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ORIGINAL PAPER

The Effect of Listening to Holy Quran Recitation on Weaning Patients Receiving Mechanical Ventilation in the Intensive Care Unit: A Pilot Study

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Abstract Mechanical ventilation (MV) causes high level of stress in hospitalized patients. Weaning is the gradual process of decreasing ventilator support that in turn lead to termination of MV and increased respiratory effort, which may exacerbate symptoms and prolong MV. This study aimed to investigate the effect of listening to Holy Quran recitation (HQR) as a non-pharmacological intervention in patients during weaning from mechanical ventilation. This is a randomized controlled trial in which 55 patients admitted in the intensive care unit (ICU) and on mechanical ventilation were recruited. Patients were divided into experimental (case) and control group. In the experimental group, patients received 30 min of HQR, whereas in the control group, patients had 30 min of rest in bed before the start of the weaning. The physiological and/or clinical parameters of weaning

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were recorded. These parameters include rapid shallow breathing index, respiratory rate, heart rate, oxygen saturation, exhaled carbon dioxide, and blood pressure. The baseline demographic data for groups were presented in tables. The mean age was 54 ± 0.5 years for the experimental and 56.4 ± 18.5 years for the control groups. The physiological and clinical parameters were compared between case and control and found no significant difference. The preliminary findings of this pilot study suggest that there is no negative effect of HQR on weaning patients from mechanical ventilation in the ICU. The results also outline and explorthe possible utility of HQR further in ICU patients as an intervention in weaning patients off from ventilator in the ICU. Although there remains much to be done, our work generates important findings in the field of critical care management.

Introduction

Early researches revealed that holiness and beliefs are lost in today's world; few published studies proved the listening and maintaining Holy Quran helped in reduction of depression and stress (Mohammadi Laeini et al. 2009). Voice of Quran has a positive effect on stress and anxiety of hospitalized patients especially in ICU (Khatoni 1997). The objective of this study is to investigate the effect of introducing a 30-min HQR in reducing stress and in improving weaning parameters among mechanically ventilated patients.

Mechanical ventilation is one of the most important life-saving interventions in intensive care units (ICU). Patients on mechanical ventilations encounter a lot of stress during this intervention. Recent studies reported that 85% of the ICU patients encounter stress (McKinley et al. 2004). Factors responsible for such stress include the sound of ventilators, the audible alarms, and other unfamiliar sounds which may lead to panic and anxiety among patients (Thomas 2003). This stress- and anxiety-related discomfort is usually managed by administration of sedative drugs which in turn leads to an undesirable side effects to the respiratory system and increases duration on the mechanical ventilation. This further leads to a many life-threatening complications such as ventilator acquired infection, gastrointestinal bleeding, and deep venous thrombosis (Rello et al. 2006). In addition, there may be an increase in the overall cost of stay in ICU and mortality. Therefore, there is a need to effectively manage these patients. In this regard, non-pharmacological, adjunctive interventions, such as listening to music and spiritual intervention, e.g., prayers, were studied and shown positive effects in reducing stress and anxiety in mechanically ventilated patient (Hunter et al. 2010; Bradt et al. 2010; Chlan et al. 2013; Chlan and Heiderscheit 2010; Jaber et al. 2007; Besel 2006; Fontaine 1994; Anastasi and Newberg 2008; Al-Ghazal, 2008). Muslim patients generally believe in the healing power of the Holy Quran. A multistage cluster cross-sectional household survey was conducted among Saudi residents in 1408 individuals, and the results showed that 68% of the respondents used recitation of the Holy Quran as a method of healing and treatment during the last 12 months (Al-Faris et al. 2008). Although literature is full of the effect of prayer on health as healing processes for different types of patients (Al-Ghazal 2008), little is known about the effect of listening to HQR in promoting positive effects during weaning from mechanical ventilation.

It is hypothesized that listening to HQR can be used as a non-pharmacological intervention in conjunction with weaning protocols in mechanically ventilated ICU patients. In

other words, this study is designed to examine the effect of listening to Holy Quran recitation in reducing physiological signs of stress during mechanical ventilation and after weaning Such intervention is easy to apply and economical. This study will use this approach and will investigate and evaluate the relationship in groups in ICUs patients who are on mechanical ventilation and meet the inclusion criteria of this research.

Methodology

This randomized control trial (RCT) was carried out in 2015–2016 in the intensive care unit (ICU) of King Fahad University Hospital (KFUH). The Ethics Committee of the University of Dammam obtained the ethical approval Reference number is IRB-2014-04-057. In this study, participants were divided into experimental (case) and control group. All met the preset inclusion criteria for the experimental and the control groups.

The inclusion criteria for this study include patient's age should be 18 years or older, neurologically stable (alert, oriented, had no psychiatric illnesses), capable of following researcher's instructions, with no hearing impairment, thermodynamically stable, Muslim, on spontaneous ventilator modes, and fit the weaning criteria.

Data Collection

Experimental Group (Weaned with Holy Quran Recitation)

The intervention group had a single 30-min session of listening to a recorded recitation of Holy Quran from chapter (surat) Albaqara using the voice of Sheikh Maher Almuaqly, while the patient was on spontaneous breathing trial (SBT). The particular surat was chosen because it is the longest and most comprehensive surat and considered as both Makki and Madani (partly revealed in Makkah and partly in Medina). The portion of surahs revealed in Makkah concentrate on teaching the correct belief in Allah, destroying ones attachment to the dunya, resurrection and the hereafter (Jannah and Jahannam), and the Madani part of this surah revolve more around ahkam (rulings of Islam), but at the same time these ahkam are linked to the hereafter (punishment and reward). The particular reciter was chosen because Sheikh Maher Almuaqly is the Imam of Grand Mosque of Makkah and is very popular and famous among Muslims for his heart touching voice and way of recitation with correct pronunciation and relaxing voice, and it was thought to have a positive psychological effect on people based on the opinion of five experts' panel including intensivist, pulmonologist, ICU-registered nurse, and two respiratory care practitioners. After assessing patient's fitness to wean, the recitation was introduced using digital Ipod player with a disposable head phones for duration of 30 min. The volume of the RHQ was adjusted to a satisfactory level based on experimental groups' subject's facial expressions. The measurements of physiological parameters, namely heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean artery pressure (MAP), respiratory rate (RR) and saturation of partial oxygen (SPO2) of patients, were recorded as baseline before the intervention started, and followed by 5-min interval during the 30-min intervention, and 5 min after the intervention completed.

Control Group (Weaned with Conventional Method)

The same procedure of physiological stress response parameters as intervention group were measured from the control group. The patients were instructed to close their eyes for 30 min with neither head phone nor prayer recitation. Data recorded immediately before and after the intervention includes rapid shallow breathing index (RSBI), respiratory rate (RR), heart rate (HR), oxygen saturation (SpO_2), exhaled carbon dioxide ($TeCO_2$), and blood pressure (BP). While the experimental group where made to listen to the recitation for 30 min, the control group was instructed to close their eyes for 30 min with headphones on but IPod off.

The study considers avoiding all the possible and potential confounders that may influence patients' response on intervention. For example, all data were collected in the morning while lights and curtains were closed to reduce unnecessary visual disturbances. In addition, all medical staff in the ICU was informed that there was an ongoing research and that they needed to minimize unnecessary procedures and noises during the research duration. Furthermore, research nurse stayed with the patients during the intervention period to make sure that the all required data are collected and to make sure that the weaning criteria are met and patient's condition remains stable throughout the intervention.
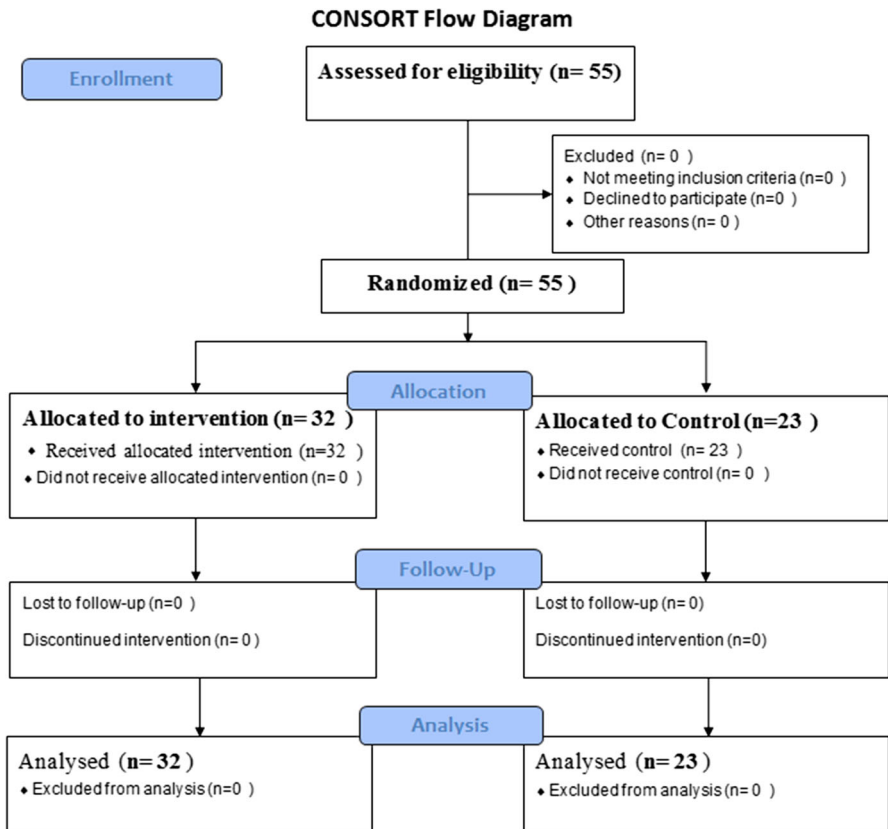

CONSORT Flow Diagram

Fig. 1 Data collection flowchart for this study

The recommended pressure support ventilation of 8 cm H_2O was the mode of spontaneous breathing trial. The study flowchart is presented in Fig. 1.

Statistical Analysis

Baseline demographic data were summarized for both groups (case and control) and are presented in Table 1 and examined statistically for homogeneity using Independent sample t test and Chi-square test (categorical variables). The comparison of respiratory measurements before and after weaning in both groups was done using paired sample t test for every clinical and physiological variable. These parameters are: respiratory rate (RR), heart rate (HR), blood pressure (BP), tidal volume (TV), oxygen saturation (SpO_2), end tidal carbon monoxide (ETCO), rapid shallow breathing index (RSBI), negative inspiratory flow (NIF), fraction of inspired oxygen (FiO_2), tidal volume (TV), rapid shallow breathing index (RSBI), and pressure support (PS) level. The data were analyzed using SPSS version 22. p values less than 0.05 were considered as significant in this study.

Results

Fifty-five participants were recruited, out of which 39(71%) were male and 16(29%) were female. The age range of study subjects were 18–74 years with a mean of 54 ± 0.5 years for the experimental group and 56.4 ± 18.5 years for the control group. All subjects have

Table 1 Comparison of baseline demographic and physiological parameters of study cohort

Measurements	Case N = 32	Control N = 23	P value
Age (years)	54.0 ± 22.5	56.4 ± 18.5	0.08
Gender (M/F)	21/11	18/05	0.308*
Duration of MV (days)	7.4 ± 5.6	6.6 ± 4.1	0.6
Vital signs			
Resp rate/min	21.1 ± 6.0	25.1 ± 13.0	0.5
Heart rate/min	96.7 ± 19.2	96.0 ± 19.4	0.2
Blood pressure (Sys/dias)	Sys: $136.8 \pm 23.7/70.2 \pm 12.6$	Sys: $134.8 \pm 23.8/71.0 \pm 14.6$	
V_T	478.7 ± 161.0	410.1 ± 103.5	0.13
SpO_2	97.4 ± 2.1	97.1 ± 2.3	0.07
ETCO	37.2 ± 9.7	36.0 ± 24.6	0.61
RSBI	56.4 ± 26.6	55.1 ± 27.0	0.71
PS_level	10.8 ± 2.5	10.6 ± 2.3	0.26
NIF	-14.6 ± 10.5	-15.7 ± 7.2	0.2
FiO_2%	35.0 ± 3.8	33.0 ± 4.8	0.1

*Chi-square test for gender comparison. Independent sample t test was used to check the difference between the groups. All parameters showed nonsignificant difference

ETCO end tidal carbon monoxide, *RSBI* rapid shallow breathing index, *NIF* negative inspiratory flow, *FiO₂* fraction of inspired oxygen, *TV* tidal volume, *SpO₂* oxygen saturation

range of different clinical diagnoses and comorbidities. Table 1 summarizes the comparison of baseline demographic data for case and intervention group. The difference between duration on mechanical ventilation prior to weaning was also not significant, i.e., 7.4 ± 5.6 in cases versus 6.6 ± 4.1 in control ($p = 0.6$). The results showed that there was no significant difference in all parameters between the groups, i.e., respiratory rate RR (0.50), heart rate (HR) (0.20), blood pressure (BP), and oxygen saturation (SpO_2) (0.07). This suggested that the groups are statistically well matched.

The study subjects' medical diagnoses were pulmonary ($n = 26$) and extra pulmonary diseases ($n = 29$) such as heart block, diabetic ketoacidosis, myocardial infarction, road traffic accidents, and hypertension. All patients were receiving positive end-expiratory pressure.

Pretest–posttest score suggests no statistical significant difference found in patients' recovery from conventional method of weaning and listening to RHQ during weaning (Table 2). The comparison shows that there are no significant differences in patients' recovery using either conventional method of weaning or Holy Quran recitation during weaning. Although mean heart rate of HQR group was slightly higher than the control group, the respiratory rate (RR) was low in RHQ group than control ones after weaning. A very slight difference was observed in systolic blood pressure between RHQ and control patients, respectively (137.4, 131.1).

There were no statistical significant differences observed in both groups (case and control) before and after HQR in male and female patients (Tables 3 and 4). Although there are differences observed in means between the two groups (RHQ and control group), none of them are significant.

Table 2 Paired sample T test in study participants with and without Holy Quran recitation

Measurements	Case N = 32			Control N = 23		
	Baseline	After weaning	P value	Baseline	After weaning	P value
Resp rate/min (RR)	21.1 ± 6.0	20.9 ± 6.0	0.8	22.9 ± 7.1	23.4 ± 6.3	0.7
Heart rate/min (HR)	96.7 ± 19.2	97.6 ± 21.3	0.5	96.0 ± 19.4	96.2 ± 18.5	0.6
Blood pressure (Syst/dias) (BP)	Sys: 136.8 ± 23.7 Dias: 70.2 ± 12.6	Sys: 137.4 ± 23.7 Dias: 73.3 ± 14.3	0.8	Sys: 134.8 ± 23.8 Dia: 71.0 ± 14.6	Sys: 131.1 ± 24.4 Dia: 73.3 ± 24.7	0.7
V_T	478.7 ± 161.0	488.7 ± 164.0	0.7	410.1 ± 103.5	423.1 ± 90.0	0.6
SpO_2	97.4 ± 2.1	97.3 ± 2.1	0.3	97.8 ± 2.3	97.4 ± 2.3	0.3
TECO	36.7 ± 9.0	37.2 ± 9.7	0.5	36.2 ± 9.8	36.0 ± 24.6	0.4
RSBI	56.4 ± 26.6	55.2 ± 27.0	0.7	55.1 ± 27.0	56.4 ± 27.0	0.6
PS_level	10.8 ± 2.5	10.2 ± 2.2	0.1	10.6 ± 2.3	10.2 ± 2.1	0.1
NIF	-15.6 ± 10.4	-15.7 ± 10.2	0.9	-17.2 ± 8.3	-15.7 ± 7.2	0.4

The comparison of respiratory measurements before and after weaning in case and control group

ETCO end tidal carbon monoxide, *RSBI* rapid shallow breathing index, *NIF* negative inspiratory flow, *FiO2* fraction of inspired oxygen, *TV* Tidal volume, *SpO2* oxygen saturation

Table 3 Paired sample T test in male participants with and without Holy Quran recitation

Measurements	Case N = 32		Control N = 23	
	Mean difference	P value	Mean difference	P value
Resp rate/min (R2-R1)	0.19 ± 5.96	0.89	-1.1 ± 5.1	0.37
Heart rate/min (HR)	-1.86 ± 11.69	0.80	0.1 ± 5.8	0.59
Blood pressure (Syst/dias) (BP)	$-0.3 \pm 18.22/-3.9 \pm 8.37$	0.94/ 0.05	$4.6 \pm 15.6/-3.7 \pm 26.3$	0.23/ 0.56
V_T	4.76 ± 161.52	0.47	-14.9 ± 115.8	0.93
SpO_2	0.3 ± 1.81	0.7	0.2 ± 1.3	0.46
TECO	-1.23 ± 4	0.29	4.4 ± 16.9	0.41
RSBI	1 ± 24.03	0.85	-2.3 ± 22.6	0.66
PS_level	0.88 ± 2.09	0.12	0.5 ± 1.3	0.12

The comparison of respiratory measurements in male patients before and after weaning in case and control group

ETCO end tidal carbon monoxide, *RSBI* rapid shallow breathing index, *NIF* negative inspiratory flow, *FiO₂* fraction of inspired oxygen, *TV* tidal volume, *SpO₂* oxygen saturation

Table 4 Paired sample T test in females' participants with and without Holy Quran recitation

Measurements	Case N = 32		Control N = 23	
	Mean difference	P value	Mean difference	P value
Resp rate/min (R2-R1)	0.4 ± 6	0.84	2 ± 2.3	0.12
Heart rate/min (HR)	0.9 ± 7.2	0.12	-1.8 ± 4.7	0.28
Blood pressure (BP) (Syst/dias)	$-1.1 \pm 11.5/-1.2 \pm 15.9$	0.76/ 0.81	$0.2 \pm 3.5/ 3.8 \pm 6.4$	0.90/ 0.32
V_T	-38.3 ± 76.7	0.68	-6 ± 57.2	0.82
SpO_2	0.3 ± 1.4	0.53	1 ± 2.5	0.43
TECO	0.5 ± 2.2	0.54	-11 ± 25.4	0.45
RSBI	1.5 ± 12.3	0.7	2.4 ± 23.3	0.82
NIF	0.5 ± 2.1	0.58	-1 ± 1.7	0.42

The comparison of respiratory measurements in female patients before and after weaning in case and control group

ETCO end tidal carbon monoxide, *RSBI* rapid shallow breathing index, *NIF* negative inspiratory flow, *FiO₂* fraction of inspired oxygen, *TV* tidal volume, *SpO₂* oxygen saturation

Discussion

This study examines the effect of listening to Holy Quran recitation on respiratory-related physiological parameters during patients' weaning in the ICU. In addition, this study compares the weaning outcomes in patients who weaned with and without Holy Quran recitation, respectively.

It has been found that there is no significant difference between control and intervention groups. These findings are not in harmony with studies related to the effect of music and healing prayers. These studies showed a positive effect and improvement in physiological parameters and stress reduction. The study did not produce meaningful results not necessarily because of the HQR intervention itself, but there may be other confounders which are discussed below.

It was found from the literature that the high levels of the noise in the ICUs is a major concern in ICUs as it increases stress which can affect body's ability to heal (Giusti and Piergentili 2009). A study showed that the noise level in KFHU where this research was conducted has been found to be higher than international standards and WHO guidelines (Qutub and El-Said 2009). The open setting of the unit added to problem and eased the source of noise. This noise may influence the hearing ability HQR though headphones of ICU patients.

This has restricted the study and prohibited the effect of HQR to manifest. Besides that, the limited bed numbers and the low admission rate meant that involved group sizes to be insufficiently small. This is also due to difficulties in inviting critically ill patients to join the study, due to the nature of the illnesses, and that made generalization difficult. However, we tried our best to recruit as many as we can considering time *limitation* of the project as well as researchers availability. Additionally, it was quite difficult to invite critically ill patients to join a study, as most patients were not able to give informed consent (therefore cannot be recruited). Furthermore, quite a few patients were able to give informed consent but still unable to concentrate enough to answer questions or in no mood to do so because of their illness. In addition, it is known that subjects anxiety levels is affected by the time of the day at which data are collected. But compliance with data collections as set by the study was breached.

Also subject's choices of Quran Suras (Chapters) and reciters during HQR sessions were not taken into consideration as different people would have been influenced more by their preferred chapters and reciters.

It was found also that 30 min of data collection was not enough since some involved patients who were critically ill needed more time to recover, be free from sedation, and ready for weaning with full alertness and calmness. It can be added that the study only measured the immediate pre–post-intervention effect. The presence or absence of any long-term effects was not examined as we focused on a single 30-min session on mechanically ventilated patients. Due to short period of study time (as study was funded and has to be finished before due date), we could not examine HQR effect on patients in long-term sessions that is why we could not compare its effect with repeated sessions as done by other somewhat similar studies. This is the weakness of this study, and it needs to be repeated in future to investigate the effect of HQR in multiple sessions. Moreover, for such a study to be effective, it should have been conducted in more than one ICU, and hence the generalizability of the results was deemed limited. It was proposed that the effect of this study would have been more influential if a live recitation of preferred chapters was conducted, especially if this reciter is a close relative to the involved subjects and in some special cases by the patient him/herself.

The degree of mental and psychological acceptance to recitation differs from a subject to another depending on the degree of strength of their beliefs and their religious upbringing. And different reaction time to produce any clinical or psychological effect to listening to HQR. As a result of the above, this research could have been made better with larger sample size and with a better research environment.

Other factors may include the small sample size lack of repeated measurements of physiological parameters for at least 2 h to detect any meaningful differences (improvements) in measured variables, and also the environment where the study was conducted.

Despite above factors, this study will bring a lot of significant points that needs to be considered for any further future studies. Thus, we believe that the findings of this study are very useful despite some limitations which is discussed below, and thus caution is needed to interpret results before drawing any final conclusion.

A similar cross-sectional and follow-up research with higher sample size is recommended to study the effect of recitation which could be able to detect the benefit of this intervention which may influence the many outcomes such as patients; recovery time, duration of hospital stay, patients' ventilator-dependent days, length of ICU stay, quality of life, patient satisfaction, post-discharge outcomes, mortality, and cost-effectiveness.

Study Limitations

All necessary measures were followed such as orientation, training and protocols settings, and so on. However, the following were among the most important limitations encountered during the study:

It was found that some of the patient's bed were placed in an open setting within the ICU, that made it diffcult for the researchers to collect data easily as recommended quiet environment. Patients should have been placed in a quiet room in a more modernized ICU (Philbin and Lincoln 2002). Limited bed numbers and low admission rates contributed to various legislative limitations led to insufficiently small sample size. The small sample size becomes more evident when we divide both cohorts according to their respective genders. Power analysis calculations indicate that (power $= 70\%$, $p = 0.05$) 94 participant would be needed per group as sample size for future study.

In addition, study samples recruited from different ICUs should be considered in future research. Nursing and physician stations were also extremely close to patients' beds. The ICU is to be made more spacious to give patients more privacy and comfort.

In addition, repeated measurements for physiological and clinical parameters after intervention could be able to more effectively detect any significant variations as shown in other studies (Jaber et al. 2007: Beaulieu-Boire, et al. 2013, Bradt et al. 2010).

The noise level in the ICU could be the confounder in our population as it can influence both hearing ability as well as physiological and psychological status of patients in the ICU. In future studies, level of noise should be measured as considered in other studies. A systematic review of 29 studies related to ICU noise found that the major sources of noise in the ICU were conversations, equipment alarms, caregiver activities (such as hand washing and opening equipment), telephones, pagers, televisions, closing doors, and falling objects (Konkani and Oakley 2012).

Weaning time protocols should be carefully followed. Furthermore, in future studies, emphasis should be made on the importance of following weaning timing protocols.

Compliance with Ethical Standards

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