitive disorders confirmed by a doctor.

Data collection tools and methods

The data collection instruments in this study comprised three questionnaires:

1-Demographic questionnaire: This included the following items: age, gender, level of education, ability to do daily tasks, number of days hospitalized in ICU, cause of arrest (cardiac or respiratory), location of arrest (in-hospital or out-of-hospital), history of intubation, and use of mechanical ventilation.

2- SF-12 QOL Questionnaire: The SF-12 is a 12-item short-form tool for assessing health-related quality of life in individuals aged 14 years and older. It evaluates physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. Scores are categorized as follows: 36–48 indicates good quality of life, 24–35 indicates moderate quality of life, and 12–23 indicates poor quality of life. The validity of the physical subscale has been confirmed in 14 studies, with a mean relative validity of 0.67 for the 12 physical items. The mental subscale has been validated in six studies, with a mean validity of 0.97. Reliability was assessed using the test-retest method, yielding a correlation coefficient of 0.89 in a sample of 76 participants, and it has also been reported for 12 subjects (13).

3- Maastricht Questionnaire (MQ): This questionnaire was created by Maastricht and contains 21 questions. Each item was evaluated on a three-point scale (No: 0 points, I don't know: 1 point, yes: 2 points). The lowest score is zero, and the highest score is 42. The higher the mean score, the higher the level of VE. Elson has reported the reliability of this questionnaire based on Cronbach's alpha of 0.92. On the other hand, the validity of this questionnaire has been confirmed based on the opinion of psychologists, and as an example, in the study of Hashemi et al., the reliability of this questionnaire was reported as 0.86 according to Cronbach's alpha (14).

Statistical analysis

After data collection, statistical analysis was performed using SPSS version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive analysis and Mann-Whitney test, Kruskal-Wallis test, and Spearman correlation were used to analyze the data, and to assess the normality of the data distribution, the Shapiro-Wilk test was performed. A significance level of 0.05 was considered for all statistical analyses.

Results

As shown in Table 1, the majority of participants were male (69.7%) with a mean age of 47.47 ± 18.72 years. Most of the patients are unemployed or retired (56.6%), and most of the employed people are self-employed. Few patients have a university education (6.6%). Most patients have cardiac arrest (31.6%), and it has occurred in-hospital more (32.9%). 46 people (60.5%) of the patients were intubated, and 51 of them (67.1%) had the stress of disease recurrence. Most patients can do things independently (68.4%), and 8 patients (10.5%) are completely dependent on others. As shown in Table 2, the patients' mean Quality of Life score (30.78±2.00) was around the mid-range of the questionnaire, while the mean Vital Exhaustion score (38.93 ± 10.58) indicated a relatively high level compared to the questionnaire scale.

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Table 1. Frequency distribution of demographic characteristics

Variable	Maximum	Minimum	Mean ± SD	
Age*	83	13	47.47±18.72	
Variable			**Percentage**	**Frequency**
Gender**	Men		69.7	53
	Women		30.3	23
Job Status**	Self-employed		38.2	29
	Employee		5.3	4
	Retired		10.5	8
	Jobless		46.1	35
Education**	Illiterate		22.4	17
	Less than a diploma		42.1	32
	Diploma and above		35.5	27
Cause of Arrest**	Heart		65.8	50
	Respiratory		34.2	26
Location of Arrest**	In-Hospital		72.3	55
	Out-Of-Hospital		27.7	21
Intubation**	Yes		60.5	46
	No		39.5	30
Recurrence Stress**	Yes		67.1	51
	No		32.9	25
Ability to do daily routine**	Independent		68.4	52
	Need help		21.1	16
	Dependent		10.5	8

*Data presented as means ± SD.
**Data presented as n (%).

Table 2. Mean scores of quality of life and vital exhaustion

Variable	maximum	minimum	Mean ± SD	Median
Quality of Life*	38	25	30.78±2.00	31
Vital Exhaustion*	55	21	38.93±10.58	39.5

*Data presented as means ± SD.

Based on the results of Table 3, no statistically significant difference was observed in the mean QOL scores according to demographic variables (p-value > 0.05). Mean VE scores according to variables of education, stress of disease recurrence, and ability to do daily routine and physical activity showed a statistically significant difference (p-value < 0.05). The mean scores of VE in the educational group with a diploma and higher education level are statistically significant (p-value = 0.003) compared to illiterate people. The mean scores of VE are lower in people with the stress of disease recurrence (p-value < 0.001). A significant negative correlation was observed between Quality of Life and Vital Exhaustion (Spearman's r = -0.522, p ≤ 0.001), indicating that higher VE is associated with lower QOL.

Discussion

This study aimed to determine the QOL and VE of patients after CPR. The results showed that the patients in this study had relatively low Quality of Life scores, while Vital Exhaustion scores were relatively high. A significant inverse relationship was observed between Quality of Life and Vital Exhaustion, indicating that

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Table 3. Comparison of mean scores of quality of life and vital exhaustion according to demographic variables

Variable		Quality of Life	Vital Exhaustion
		Mean ± SD	**Mean ± SD**
Gender*	Men	30.86±2.13	39.52±11.30
	Women	30.61±1.69	37.56±8.80
P-value		**0.594**	**0.303**
Age Category**	≤40 years	30.71±1.71	39.17±12.10
	40-59 years	31.20±2.12	41.25±10.55
	≥60	30.45±2.18	36.33±8.34
P-value		**0.716**	**0.250**
Education**	Illiterate	30.29±2.54	34.29±8.15
	Less than a diploma	30.65±2.13	37.56±11.21
	Diploma and above	31.25±1.31	43.48±9.74
P-value		**0.084**	**0.013**
Job Status*	employed	30.69±1.97	39.42±11.89
	Unemployed or retired	30.86±2.04	38.55±9.59
P-Value		**0.983**	**0.694**
Arrest Location and Cause **	Heart	30.29±2.01	37.37±9.33
	Respiratory	31.46±1.80	44.53±9.62
	Inside A Hospital	30.88±2.38	37.84±10.94
	Out Of Hospital	30.85±1.23	38.35±12.15
P-value		**0.445**	**0.217**
Intubation*	Yes	30.5±2.10	37.95±11.05
	No	31.23±1.77	40.43±9.81
P-value		**0.087**	**0.302**
Recurrence stress*	Yes	31.32±2.21	46.36±7.15
	No	30.52±1.85	35.29±10.12
P-value		**0.127**	**≤0.001**
Ability to do daily routine**	Independent	31.07±1.91	42.76±9.32
	need help	30.00±2.31	33.75±8.44
	Dependent	30.5±1.60	24.37±1.50
P-value		**0.146**	**≤0.001**

*Data presented as means ± SD. The Mann-Whitney test was used for comparison.
**Data presented as means ± SD. The Kruskal-Wallis test was used for comparison

patients with lower Quality of Life tended to experience higher levels of Vital Exhaustion. Also, no significant relationship was observed between the QOL in terms of demographic variables, but a relationship was observed between VE and education variables, stress of disease recurrence, and ability. It should be noted that no similar study was found until the research was conducted, and few studies had investigated the relationship between VE and the demographic information of patients. We compared similar studies in the field of VE.

Our findings indicate that patients experiencing recurrence-related stress exhibited significantly higher levels of vital exhaustion (VE: 46.36) compared to those without such

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stress (VE: 35.29; $p \leq 0.001$). This demonstrates that the psychological burden of anticipating disease recurrence is associated with greater fatigue and depletion. In contrast, differences in quality of life (QOL) between patients with and without recurrence-related stress were minimal (31.32 vs. 30.52) and not statistically significant ($p = 0.127$). These results align with previous research indicating that psychological stress contributes to mental health challenges. Hasanpour et al. (2018) reported elevated rates of depression, anxiety, and post-traumatic stress disorder among patients recently discharged from intensive care units, negatively impacting daily functioning and social participation (9). Similarly, Saarinen et al. (2021) found that work-related stress increases VE and cardiovascular reactivity, consistent with burnout as a chronic stress response persisting beyond acute stressors (14). So, failure to adapt to chronic stress can lead to VE (10). Holtermann et al. (2021) observed that lower leisure-time physical activity was associated with higher VE in a cohort of 104,046 cardiovascular patients, which aligns with our finding of a significant correlation between VE, functional capacity, and physical activity (15). As a result, with the adverse effect of VE on human health and well-being, one can witness a change in lifestyle and a deterioration of the QOL (16). In summary, our results confirm that recurrence-related stress is significantly associated with elevated vital exhaustion, although its impact on overall quality of life appears limited. Longitudinal studies are warranted to further explore these relationships and potential mechanisms.

Most people experience chronic stress and, as a result, VE, making them most likely to show unhealthy behavior, which in turn can negatively affect their QOL and cause a decrease in their quality of life. In this regard, the results of the Kotova study and colleagues (2021) proved in Moscow that the exacerbation of VE in men negatively affects the most important parts of their lives. Also, the researchers of this study have introduced VE as an indicator of physical and mental well-being, and with its increase, a significant decrease in QOL and lifestyle poverty has been observed in the studied samples (10). Eleanor's study results et al. (2020) have shown that there is a significant risk of functional decline associated with successful CPR in patients over 80 years of age (17). Therefore, the results obtained in this study are in line with the above study and confirm the relationship between the exacerbation of VE and the reduction of QOL. This study shows that VE in cardiovascular disease patients follows the unhealthy lifestyle they lead. VE is a state of mind that manifests itself with mood swings and decreased energy, and all of these are part of the components of defining the QOL (18). For this purpose, the results of a review study by Hasanpour et al. (2019) showed that psychological problems, cognitive dysfunction, and problems in daily functioning among CPR survivors are related to a decrease in QOL (9).

However, unlike the results of the present study, in Hydone's review and that of his colleagues (2017), the results indicated that most of the articles concluded that the QOL for survivors of cardiac arrest and CPR is generally acceptable. This discrepancy can be because the articles reviewed in this review include heterogeneous research methods, a large number of different research tools, and different societies with different cultures (14). Considering the limited sources aligned with the present study, the findings of the existing studies are consistent with those of the present study, all confirming the results obtained. However, there are few studies where survivors describe their personal experience of CPR. This knowledge is important to support healthcare personnel in providing optimal care during the recovery process. As a result, to improve the time and results of rehabilitation and to better understand the condition of survivors, there is a need for clear guidelines and specific assessment tools to assess the QOL of survivors (14).

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Limitations

This study has several limitations. First, the cross-sectional design prevents any conclusions about causality between Quality of Life and Vital Exhaustion. Second, the scarcity of previous research in this area limits the ability to compare and contextualize the findings. Third, certain demographic factors, such as the low literacy levels of some patients, may have influenced the accuracy of responses. Additionally, self-reported questionnaires are subject to response bias, and the sample size and selection may limit the generalizability of the results to other populations.

Conclusion

QOL is an important indicator for evaluating the impact of interventions on cardiovascular diseases. Improving the QOL is one of the important goals of the patient's participation in the cardiac rehabilitation program. Therefore, according to the results of the study, it is suggested to carry out educational planning and necessary measures. This includes conducting educational workshops for both treatment staff and patients, as well as providing regular follow-ups for patients after CPR. However, due to the lack of sufficient studies in the field of physical and cognitive changes in patients after CPR and comprehensive cardiac rehabilitation interventions on the QOL and VE in these people, it is suggested. Also, it is recommended that training workshops be designed and implemented based on the statistical findings of this study.

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