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# An Evaluation of Vijaya Extract (Cannabryl Full Spectrum) For Pain Management in Cancer Patients as an Adjuvant Therapy in Palliative Care: A Pilot Study

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**Abstract**

**Background:** Pain is one of the most common and distressing symptoms in cancer patients, particularly during advanced stages where palliative care becomes the primary focus. Despite the availability of conventional analgesics, effective pain control remains challenging due to their well known adverse effects, tolerance, and limited long-term compliance. Ayurveda describes several drugs possessing Vedanahara and Shoolaprashamana ( analgesic) properties that may offer complementary benefits in pain management.

**Objective:** The objective of the study is to evaluate the efficacy of Vijaya Extract (Cannabryl Full Spectrum) for pain management in cancer patients as an adjuvant therapy in palliative care.

**Materials and Methods:** This pilot study included 20 cancer patients suffering from pain, attended the Sangyaharan Vedanahara OPD, Sir Sunder Lal Hospital, Institute of Medical Sciences, Banaras Hindu University. Patients of either sex fulfilling the inclusion criteria were enrolled after obtaining written informed consent. Vijaya Extract (Cannabryl Full Spectrum) was administered orally (Sub lingual) mixed with melted cow ghee half TSF twice daily along with standard palliative care. Pain assessment scales, biochemical markers such as dopamine, serotonin, homocysteine, epinephrine and noradrenaline and hemodynamic parameters – Blood Pressure and Pulse rate were recorded at baseline (Day 0) and at the end of a 30-days follow-up period (Day 30).

**Results:** The study demonstrated improvement in pain scores and favorable trends in biochemical markers without significant adverse effects.

**Conclusion:** From the result of current study, we can conclude that Vijaya Extract (Cannabryl Full Spectrum) is an effective adjuvant therapy for pain management in palliative cancer care as an adjuvant and may provide a basis for future large-scale clinical trials.

**Keywords:** Vijaya Extract; Cannabryl Full Spectrum; Cancer pain; Palliative care; Adjuvant therapy; Ayurveda.

## 1. Introduction:

Pain is one of the most common, distressing, and debilitating symptoms experienced by patients suffering from cancer, particularly in advanced stages where palliative care becomes the primary focus of management [1,2]. Cancer-related pain significantly affects physical functioning, emotional stability, sleep patterns, appetite, and overall quality of life [3]. Despite remarkable advances in oncology and supportive care, effective pain management in cancer patients remains a major clinical challenge [4]. Pain in cancer is often complex and multifactorial, arising from tumor invasion, inflammation, nerve compression, ischemia, metastasis, or as a consequence of anticancer therapies such as surgery, chemotherapy, and radiotherapy

[5,6]. Conventional pain management strategies primarily rely on non-steroidal anti-inflammatory drugs, opioids, and adjuvant analgesics. Although these therapies provide symptomatic relief, long-term use is frequently associated with adverse effects such as gastrointestinal disturbances, sedation, tolerance, dependency, and reduced patient compliance [7,8]. In palliative care settings, where the emphasis is on comfort and quality of life rather than cure, these limitations highlight the need for safer, complementary, and patient-friendly approaches to pain management [9].

Ayurveda, the ancient system of medicine, offers a holistic understanding of pain and its management. Pain is described as a manifestation of disturbed physiological balance, and its treatment focuses on restoring harmony through individualized therapeutic approaches [10]. Classical Ayurvedic texts describe a wide range of drugs possessing Vedanahara, Shoolaprashamana, and Shothahara(analgesic and anti-inflammatory) properties, which have been traditionally used in painful and inflammatory conditions. Their application in cancer pain management has largely remained traditional and experience-based. Herbal drugs such as Rasna, Eranda, Nirgundi, Bhringaraja, Parijata, Shallaki, Shigru, Ahifena, and Vijaya are well documented in Ayurvedic literature for their analgesic and anti-inflammatory potential [11,12]. These drugs are believed to act by modulating pain pathways and restoring systemic balance, thereby providing relief without producing severe adverse effects. Among these, Vijaya has been traditionally utilized for its pain-modulating, calming, and therapeutic properties. Ayurvedic formulations containing Vijaya have been indicated in various painful conditions [13]. In recent years, there has been growing interest in evaluating such traditional remedies through scientific and evidence-based approaches. Vijaya Extract (Cannabryl Full Spectrum) represents a standardized herbal preparation designed to harness the therapeutic potential of Vijaya in a scientifically acceptable form. Palliative care aims to improve the quality of life of patients and their families facing life-threatening illness through prevention and relief of suffering [14]. Integrating Ayurvedic herbal formulations as adjuvant therapy alongside conventional palliative care may offer additional benefits in managing cancer-related pain. Oral administration of herbal extracts is practical and acceptable in most cancer patients receiving palliative care, provided safety and tolerability are ensured. Despite traditional usage and increasing interest in integrative oncology, there is a lack of systematic scientific studies evaluating the efficacy and safety of Vijaya Extract (Cannabryl Full Spectrum) in cancer pain management [15]. Objective assessment using standardized pain assessment scales and biochemical markers such as dopamine, serotonin, homocysteine, epinephrine, noradrenaline and hemodynamic parameters is essential to generate evidence-based data [16]. Keeping these considerations in view, the present pilot study has been planned to evaluate the efficacy of Vijaya Extract (Cannabryl Full Spectrum) for pain management in cancer patients as an adjuvant therapy in palliative care. The findings of this study are expected to provide preliminary scientific evidence and serve as a foundation for future large-scale clinical trials aimed at integrating Ayurvedic interventions into evidence-based palliative cancer care.

## 2. Materials and Methods

### 2.1 Study Design

The present study is designed as a **pilot, prospective, open-label clinical study** to evaluate the efficacy of **Vijaya Extract (Cannabryl Full Spectrum)** for pain management in cancer patients when used as an adjuvant therapy in palliative care. The Primary objective of the study was to evaluate the efficacy of **Vijaya Extract (Cannabryl Full Spectrum)** for pain management in cancer patients when used as an adjuvant therapy in palliative care. The secondary objective of the study was to observe and analyze the scientific validation of the proposed herbal drug through evidence-based clinical parameters, biochemical markers related to pain and inflammation, and hemodynamic observations. Cannabryl Full Spectrum was provided by Pharma Hemp Laboratory, Indogenix Biosciences LLP, Bhopal, India.

### 2.2 Study Setting

The study was conducted at the **Sangyaharan Vedanahara Outpatient Department (OPD)**, Sir Sunder Lal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi. This OPD regularly manages patients suffering from various painful conditions, including cancer-related pain, and provides facilities for clinical evaluation, follow-up, and laboratory investigations.

### 2.3 Ethical Committee Approval

The study was approved by the Institutional Ethical Committee (2023/EC/6720) of the Institute of Medical Sciences, Banaras Hindu University, Varanasi, and registered under Clinical Trials Registry – India (CTRI),

with CTRI number CTRI/2025/07/091493. The study was conducted strictly in accordance with institutional ethical guidelines and accepted ethical principles. Written informed consent was obtained from all participants before their enrollment in the study.

**2.4 Participants**

A total of **20 patients suffering from different types of cancers associated with pain**, of either sex, attended the Sangyaharan Vedanahara OPD were enrolled in the study. Patients were screened and registered after fulfilling the predefined inclusion and exclusion criteria. All eligible participants were informed of the nature, purpose, and procedures of the study in detail, and their participation was entirely voluntary.

**2.5 Inclusion and Exclusion Criteria**

Patients diagnosed with cancer and experiencing pain were included in the study, irrespective of whether they were receiving conventional cancer therapy. Eligible participants were those willing to receive an Ayurvedic herbal drug as an adjuvant treatment and who were capable of providing written informed consent. Patients with pre-existing systemic diseases such as diabetes mellitus, hypertension, or thyroid disorders requiring regular treatment were excluded from the study. In addition, individuals who were unwilling to participate or unable to comply with scheduled follow-up visits were not included.

**2.6 Intervention**

A dose of 50 mg (one drop) of the drug was mixed with 2.5g of melted cow ghee and put under the tongue of the patient for 5-10 min. and advised to swallow at 8:00 a.m. and at 8:00 p.m. after breakfast and after dinner, respectively. Patients were advised to continue their ongoing conventional therapy, if any, without any alteration during the study period. The total duration of the study was 30 days. Each enrolled patient was assessed at baseline (Day 0) and followed up at the end of a 30-day period (Day 30) to evaluate the outcome of the intervention. The study design takes into account the possibility of drop-out cases due to disease progression, non-compliance, or other unavoidable reasons.

**2.7 Assessment Parameters**

The outcome of the study was evaluated by assessing clinical pain using standardized pain assessment scales, along with biochemical markers related to pain and inflammation. Hemodynamic parameters, including blood pressure, pulse rate and respiratory rate were also monitored. All observations were recorded at baseline and during each follow-up visit using a predefined and structured proforma.

**2.8 Blood Collection**

Blood samples were collected from the patients, before and after the treatment during OPD visits under strict aseptic conditions by trained personnel. Venous blood was drawn and serum was separated for the estimation of biochemical pain markers. Laboratory investigations were carried out in the departmental laboratory following standard operating procedures and quality control measures.

2.9 **Enzyme-linked immunosorbent assay detection**

Serum levels of dopamine, serotonin, epinephrine, noradrenaline, and homocysteine were determined using a human ELISA kit from ELK Biotechnology. All the kits were based on the competitive inhibition enzyme-linked immunosorbent assay technique. The experiments were performed according to the manufacturer's instructions.

**2.10 Data Analysis**

The collected clinical and biochemical data were compiled systematically. Pain assessment scores, neurotransmitter levels, and hemodynamic parameters were expressed as mean ± standard deviation (SD). Baseline values were compared with values obtained during follow-up visits to evaluate the effect of Vijaya Extract (Cannabryl Full Spectrum) on pain management. Statistical analysis was performed using standard statistical methods**.** Student’s t-test was applied to assess the significance of differences between baseline and post-intervention observations. A p-value of less than 0.05 was considered statistically significant. The analyzed data was presented in the form of tables and graphical representations wherever appropriate to facilitate clear interpretation of results and to assess trends in pain relief and biochemical response.

## 3. Results and Discussion

### 3.1 General Clinical Profile of Patients

A total of 20 cancer patients suffering from pain were enrolled in the present pilot study. Patients included were of either sex and were suffering from different types of cancers associated with varying degrees of pain. Baseline demographic and clinical characteristics of the patients were recorded at the time of enrollment (Table 1). The patients were found to be comparable with respect to baseline parameters, ensuring uniformity of the study population. At baseline, all patients reported moderate to severe pain requiring continuous pain management. The baseline assessment served as a reference for comparison during subsequent follow-up evaluations.

**Table 1: Baseline Demographic and Clinical Characteristics of Enrolled Cancer Patients**

| **Parameter** | **Observation** |
|---|---|
| **Total number of patients (n)** | 20 |
| **Sex distribution** | Male:11(55%)<br>Female: 9 (45%) |
| **Type of cancer** | Different cancer types (as per diagnosis records) |
| **Age (years), Mean ± SD** | 39.20 ± 15.10 |
| **Body weight (kg), Mean ± SD** | 55.80 ± 6.85 |
| **Baseline pain severity** | Moderate to severe |
| **Baseline VAS score, Mean ± SD** | 7.40 ± 0.90 |
| **Baseline clinical condition** | Persistent cancer-related pain requiring continuous pain management |
| **Comparability of baseline parameters** | Comparable |
| **Statistical remark** | NS (Non- significant) |

### 3.2 Effect of Vijaya Extract (Cannabryl Full Spectrum) on Mean Blood Pressure

Mean blood pressure was assessed to evaluate the cardiovascular safety of Vijaya Extract. Comparison of baseline values with those recorded after 30 days of treatment revealed no statistically significant difference ($p > 0.05$). The mean blood pressure remained within normal physiological limits throughout the study duration (Table 2). These observations suggest that oral administration of Vijaya Extract did not adversely influence hemodynamic parameters. The absence of significant blood pressure changes supports the safety and tolerability of Vijaya Extract in cancer patients undergoing palliative treatment.

**Table 2: Statistical comparison of mean blood pressure before and after 30 days of treatment with Vijaya Extract**

| **Vijaya Extract (Cannabryl Full Spectrum) (Oral-S/L)** | **Mean Blood Pressure (mmHg) Mean ± SD** | |
|---|---|---|
| **N- 20** | **Baseline (Day 0)** | **After 30 Days (Day 30)** |
| **Drug dose-50 mg twice a day** | 98.20 ± 9.36 | 97.65 ± 8.74 |
| **Statistical Comparison** (Paired *t* test) | t = 0.28<br>p = 0.78 | |
| **Remark** | NS | NS |

**NS:** Non-significant

### 3.3 Effect of Vijaya Extract (Cannabryl Full Spectrum) on Pulse Rate

Pulse rate measurements taken at baseline and after 30 days of Vijaya Extract (Cannabryl Full Spectrum) administration showed no statistically significant variation ($p > 0.05$). The pulse rate remained stable and within normal limits during the study period. This stability indicates that Vijaya Extract did not exert any undesirable effect on cardiac rhythm or autonomic regulation (Table 3). The findings further support the

cardiovascular safety profile of Vijaya Extract when used as an adjuvant therapy for pain management in cancer patients.

**Table 3: Statistical comparison of mean pulse rate before and after 30 days of treatment with Vijaya Extract**

| **Vijaya Extract (Cannabryl Full Spectrum) (Oral-S/L)** | **Pulse Rate (/min) Mean ± SD, Baseline (Day 0)** | **Pulse Rate (/min) Mean ± SD, After 30 Days (Day 30)** |
|---|---|---|
| **N- 20** | | |
| **Drug dose-50 mg twice a day** | 87.20 ± 10.14 | 86.05 ± 9.26 |
| **Statistical Comparison** (Paired *t* test) | t = 0.39<br>p = 0.69 | |
| **Remark** | NS | NS |

**NS: Non-significant**

### 3.4 Effect of Vijaya Extract on Pain (VAS Score)

Pain intensity evaluated using the Visual Analogue Scale demonstrated a noticeable reduction following 30 days of treatment with **Vijaya Extract (Cannabryl Full Spectrum)**. Baseline VAS scores reflected moderate to severe pain among the study participants. After completion of the treatment period, a significant decrease in mean VAS scores was observed (Table 4). Statistical analysis using a paired *t*-test showed this reduction to be highly significant ($p < 0.001$). These findings indicate that Vijaya Extract possesses considerable analgesic potential and may contribute effectively to pain relief when used as an adjuvant therapy in cancer patients receiving palliative care.

**Table 4: Statistical comparison of mean VAS score before and after 30 days of treatment with Vijaya Extract**

| **Vijaya Extract (Cannabryl Full Spectrum) (Oral-S/L)** | **VAS Score (Mean ± SD)** | |
|---|---|---|
| **N- 20** | **Baseline (Day 0)** | **After 30 Days (Day 30)** |
| **Drug dose-50 mg twice a day** | 7.30 ± 0.91 | 4.55 ± 0.88 |
| **Statistical Comparison** (Paired *t* test) | t = 9.84<br>p = 0.0002 | |
| **Remark** | Highly Significant | Highly Significant |

### 3.5 Effect of Vijaya Extract (Cannabryl Full Spectrum) on Ojas- negative scale

A total of 20 cancer patients suffering from pain were assessed for Ojas-Bala status before and after 30 days of treatment with **Vijaya Extract (Cannabryl Full Spectrum)**. At baseline, the majority of patients showed features suggestive of moderate to severe Ojas-kṣhaya, reflected by higher mean Ojas- Negative scores. After completion of the treatment period, a marked improvement was observed in the overall Ojas-negative status of the patients. The mean Ojas-negative score showed a considerable reduction after 30 days of therapy, indicating improvement in physical strength, mental stability, sensory functions, and general vitality. Statistical analysis using a paired *t*-test demonstrated the observed change (Table 5). These findings suggest that Vijaya Extract (Cannabryl Full Spectrum) possesses Ojo-vardhaka potential and contributes highly significantly ($p < 0.001$). positively to the restoration of systemic strength and resilience. Improvement in Ojas-Bala may also reflect better tolerance to disease burden and enhanced overall well-being in cancer patients receiving palliative care.

**Table 5: Statistical comparison of Ojas-Negative scale score before and after 30 days of treatment with Vijaya Extract (Cannabryl Full Spectrum) ( (n = 20)**

| **Parameter** | **Mean ± SD** |
|---|---|
| **Baseline Oja-negative Score** | 35.60 ± 5.18 |
| **After 30 Days Oja-negative Score** | 28.95 ± 4.72 |

| **Statistical Test** | Paired *t*-test |
|---|---|
| **t-value** | 7.92 |
| **p-value** | 0.0002 |
| **Remark** | Highly Significant |

### 3.6 **Effect of Vijaya extract (Cannabryl Full Spectrum) on Biochemical parameters**

ELISA results show that the drug increases dopamine, and serotonin levels before and after treatment, while homocysteine, epinephrine and noradrenaline levels are reduced following treatment (Figure 1, A-E). An increase in dopamine and serotonin levels after treatment and decrease in Homocysteine, epinephrine and noradrenaline levels after treatment of 30$^{th}$ day follow up observation support the analgesic and anti-inflammatory response of trial drug. How ever there was no significant difference observed between the biochemical parameters before and after treatment.

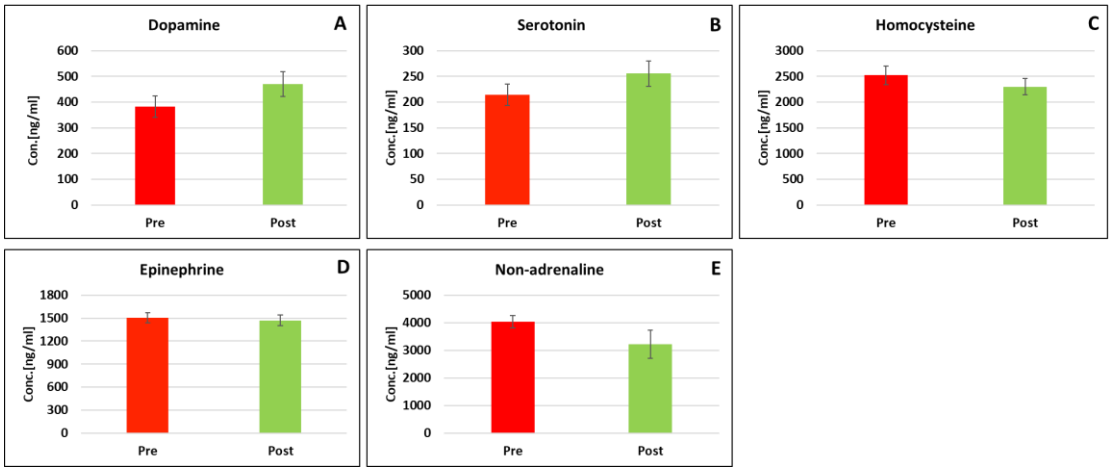


**Figure 1**: The contents of serum (A) Dopamine, (B) Serotonin, (C) Homocysteine, (D) Epinephrine, and (E) Noradrenaline in the patients before and after treatment. The error bars represent the standard error mean (SEM).

### 3.7 Discussion

Pain management in cancer patients, especially in palliative care settings, requires a holistic and patient-centered approach. The present pilot study was undertaken to evaluate the efficacy of Vijaya Extract (Cannabryl Full Spectrum) as an adjuvant therapy for pain management in cancer patients. The observed reduction in pain scores, along with favorable changes in dopamine, serotonin, homocysteine, epinephrine, and noradrenaline levels, suggests a potential analgesic and pain-modulating role of Vijaya Extract (Cannabryl Full Spectrum) . These findings are in alignment with the Ayurvedic concept of vedanahara and shoolaprashamana actions attributed to Vijaya. The oral administration of Vijaya Extract (Cannabryl Full Spectrum) was found to be feasible and acceptable in palliative care settings. The absence of significant adverse effects and stable hemodynamic parameters further support its safety profile. However, being a pilot study with a small sample size and short duration, the findings should be interpreted cautiously. The results of this study provide preliminary scientific evidence and highlight the need for further large-scale, randomized controlled clinical trials to establish the efficacy, safety, and mechanism of action of Vijaya Extract (Cannabryl Full Spectrum) in cancer pain management.

### 4. Conclusion

The findings of the present pilot study suggest that **Vijaya Extract (Cannabryl Full Spectrum)** may be a useful adjuvant therapy for pain management in cancer patients receiving palliative care. The observed reduction in pain assessment scores, along with favorable changes in pain-related biochemical markers such as dopamine, serotonin, homocysteine, epinephrine and noradrenaline observations indicate a possible analgesic and pain-modulating effect of the intervention. The stability of hemodynamic parameters throughout the study period suggests that Vijaya Extract (Cannabryl Full Spectrum) was well tolerated and did not produce any significant adverse physiological effects. Oral administration of the extract was found to be feasible and acceptable in the palliative care setting, where patient comfort and compliance are of primary

importance. As this study is a pilot investigation with a limited sample size and short duration of follow-up, the results should be interpreted with caution. Definitive conclusions regarding efficacy and mechanism of action cannot be drawn at this stage. Further studies involving larger sample sizes, longer duration, and randomized controlled study designs are required to confirm the findings and to establish the safety, efficacy, and therapeutic role of Vijaya Extract (Cannabryl Full Spectrum) in cancer-related pain management. The present study provides preliminary scientific evidence supporting the potential role of Ayurvedic herbal interventions as adjuvant therapies in palliative cancer care and may serve as a foundation for future evidence-based clinical research.

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**6. Conflict of Interest**
The authors declare no conflict of interest.

**7. Author contributions**
KKP: design, planning, data analysis, and conduction of clinical trial, K: Design, planning performing in vitro experimentation including ELISA, data analysis, and manuscript writing, PKM: conduction of clinical trial, DV: provided trial drug and review writing, NG: design and planning, formal analysis.

**References:**
1. van den Beuken-van Everdingen MH, Hochstenbach LM, Joosten EA, Tjan-Heijnen VC, Janssen DJ. Update on Prevalence of Pain in Patients with Cancer: Systematic Review and Meta-Analysis. J Pain Symptom Manage. 2016 Jun;51(6):1070-1090.e9. doi: 10.1016/j.jpainsymman.2015.12.340. Epub 2016 Apr 23. PMID: 27112310.
2. Portenoy RK. Cancer pain: pathophysiology and syndromes. Lancet. 1992 Apr 25;339(8800):1026-31. doi: 10.1016/0140-6736(92)90545-e. PMID: 1349060.
3. Carlson CL. Effectiveness of the World Health Organization cancer pain relief guidelines: an integrative review. J Pain Res. 2016 Jul 22; 9:515-34. doi: 10.2147/JPR.S97759. PMID: 27524918; PMCID: PMC4965221.
4. Portenoy RK, Lesage P. Management of cancer pain. Lancet. 1999 May 15;353(9165):1695-700. doi: 10.1016/S0140-6736(99)01310-0. PMID: 10335806.
5. Bennett MI, Rayment C, Hjermstad M, Aass N, Caraceni A, Kaasa S. Prevalence and aetiology of neuropathic pain in cancer patients: a systematic review. Pain. 2012 Feb;153(2):359-365. doi: 10.1016/j.pain.2011.10.028. Epub 2011 Nov 23. PMID: 22115921.
6. Cluxton C. The Challenge of Cancer Pain Assessment. Ulster Med J. 2019 Jan;88(1):43-46. Epub 2019 Jan 22. PMID: 30675079; PMCID: PMC6342038.
7. Smith HS. Opioid metabolism. Mayo Clin Proc. 2009 Jul;84(7):613-24. doi: 10.1016/S0025-6196(11)60750-7. PMID: 19567715; PMCID: PMC2704133.
8. Judith A. Paice et al. Use of Opioids for Adults With Pain From Cancer or Cancer Treatment: ASCO Guideline. *J Clin Oncol* **41**, 914-930(2023). DOI:10.1200/JCO.22.02198
9. Deng G, Cassileth BR. Integrative oncology: complementary therapies for pain, anxiety, and mood disturbance. CA Cancer J Clin. 2005 Mar-Apr;55(2):109-16. doi: 10.3322/canjclin.55.2.109. PMID: 15761079.
10. Sharma PV. **Dravyaguna Vijnana.** Vol 2. Varanasi: Chaukhambha Bharati Academy; 2013:1–40.
11. Dash B, Sharma RK. **Caraka Samhita.** Varanasi: Chaukhambha Sanskrit Series; 2014:1–55.
12. Tripathi B. **Ashtanga Hridaya.** Varanasi: Chaukhambha Sanskrit Pratishthan; 2012:1–50.
13. Russo EB. Cannabinoids in the management of difficult to treat pain. Ther Clin Risk Manag. 2008 Feb;4(1):245-59. doi: 10.2147/tcrm. s1928. PMID: 18728714; PMCID: PMC2503660.
14. Carlson CL. Effectiveness of the World Health Organization cancer pain relief guidelines: an integrative review. J Pain Res. 2016 Jul 22; 9:515-34. doi: 10.2147/JPR.S97759. PMID: 27524918; PMCID: PMC4965221.

15. Whiting PF, Wolff RF, Deshpande S, et al. Cannabinoids for Medical Use: A Systematic Review and Meta-analysis. JAMA. 2015;313(24):2456–2473. doi:10.1001/jama.2015.6358
16. Sproston NR, Ashworth JJ. Role of C-Reactive Protein at Sites of Inflammation and Infection. Front Immunol. 2018 Apr 13; 9:754. doi: 10.3389/fimmu.2018.00754. PMID: 29706967; PMCID: PMC5908901.
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