https://doi.org/10.33805/2638-8073.127
Volume 4 Issue 1 | PDF 127 | Pages 3
Edelweiss: Psychiatry Open Access
Research article ISSN: 2638-8073

Effect of Music on Salivary Amylase in Patients Undergoing Chemotherapy

Syed Imran[1*], MS Moosabba[2] and Alphonsa Ancheril[3]

Affiliation

[1]Yenepoya Nursing College, Yenepoya University, India
[2]Yenepoya Medical College, Yenepoya University, India
[3]Athena College of Nursing, Rajiv Gandhi University, India

[*]**Corresponding author:** Syed Imran, Yenepoya Nursing College, Yenepoya University, India, E-mail: syed_vinu@yahoo.co.in

Citation: Imran S, Moosabba MS and Ancheril A. Effect of music on salivary amylase in patients undergoing chemotherapy (2020) Edelweiss Psyi Open Access 4: 15-17.

Received: Feb 22, 2020
Accepted: Mar 13, 2020
Published: Mar 23, 2020

Abstract

Background: The diagnosis and the treatment for cancer are significant stressors for the patients. It can affect physical as well as psychological well-being. Variations in salivary amylase indicate physiological responses to the stressful experience during chemotherapy. Music therapy is witnessed to decrease psychosocial distress in the oncology setting. Listening to music can positively benefit neurophysiologic and emotional responses as well as promote relaxation, especially beneficial for cancer patients undergoing painful and anxiety-inducing chemotherapy. It is, therefore nurses, who are so familiar with this environment, not only to be aware of this anxiety-producing process but to cope with it and to alleviate it for the patient as much as possible.

Objective: The objective of the study was to determine the salivary amylase levels in patients undergoing chemotherapy before and after listening to preferred music. Design: Quasi-experimental repeated measure design. Setting; Experimental and control group were recruited from two oncology units of selected multispecialty hospitals. Participants: Purposive sampling techniques were used to select the study participants. Patients of age group eighteen and above, undergoing first time chemotherapy treatment and the chemotherapy infusion lasts for minimum of 3 hours duration was the inclusion criteria whereas Patients who were unable to listen to music due to hearing problems, those who were with head and neck cancer, diabetes, hypertension, and thyroid problems were excluded from the study. 168 eligible participants were recruited among which 8 were unable to continue.

Methods: Saliva was collected from both the study groups before and after the chemotherapy administration. The patient preferred instrumental music intervention was administered for the duration of 3 hours during chemotherapy with the help of mp3 player and musical pillow in the experimental group where the control group had a routine oncology unit care and they were rested on a bed during the chemotherapy administration. The post-tests were done on day 3 and day 5.

Results: Significant changes in mean salivary amylase were observed in the experimental group compared to the control group ($p<0.05$). Repeated measure ANOVA also showed a significant difference ($p<0.05$) in the experimental group at different time points of observation. There was a significant association between the baseline amylase level and stage of cancer in both the experimental and control group ($p<0.05$).

Conclusion: Music was effective in patients undergoing chemotherapy in terms of reduction in salivary amylase level.

Keywords: Salivary amylase, Chemotherapy, Music therapy, Cancer treatment, Anxiety, Oncology.

Introduction

Patients undergoing cancer treatment may have physical and psychological problems. Chemotherapy is often considered the most stressful of the treatment modalities primarily as a result of the myriad of side effects that the patient has to endure [1]. It can affect the patient's physical, psychological and spiritual well-being [2]. Salivary alpha-amylase is a useful biomarker that can be used in assessing human psychobiological and social behavioral processes [3].

Assessment of pre-treatment anxiety is challenging and mainly based on lengthy questionnaires or plasma biomarkers that cannot be used for bedside decision-making. There is a potential role for noninvasive, real-time, and point-of-care biomarkers such as salivary amylase to identify anxious patients and to target pre-treatment pharmacologic or non-pharmacologic interventions in patients undergoing chemotherapy.

Salivary Amylase is the principal saliva protein and is mainly secreted by the parotid glands. An association between changes in Salivary Amylase during exposure to a stressful stimulus and changes in blood nor-epinephrine or heart rate variability indices strongly suggests that Salivary Amylase is an accurate marker of sympathetic nervous system activity [4]. The purpose of this study was to evaluate the effect of patients preferred music on levels of salivary amylase before and after chemotherapy administration.

Material and Methods

Quasi experimental repeated measure design was adopted to conduct this study. The study was approved by the university ethics committee (YUEC 155/2016).

Study Participants

Patients with all types and all stages of cancer were included in the study between the age group of 19-65. Oncology units of two different hospitals were selected as one for experimental group and another for control group. Patients who were 18 years of age or older, who did not have hearing deficiencies and the chemotherapy infusion lasts for a minimum of 3 hours duration was the inclusion criteria whereas patients who were unable to listen to music due to hearing problems, who had head and neck cancer and had diabetes, hypertension, and thyroid problems were excluded from the study. All patients were provided informed consent and were informed that they could withdraw from the study at any time [5-9].

Intervention

The music intervention included 10 different variety of instrumental music library. Each library had slow, instrumental music collections of 3 hours length which was recorded and stored in Sony portable mp3 players. They were selected by the investigator as research demonstrates them to be more relaxing. The selected music libraries were sent for the validation to the experts in the field of music. The study participants first selected one of the 10 libraries by listening to it, and then they were given with Sony portable mp3 player with 3.5 mm port.

The study participants were also provided with "sleep tune musical pillow" developed by Reliance comforts which had two mini electronic speakers embedded in the pillow connected through a wire with 3.5 mm jack. The benefit of using a pillow in this study was to make study participants feel comfortable and to avoid keeping headphones for a long time in the ears which is uncomfortable while undergoing chemotherapy. The pillow covers were changeable and washable for infection control. The period of unsupervised activity consisted of any activity that the patient desired [10-12].

Data Collection Procedure

The baseline assessment of salivary amylase was done on the 1st day before starting the chemotherapy. Music was administered to the experimental group by following the protocol for 3 hours of duration. The post-tests were done on day 1 i.e.; soon after the intervention for the experimental group and after three hours of chemotherapy for the control group. Post-tests were also done on, day 3 and day 5 for both the groups [13-17].

Salivary Amylase Assay

Salivary amylase Assay was carried out by following the protocol provided by the AGAPPE technologies, India.

Results

A total of 160 patients were included in the study. 80 were in intervention and 80 were in control group. The baseline and clinical characteristics of the patients are presented in **table 1**. No differences were found between the groups in their baseline characteristics.

Comparison of Amylase Scores Over a Different Period of Time within the Experimental and Control Groups

The data presented in **table 2** shows that the salivary amylase level decreased within the experimental ($F=181.69$, $p<0.001$) group at different time points and slightly increased in the control ($F=5.68$, $p<0.05$) group. Further, post hoc analysis was done by Bonferroni test to compare the effect between different times of observation of amylase score. The data in the **table 3**, Post hoc analysis using Benferroni test shows significant changes in mean difference over different time points in both the groups ($p<0.05$). Therefore, the null hypothesis is rejected and concluded that there is a significant difference in the mean baseline and post test scores of amylase in experimental and control group. The data in the **table 4** shows that the salivary amylase levels decreased in the experimental group from baseline (398.3 ± 108.9 IU/mL) to post-test day 5 (323.7 ± 106.9 IU/mL). However, in the control group, there was a slight increase from baseline (386.1 ± 111.8 IU/mL) to post-test day 3 (389.6 ± 112.4 IU/mL) and day 5 (393.93 ± 111.7 IU/mL). Comparison of the salivary amylase levels between the experimental and control groups showed a statistically significant decrease ($p<0.01$) on post-test day 3 and on day 5 (<0.001). The differences were not significant ($p>0.05$) at baseline.

	Study groups			
Variable	**Experimental Frequency (%)**	**Control Frequency (%)**	χ^2	**p value**
Age (in years)				
19-30	8 (10)	12 (15)	-	-
31-40	17 (21)	23 (28)	75.994	>0.05
41-50	35(43)	34 (42)	-	-
51-60	20 (25)	11 (13)	-	-
Gender				
Male	43 (53)	42 (52)	14.312	>0.05
Female	37 (46)	38 (47)	-	-
Education				
No formal education	28 (35)	33 (41)	-	-
Primary education	21 (26)	24 (30)	35.398	>0.05
Secondary education	23 (28)	16 (20)	-	-
Pre university	08 (10)	05 (06)	-	-
Degree and above	-	02 (02)	-	-
Occupation				
Home maker	33 (41)	38 (47)	-	-
Agriculture	26 (32)	24 (30)	8.737	>0.05
Business	16 (20)	12 (15)	-	-
Private/Govt employ	01 (01)	05 (06)	-	-
Unemployed	04 (05)	01(01)	-	-
Marital status				
Married	64 (80)	59 (73)	-	-
Unmarried	14 (17)	15 (18)	113.59	>0.05
Divorced/separated	02 (02)	03 (03)	-	-
Widow	-	03 (03)	-	-
Type of cancer				
Ca Lung	09 (11.3)	17 (21)	-	-
Ca Bladder	07 (8.8)	10 (12)	-	-
Ca Breast	13 (16.3)	11 (13)	-	-
Ca Cervix	05 (6.3)	01 (01)	-	-
Ca Ovary	04 (05)	01 (01)	-	-
Ca Stomach	14 (17.5)	14 (17.5)	125.9	>0.05
Ca Rectum	09 (11.3)	10 (12)	-	-
Ca Kidney	06 (7.5)	05 (6.3)	-	-
Lymphoma	07 (8.8)	06 (07)	-	-
Ca Colon	02 (2.5)	01 (01)	-	-
Leukemia	04 (05	04 (05)	-	-
Stage of cancer				
I stage	05 (6.3)	06 (7.5)	-	-
II stage	22 (27.5)	24 (30)	-	-
III stage	45 (56.3)	44 (55)	115.85	>0.05
IV stage	08 (10)	06 (7.5)	-	-
Type of treatment				
Adjuvant chemotherapy	34 (42)	43 (53)	-	-
Neo adjuvant chemotherapy	46 (57)	37 (46)	4.56	>0.05
Exposure to any therapies before				
Yes	-	-	-	-
No	80 (100)	80 (100)	-	-
Exposure to music therapy before				
Yes	-	-	-	-
No	80 (100) x	80 (100)	-	-

Note: The data of both the groups is expressed as frequency with percentage in parenthesis. Experimental group-patients with cancer receiving music intervention while undergoing chemotherapy, control group-patients with cancer receiving normal routine care while undergoing chemotherapy, Ca-Cancer, p>0.05-groups were homogenous.

Table 1: Patients baseline and clinical characteristics.

Observation	Amylase level (IU/mL)					
	Experimental			Control		
	Mean ± SD	F value	P-value	Mean ± SD	F value	P-value
Pre-test baseline	398.3 ± 108.9	-	-	386.1 ± 111.8	-	-
Post-test day 3	359.6 ± 108.0	181.69	<0.001***	389.6 ± 112.4	5.68	<0.05*
day 5	323.7 ± 106.9	-	-	393.9 ± 111.7	-	-

Note: The statistical test used: repeated measure ANOVA, *significant p<0.05, **highly significant p<0.01, ***very highly significant p<0.001.

Table 2: Amylase scores at different times of observations within experimental and control groups.

Observation		Amylase level (IU/mL)					
		Experimental			Control		
		Mean diff	SE	P-value	Mean diff	SE	P value
Baseline	Post-test day 3	37.62	3.33	<0.001***	5.45	2.03	<0.05*
	day 5	73.73	4.9	<0.001***	-3.9	4.65	>0.05
Post-test day 3	Post-test day 5	36.11	3.13	<0.001***	-4.35	4.64	<0.05*

Note: The statistical test used: repeated measure ANOVA, *significant p<0.05, **highly significant p<0.01, ***very highly significant p<0.001.

Table 3: Intragroup comparison of amylase scores at different times of observation in experimental and control groups.

Observation	Amylase level (IU/mL)			
	Experimental (Mean ± SD)	Control (Mean ± SD)	t value	p value
Pre-test baseline	398.3 ± 108.9	386.1 ± 111.8	0.7	>0.05
Post-test day 3	359.6 ± 108.0	389.6 ± 112.4	-1.205	<0.01**
day 5	323.7 ± 106.9	393.9 ± 111.7	-4.067	<0.001***

Note: Statistical test used: independent t test, *significant p<0.05, **highly significant p<0.01, ***very highly significant p<0.001.

Table 4: Comparison of Salivary amylase scores between the experimental and control groups.

Discussion

The present study findings highlights that listening to the patient preferred recorded music while receiving chemotherapy was related with decrease in salivary alpha amylase level in patients with cancer (p=0.001). this relation is confirmed with other study done by (Andreas Charalambous, 2015) based on a randomized control trial, examine the effect of progressive muscle relaxation and guided imagery along with music as anxiety reducing intervention for patients with breast cancer undergoing chemotherapy. Salivary cortisol and amylase levels were assessed before and after intervention.

Conclusion

Present study result showed that there was a significant difference in salivary amylase levels before and after chemotherapy in experimental group compared to control group. Hence assessment of stress provoking biomarkers like salivary amylase is important to assess the pre-treatment induces anxiety and stress.

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