Effect of music therapy in dysmenorrheic subjects during menstrual phase of menstrual cycle

Jayamala Annachira Kushalappa¹, Preethi Bangalore Lakshmanagowda², Shwetha B M² and Bharathi C²

¹Department of physiology, Sri Venkateshwara Medical College Hospital & Research Centre, Puducherry, India
²Department of physiology, M S Ramaiah Medical College & Hospital, Bangalore, India

Abstract

Introduction: Dysmenorrhea is a prevalent problem, which adversely affect the day to day activities of students. Heart rate variability is a noninvasive tool to assess the sympathovagal balance. Music therapy being an easy approach can be used to alleviate the severity of dysmenorrhea.

Methods: 30 young adolescent girls suffering from primary dysmenorrhea were included in the study. Day 1 of menstrual cycle, Premenstrual Syndrome- Dysmenorrhea Questionnaire was administered. HRV was tested for all subjects. Music therapy was administered for one week prior to the next expected date of menstruation. Raga Malakauns and Yaman by flute were used for music therapy. Day1 of next cycle HRV was repeated and a PMS-Dysmenorrhea questionnaire was readministered.

Statistics: The intragroup data was analyzed using Paired t test using SPSS16 software. P value <0.05 was taken statistically significant.

Results: In the present study, mean dysmenorrhea score before administering music therapy was 63.4± 5.3 compared to post music therapy (MT) dysmenorrhea score i.e., 57.6±8.49. Among HRV parameters high frequency domain showed significant difference between pre MT (42.3±13) and post MT (50.14± 15.7) with a p- value of 0.04. The LF-to-HF (LF/HF) ratio represents the sympathovagal balance². LF/HF ratio showed a significant difference from pre MT (1.72±0.9) to post MT (1.25±0.48) with a p-value of 0.0005. This significant difference indicates the shift of sympathovagal balance after music therapy towards parasympathetic activity.

Keywords: music therapy, Dysmenorrhea, menstrual cycle

1. Introduction

The health of young women influences not only their own health, but also the health of the future population as one quarter of India’s population comprises of girls below 25 years. One of the major physiological changes that take place in adolescent girls is the onset of menarche, which is often associated with problems of irregular menstruation, excessive bleeding, and dysmenorrhea.¹ Dysmenorrhea is a prevalent problem, which adversely affect the day to day activities of students. Adolescent girls abstain themselves from class and clinicals regularly due to dysmenorrhea. Approximately 30% adolescents use medications to manage dysmenorrhea and about 70% do not use prescription of medication. Several non pharmaceutical approaches to alleviate the dysmenorrhea exist like pelvic rocking exercises, yoga are being practiced. Alternative and complementary therapy is widely accepted and available. Among this music therapy may play an important role to alleviate symptoms of dysmenorrhea.

Heart rate variability (HRV) is a measure of autonomic nervous system function. Evaluation of heart rate variability (HRV) is based on analysis of consecutive R-R intervals and may provide quantitative information on the modulation of cardiac vagal and sympathetic efferent activities. HRV is influenced by different phases of menstrual cycle, probably because of hormones like progesterone, estrogen. Heart rate variability (HRV) is noninvasive technique to assess the cardiac autonomic balance. HRV analysis can assess the balance between sympathetic and parasympathetic regulation on cardiac activity- the two main components of the ANS (Autonomic Nervous System). In particular, the high-frequency (HF) band (0.15–0.4 Hz) in frequency-domain analysis has been regarded as the marker of vagal activity, and the low frequency (LF) band (0.04–0.15 Hz) has been regarded as the marker of sympathovagal interaction, especially sympathetic activity. Consequently, the LF-to-HF (LF/HF) ratio represents the sympathovagal balance.² Very few studies have been done on dysmenorrhea & its relationship with HRV test in Indian population. Music therapy is extremely beneficial in patients suffering from pain as in cancer patients; music indeed has been proven in oncologic patients to reduce pain, to promote wellness in their daily lives, and to increase sense of control.³⁷

1.1 Objectives of the Study

To evaluate the effectiveness of music therapy on dysmenorrhea using Heart Rate Variability and Premenstrual Syndrome dysmenorrhea questionnaire.

2. Materials and Methods

30 Female subjects in the age range of 18-25years were included in the study the subjects were explained the testing procedure and protocol. Informed consent was obtained from the participants of this study.

A detailed medical and menstrual history was obtained from all participants. Thorough general physical examination will be done. Standard anthropometric measurements like height, weight, body mass index (BMI), waist, hip circumference, and waist hip ratio (WHR) were recorded.

Subjects were asked to abstain from caffeine containing beverages on the day of recording.
All subjects were studied during menstrual phase (day 1–5) during two consecutive menstrual cycles. PMS Dysmenorrhea questionnaire is administered prior to taking HRV.

To avoid potential diurnal variations, subjects were tested (HRV) at the same time of day (between 8:00 and 9:00 AM) in a quiet room at least 24–36 h post exercise. All subjects were asked to be in the supine position with a normal breathing rate and depth with their eyes closed and in a relaxed state at least 30 min before the HRV collection. 10 min HRV of the subject were recorded using three electrodes placed in the right infraclavicular region, left infraclavicular region and left iliac region. The data was analyzed using RMS Vagus HRV software (RMS, India).

The following parameters were studied

2.1 Time Domain

SDNN- Standard deviation of N-N interval, that is, the square root of variance is mathematically equal to total power of spectral analysis. SDNN reflects all the cyclic components responsible for variability in the period of recording.

RMSSD- The square root of the mean squared difference of successive N-N interval.

NN50- The number of interval differences of successive NN intervals greater than 50ms.

pNN50- The proportion derived by dividing NN50 by the total no of NN intervals.

2.2 Frequency Domain methods

To determine the frequency domain parameters Power spectral data analysis is used. POWER SPECTRAL DENSITY ANALYSIS decomposes the heart rate signal into its frequency components and quantifies them in terms of their relative intensity termed power.

The R-R interval duration is plotted against the number of R-R intervals (tachogram). This method project the entire range of fluctuations into different frequencies.

LF (0.04 -0.15 Hz) influenced by both parasympathetic and sympathetic activity. HF (0.15 -0.4 Hz) influenced mainly by the parasympathetic data. PSD are plotted in ms²/Hz against preset frequency. Power of the spectral bands are calculated in ms² (millisecond², absolute power and in normalized units).

Procedure:
- Day 1 of menstrual cycle: PMS- Dysmenorrhea Questionnaire was administered. HRV was tested for all subjects.
- Music Therapy was given to all the subjects. Music therapy was administered for one week prior to the next expected date of menstruation. Subject was asked to be comfortably seated & listen to music in a quiet room for 30min in the mornings, till the day 1 of next menstruation (approximately 7 days). Rag Malakauns and Yaman by flute were used for music therapy.
- Day 1 of next cycle HRV was repeated and a PMS-Dysmenorrhea questionnaire was readministered.

Females between the age group of 18-25years, who had regular menstrual cycle (21-35days), were included. Females who were experiencing dysmenorrhea for the last three months with every menstruation and are not on any medication were included in the study. Females who were undergoing treatment for dysmenorrhea were excluded. Females who were diagnosed have secondary dysmenorrhea or any other gynecological problems, spinal problems, diabetes, hypertension, asthma were excluded.

2.3 Rationale for sample size:

From the Literature Study carried out by Xiaopeng Bai, Jingxiu Li, et al 2008 has shown resting HR value in the follicular phase 61.52±7.03 and in leuteal phase 64.68±6.98 has been observed. In the present study with expecting similar result with 80 % power, 95% CI and a difference of 0.5 units as clinically significant we need a minimum sample of 30.

2.4 Statistical analysis of data

The intragroup data was analyzed using Paired t test using SPSS16 software. P value <0.05 was taken statistically significant.

2.5 Study design: Longitudinal study design.

3. Results

Over a period of 6 months, 30 adolescent girls with dysmenorrhea were included in the study. Dysmenorrhea score more than 56 of Pre Menstrual Syndrome Dysmenorrhea questionnaire were included in the study. As shown in the table 1, Mean age of 30 adolescent girls who underwent music therapy for 7 days was 19.4±1.65 years. Mean BMI of the study group was 21.9±2.19kg/m².

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean (SD)</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
<td>19.4 (1.65)</td>
</tr>
<tr>
<td>Height</td>
<td>1.58 (0.05)</td>
</tr>
<tr>
<td>Weight</td>
<td>54.9 (4.5)</td>
</tr>
<tr>
<td>BMI</td>
<td>21.9 (2.19)</td>
</tr>
</tbody>
</table>

Mean ±SD of HRV parameters before & after MT (n=30)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>pre MT</th>
<th>post MT</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysmenorrhea score</td>
<td>63.4±5.3</td>
<td>57.6±8.49</td>
<td>0.0005</td>
</tr>
<tr>
<td>HR</td>
<td>78.9±19.32</td>
<td>67.4±6.8</td>
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<tr>
<td>SDNN</td>
<td>58.5±21.73</td>
<td>64.2±26.2</td>
<td>0.3035</td>
</tr>
<tr>
<td>rMMSD</td>
<td>47.9±16</td>
<td>55.9±17.8</td>
<td>0.66</td>
</tr>
<tr>
<td>PNN50</td>
<td>36.15±18.27</td>
<td>37±12</td>
<td>0.66</td>
</tr>
<tr>
<td>LF</td>
<td>61.5±12</td>
<td>58.13±16.3</td>
<td>0.32</td>
</tr>
<tr>
<td>HF</td>
<td>42.3±13</td>
<td>50.14±15.7</td>
<td>0.04</td>
</tr>
<tr>
<td>LF/HF</td>
<td>1.72±0.9</td>
<td>1.25±0.48</td>
<td>0.0121</td>
</tr>
</tbody>
</table>

Fig 1: Graph showing HF power before and after music therapy (mean±SD)
4. Discussion

Dysmenorrhea is a common gynaecological condition that is under-diagnosed and undertreated. However, dysmenorrhea seems to be the most common gynaecological problem in women regardless of age and nationality. Severe dysmenorrhea is associated with absence from school and work in young adolescent girls. Very few patients seek medical treatment even though dysmenorrhea affects general well being of the subject. A nonpharmacological method of treatment may be an alternative approach.

Simple analgesics and non-steroidal anti-inflammatory, oral contraceptives are effective in up to 70% of the patients. For women seeking alternative therapies music therapy, heat, thiamine, magnesium, and vitamin E may be effective. Music therapy is being used mainly to alleviate pain and anxiety in different clinical scenarios like in cancer patients, post operative patients.

Heart rate variability (HRV) is noninvasive technique to assess the balance between sympathetic and parasympathetic regulation. HRV changes were studied during the menstrual phase (bleeding phase 1-5 days) of menstrual cycle. This phase of menstrual cycle was selected as dysmenorrhea is common cramping pain in the lower abdomen occurring just 2 days prior to or during first few days of menstruation. This study was undertaken to investigate whether, music therapy reduces severity of dysmenorrhea which was objectively evaluated using HRV.

We included, subjects with dysmenorrhea score more than 58 into our study and music therapy was given for 7 days prior to the next expected date of menstruation. 7 days of music therapy was chosen as few studies have reported a clear increase in symptomatology starting about seven days before menstruation and reaching a maximum at the second day of the following cycle. In the present study, mean dysmenorrhea score before administering music therapy was 63.4± 5.3 compared to post music therapy (MT) dysmenorrhea score i.e., 57.6±8.49. Dysmenorrhea score showed a significant difference with a p value-0.0005.

Time domain HRV parameters like SDNN, rMMSD, PNN50 indicate parasympathetic activity. In our study significant difference in SDNN, rMMSD & PNN50 scores were not established. This may be because of lesser impact of MT on parasympathetic activity. Frequency domain parameter i.e., Low Frequency power which indicate sympathetic activity showed no significant difference. High frequency domain showed significant difference between pre MT (42.3±13) and post MT (50.14± 15.7) with a p value of 0.04. The high-frequency (HF) band (0.15–0.4 Hz) in frequency-domain analysis has been regarded as the marker of vagal activity, and the low frequency (LF) band (0.04–0.15 Hz) has been regarded as the marker of sympathetic-vagal interaction, especially sympathetic activity. Consequently, the LF-to-HF (LF/HF) ratio represents the sympathovagal balance. LF/HF ratio showed a significant difference from pre MT (1.72±0.9) to post MT (1.25±0.48) with a p-value of 0.0005. This significant difference indicates the shift of sympathovagal balance after music therapy towards parasympathetic activity.

Furthermore, music decreases anxiety, reduces psychological and physical symptoms as shown by significant decrease in dysmenorrhea score. Music therapy is indeed can be used to promote wellness in their daily lives during dysmenorrhea.

References