

“Design and Fabrication of Upanaha Equipment for Treatment of Osteoarthritis”

Dr. Amrutha Chandran^{1*}, Dr. Rohini Purohit²

¹Assistant Professor, Department of Panchakarma,

Gangaputra Ayurvedic Medical College & Hospital, Kandela, Jind, Haryana, PIN: 126102

² Associate Professor, Department of Panchakarma, Alva's Ayurveda Medical College, Moodbidri, Dakshina
Kannada -574227, Karnataka, India

*Corresponding Author: amruthachandran21@gmail.com

ABSTRACT

BACKGROUND: Upanaha is one of the Swedana procedures that have been proven to be efficacious in treating various Vatavyadhi such as Sandhigata Vata with pain and stiffness as presenting symptoms. Due to the resemblance of signs and symptoms, Sandhigata Vata may be correlated to osteoarthritis. Though Upanaha is mentioned to be retained on the part affected for 12 hours. In clinical practice, we find a deficit in its application due to non-compliance of the patient. Moreover, Upanaha being a wet heat application, has the disadvantage of quick cooling due to evaporation and inability to retain heat. Hence this study aims to design and fabricate an equipment to maintain uniform temperature and provide a convenient method of administration by using a modified technique and analyze its efficacy in Janu Sandhigata Vata (Osteo Arthritis). The heating system ensures consistent and controlled temperature regulation, allowing for the optimal release of active compounds from the herbal poultices. The supplied heat can be controlled using a monitoring system where the desired temperature can be set which is in the range of 25 °C to 65 °C. The equipment's fabrication involved the use of high-quality materials and components, ensuring its durability and reliability. The poultice is applied over the affected region of the patient and device is kept over the poultice.

Keywords: Upanaha, Poultice, osteoarthritis, constant heat supply, Monitoring system, portable device.

INTRODUCTION

Upanaha is one of the Swedana procedures that have been proven to be efficacious in treating various Vatavyadhi such as Sandhigata Vata with pain and stiffness as presenting symptoms. Due to the resemblance of signs and symptoms, Sandhigata Vata may be correlated to osteoarthritis. Though Upanaha is indicated to be performed for 12 hours but in clinical practice we find a deficit in its application due to various reasons like non-compliance of the patient and unable to retain heat. More over Upanaha being a wet heat application, it has disadvantage of quick cooling due to the evaporation. There are very few studies addressing the time factor and temperature of Upanaha among which a study has established that the application of Upanaha yielded highly significant effect in reducing the swelling, stiffness, and pain within 30 minutes when the ideal temperature was maintained.

A variety of heating methods can be used to provide heat in small areas. Those include electrical elements or heat-producing chemicals. Electric heat applications are utilized for local heat application, they are easy to use, relatively reliable, provide warmth and can easily get the shape of the body part they are applied to. Heating of the tissue is by conduction so that the effect is merely superficial, so it is safe and comfortable.

Since it is proven that the Upanaha along with maintenance of ideal temperature using any heating modalities yielded highly significant effect in reducing the swelling, stiffness and pain and it reduced the time taken for the treatment as well as improved the efficacy of Upanaha.

Hence this study aims to develop an equipment to maintain uniform temperature and provide a convenient method of administration by using a modified technique and analyze its efficacy in Janu Sandhigata Vata (Osteoarthritis)

This would prevent heat loss in Upanaha which might be beneficial to reduce the time of the therapy. It would also improve the efficacy of the procedure by providing better quality of life with minimum pain and discomfort which is the

need of the hour.

OBJECTIVES:

- To develop an equipment to maintain constant temperature in *Upanaha*.
- To reduce the time duration and increase the effectiveness of treatment.
- To evaluate the modified *Upanaha* technique using the equipment in Janusandhigata Vata(Osteoarthritis).

METHODOLOGY AND EXPERIMENTAL

The methodology employed in this study involved a combination of literature review and empirical investigation, utilizing surveys, interviews, and observations. The research design and data collection techniques aimed to provide a comprehensive understanding of the design and development of Upanaha equipment. The data analysis procedures allowed for quantitative and qualitative exploration of the participants perspectives and experiences.

EXPERIMENTAL:As the below figure shows the catia-v5 model of the Upanaha equipment which consists of PCB circuit which is having set buttons for setting the temperature as required for patients comfortness , Arduino boards maintains the constant temperature and the heating pad consists of nylon cloth, asbestos cloth ,Teflon coated heating coil .

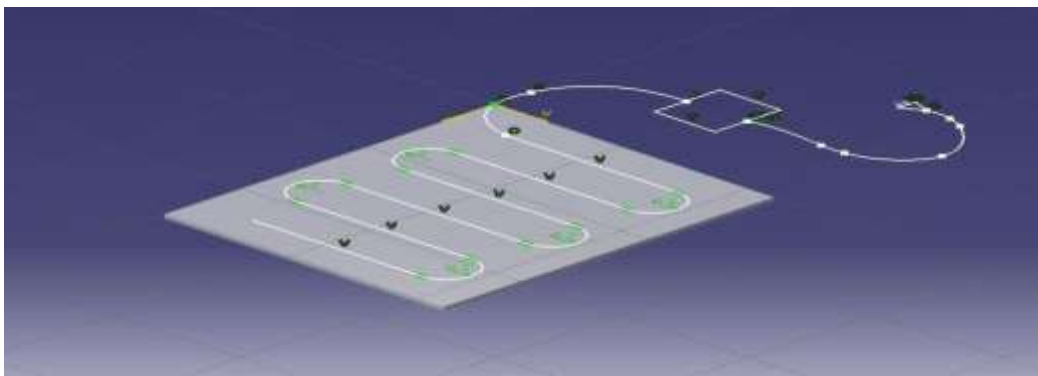


Figure4.2 shows analysis of the equipment using catia-v5 software

MATERIALS USED:

NYLON CLOTH

As shown in the below figure4.2 nylon cloth is used in skin side of the equipment so it can transfer the heat asneeds for patients. Nylon is a durable synthetic material that can withstand high temperatures and repeated usewithout tearing or degrading. Nylon is flexible and can be easily molded into different shapes and sizes, making it an ideal material for heating pads that need to be contoured to fit different body parts. Nylon is a good insulator, which helps to keep the heat generated by the heating pad focused onthe body and prevent it from dissipating too quickly. Nylon is moisture-resistant, which means that it won't absorb sweat or other fluids,making it easy to clean and maintain. Nylon is an affordable material, making it an accessible option for manufacturers looking tocreate cost-effective heating pads.



figure 4.3 shows the nylon cloth

Table 4.1 shows specifications of nylon cloth

Density	1.15 g/cm ³
Thermal conductivity	10 ⁻¹² S/m
Electrical conductivity	0.25 W/(m·K)
Melting point	190–350 °C 374–663 °F

ASBESTOS CLOTH

As shown in below figure4.3 asbestos cloth is used in the heating equipment as it is having less electrical conductivity and it retain the heat. Asbestos cloth used to be a popular material in heating pads because it has excellent insulating properties and can withstand high temperatures. Asbestos fibers are naturally occurring minerals that are

highly resistant to heat and fire, making them a useful material in many industrial and consumer applications. In heating equipment, asbestos cloth is often used as a layer of insulation between the heating element and the outer fabric covering. The asbestos cloth helps to contain the heat within the pad, ensuring that the user does not get burned and that the pad maintains a consistent temperature.



figure 4.4 shows the asbestos cloth

Table4.2 shows specifications of asbestos cloth:

Density	2.426i 2.646 G/cm3(Kg/m3)
Thermal conductivity	0.09 W/m-K at 600°C
Electrical conductivity	-

Melting point	1750°C
----------------------	--------

TEFLON COATED HEATING COIL:

As shown in below figure 4.4 Teflon coated heating coil is used in this equipment as it is shock resistant and its maximum heating temperature is 90°C. Teflon, also known as polytetrafluoroethylene (PTFE), is a non-stick and heat-resistant material that is often used in various applications, including in heating pads. The reason Teflon coated heating coils are used in heating pads is because Teflon has excellent heat resistance properties and can withstand high temperatures without melting or degrading. This makes it an ideal material to use for heating coils, which need to be able to withstand high temperatures without breaking down. In addition, the non-stick properties of Teflon make it easier to clean and maintain the heating pads. It also reduces the risk of the heating pad sticking to the skin or clothing, which could cause burns or other injuries. Overall, Teflon coated heating coils provide a safe and effective way to generate heat in heating pads, ensuring that they can be used for extended periods without any issues.



figure 4.5 shows Teflon coated heating coil

Table 4.3 shows specifications of teflon coated heating coil :

Density	2200 kg/m ³
Melting point	600 K (327 °C)

JEANS CLOTH:

Jeans, on the other hand, are typically made from denim, a sturdy and durable cotton fabric. While denim is not commonly used in heating pads, it is often used for clothing due to its durability and versatility. Jeans are known for their durability and resistance to wear and tear, which makes them suitable for everyday use.



figure 4.6 shows the jeans cloth

Table4.4 shows specifications of denim cloth:

Density	560 g / m2 (depending on the areas of use).
Melting point	290i(mean ignition)

COMPONENTS USED FOR MONITORING AND CONTROLLER THE TEMPERATURE:

1. HLK-PM01:



figure 4.7 shows HLK-PM01

HLK-PM01 is a compact AC-DC power supply module designed for low-power applications. It's a fully enclosed module that can convert 100-240V AC input voltage to 5V DC output voltage, with a maximum output power of 1 watt (200 mA). The module has a high efficiency of up to 80%, and it can operate at temperatures ranging from -20°C to +60°C.

The HLK-PM01 module is designed for easy integration into various applications, such as home automation, industrial control systems, and smart devices. It has built-in over-voltage, over-current, and short-circuit protection, which ensures safe and reliable operation. The module also meets various safety and environmental standards, including CE, FCC, and RoHS. Overall, the HLK-PM01 module is a reliable and efficient solution for low-power applications that require a stable 5V DC power supply.

2. RELAY:



figure 4.8 shows relay

A relay is an electrical component that is used to switch high-power or high-voltage circuits using a low-power or low-voltage signal. It works by using an electromagnetic field to activate a mechanical switch, which then closes or opens the circuit.

A typical relay consists of a coil, a movable armature, and one or more sets of contacts. The coil is energized by a small voltage or current, which generates an electromagnetic field. This field then attracts the movable armature towards the coil, which causes the contacts to either open or close the circuit, depending on the relay's design. Relays are used in a wide range of applications, from simple circuits like turning on/off lights or fans to complex control systems used in industries like manufacturing, transportation, and aerospace. They can switch both AC and DC circuits, and they can handle high currents and voltages. They are also available in various configurations, including single-pole/single-throw (SPST), double-pole/single-throw (DPST), and so on. Overall, relays are an essential component in many electrical systems, as they provide a safe and reliable way to control high-power circuits using low-power signals.

3. ARDUINO NANO:

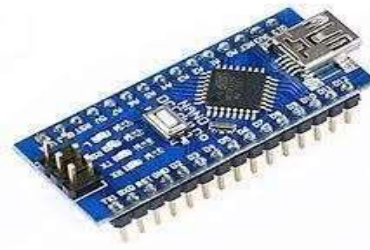


figure 4.9 shows Arduino Nano

Arduino Nano is a small, low-cost microcontroller board based on the atmega328p microcontroller chip. It's similar to the Arduino Uno board but is smaller in size and has a few different features. The board is designed to be used in various applications, including robotics, home automation, and electronic projects.

The Arduino Nano board has 14 digital input/output pins and 8 analog input pins, which can be used to connect various sensors, actuators, and other electronic components. It also has a built-in USB port for programming and power, as well as a power jack for an external power source. The board can be powered by a USB cable or a DC power supply.

Arduino Nano is programmable using the Arduino programming language, which is based on C/C++. It also has a bootloader program that allows it to be programmed without using a separate programmer. The board can be programmed using the Arduino IDE software, which is available for Windows, Mac, and Linux operating systems.

Overall, Arduino Nano is a versatile and affordable microcontroller board that is suitable for various DIY projects, prototyping, and learning. It's easy to use and program, and it has a large community of users and developers who share their projects and knowledge online.

4. OLED I2C:



figure 4.10 shows OLED I2C

OLED I2C display is a type of display module that uses organic light-emitting diodes (OLEDs) to produce bright and vivid images. It has a built-in I2C interface, which allows it to be easily connected to microcontrollers like Arduino and Raspberry Pi. The OLED I2C display module consists of an OLED panel, a driver IC, and an I2C interface chip. It typically has a resolution of 128x64 pixels or 128x32 pixels, and it can display text, graphics, and even animations. The OLED technology provides high contrast and wide viewing angles, making it suitable for various applications. The I2C interface allows multiple OLED displays to be connected to a single microcontroller using just two wires, making it easy to use and reducing the number of wires needed in the circuit. The I2C communication protocol also allows the microcontroller to control the display, change the contrast, and adjust the brightness. Overall, OLED I2C display is a popular choice for small-sized display applications due to its high contrast, wide viewing angle, and easy interfacing with microcontrollers. It's widely used in various DIY projects, smart devices, and industrial applications.

5. THERMISTORS:



figure 4.11 shows Thermistors

Thermistors are temperature-sensitive resistors that change their resistance based on changes in temperature. They are made of semiconductor materials, such as ceramic or polymer, and their resistance decreases as temperature increases (negative temperature coefficient, NTC) or increases as temperature increases (positive temperature coefficient, PTC). Thermistors are commonly used as temperature sensors in various electronic circuits, including thermostats, temperature controllers, and thermometers. They are also used in power supply circuits to protect against overheating and in temperature compensation circuits to improve the accuracy of measurements.

Thermistors come in various shapes and sizes, and they have different temperature ranges and accuracy levels. They can be either bead-shaped or disc-shaped and are available in a range of resistance values. Their resistance-temperature characteristics are typically specified by the manufacturer, and they can be calibrated and characterized to provide accurate temperature readings. Overall, thermistors are versatile and affordable temperature sensors that provide a reliable and accurate way to measure temperature in various electronic circuits and applications.

6. **SPST rocker switches:**



figure 4.12 shows SPST rocker switches

SPST rocker switches make or break the connection of a single conductor in a single branch circuit. This switch type typically has two terminals and is referred to as a single-pole switch. SPDT rocker switches make or break the connection of a single conductor with either of two other single conductors.

7. **PUSH BUTTONS:**



figure 4.13 shows push buttons

A push button switch is a mechanical device used to control an electrical circuit in which the operator manually presses

a button to actuate an internal switching mechanism.

8. **10K RESISTORS:**



figure 4.14 shows 10k resistors

The 10K Ohm resistor is a passive electronic component used to control the flow of electric current in a circuit. It has a resistance value of 10,000 Ohms and is used to limit the current flow in a circuit to a specific level .

9. **CONNECTING WIRES:**



figure 4.15 shows connecting wires

A wire is a flexible strand of metal, usually cylindrical. Wires are used for establishing electrical conductivity between two devices of an electrical circuit. They possess negligible resistance to the passage of current.

CIRCUIT DIAGRAM AND PROGRAMMING

shown in below circuit which consists of stepdown transformer, thermistors, relay, push buttons HLKPM01, Arduino NANO, OLED 12C SPST rockers switchers ,10K resistors which are used to maintain the constant temperature throughout the process by monitoring the equipment.

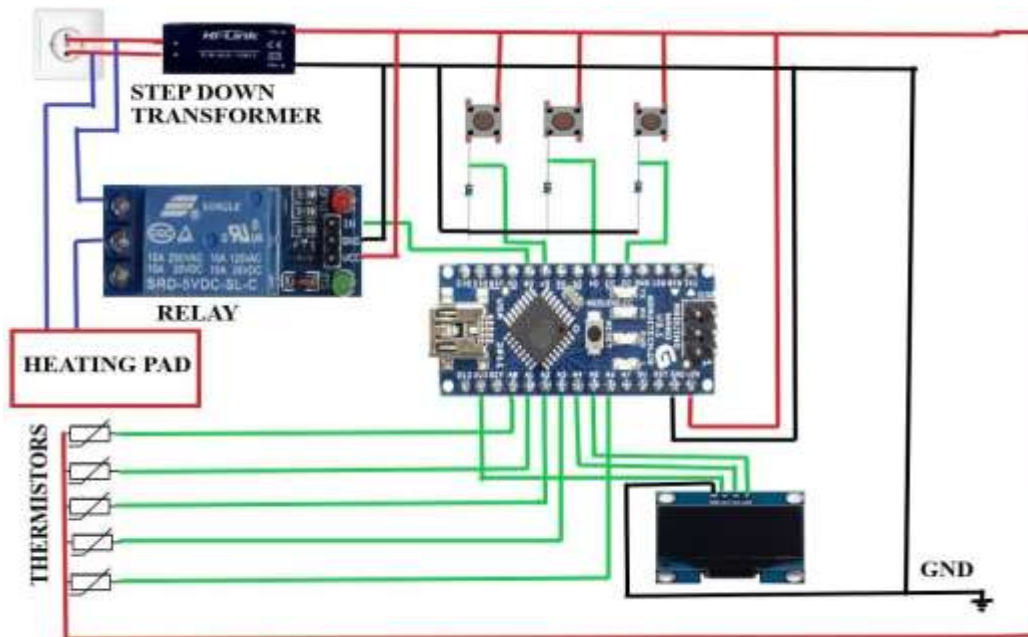
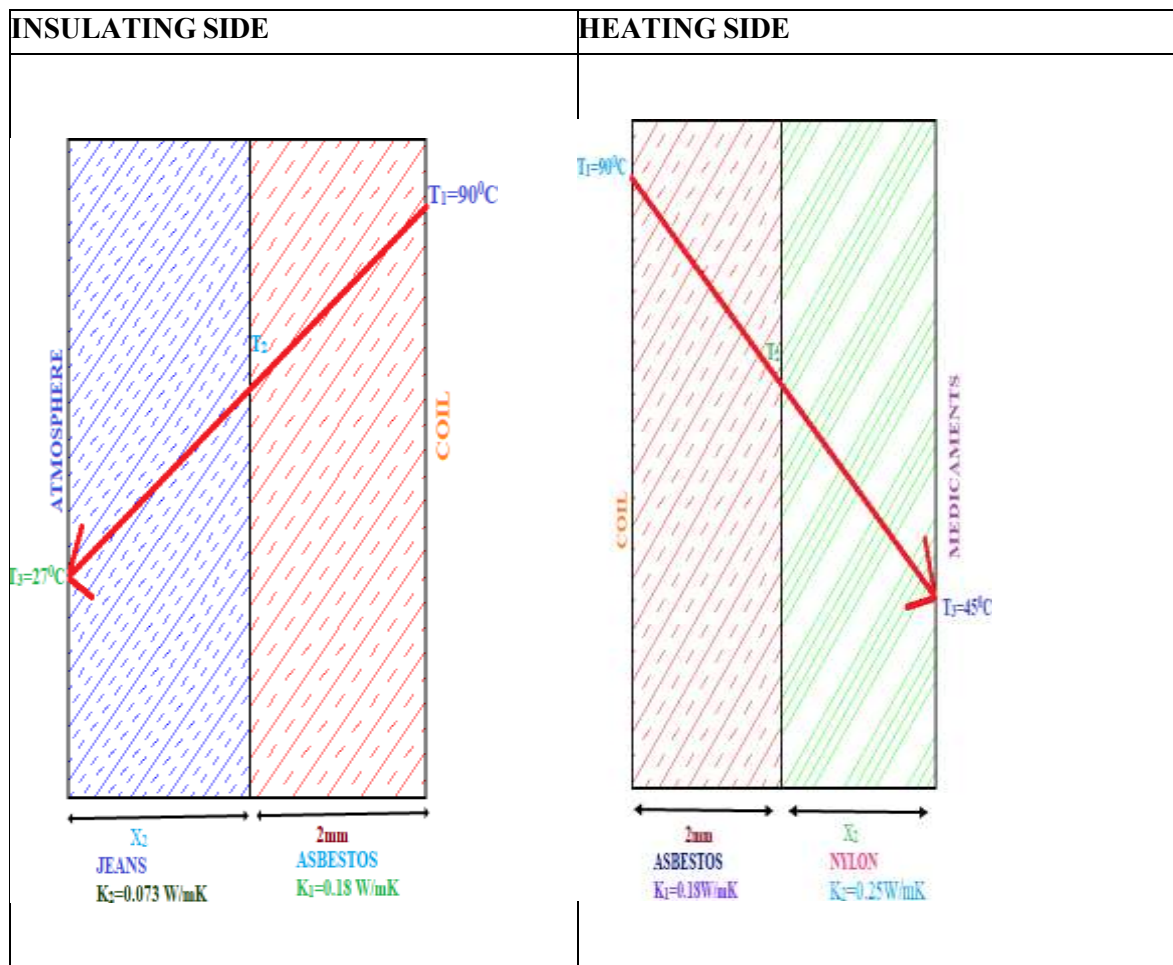


figure 5.1 shows circuit diagram

RESULT AND DISCUSSION



With the help of the “Fourier's law” is also called the law of thermal conduction equations or the law of thermal conductivity.

Fourier's law: - “Fourier’s law of thermal conduction states that the rate of heat transfer through a material is proportional to the negative gradient in the temperature and the area (perpendicular to the gradient) of the surface through which the heat flows.”With the help of the Fourier’s law, we are going to calculate the how much heat coming out of the layer by layer and how much thickness and thermal conductivity of cloth required to get the desired output from the heating equipment.

Feedback by patients

As below figure 6.1 shows feedback from 7 patients who had undergone Upanaha Kalpana treatment using this equipment. They stated that the device used for the treatment helped them to recover faster and it was more effective than the traditional method used. The device was comfortable to them during the treatment

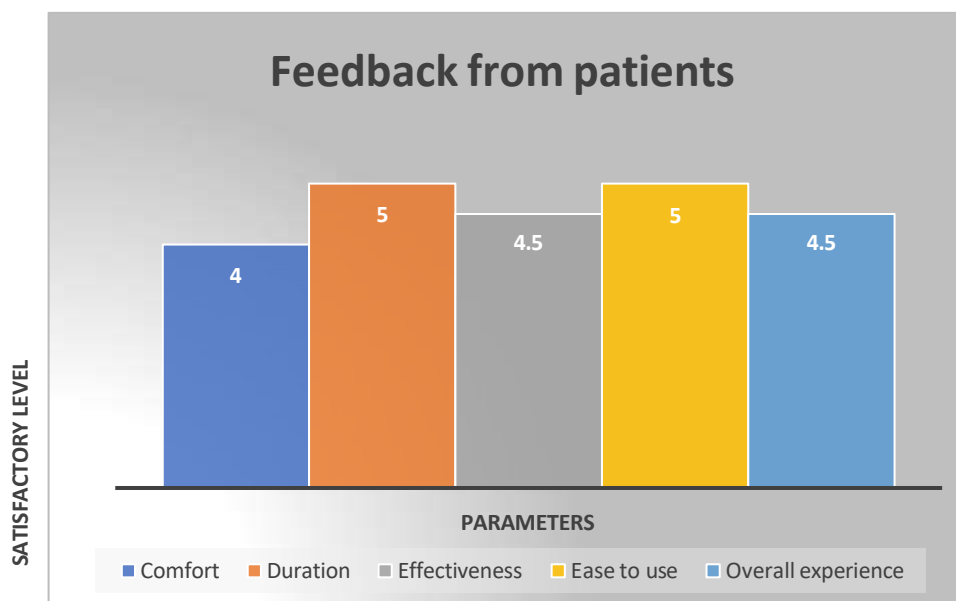
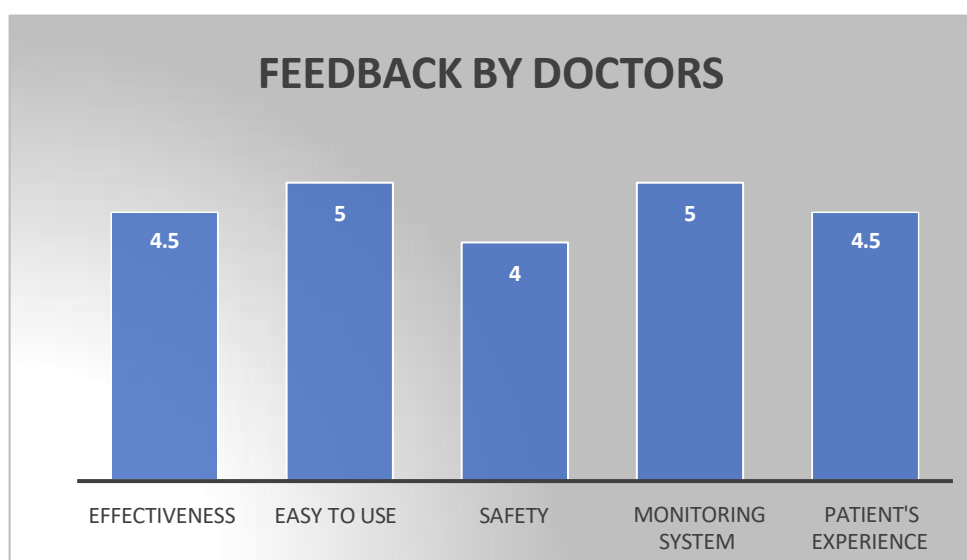


Figure 6.1 shows the gathered feedback from 7 patients is analyzed using graph

Feedback by doctors

As below figure 6.2 shows Feedback from doctors and nurse about the usability of equipment for Upanaha Kalpana treatment. They were satisfied with the equipment and easy for them to treat a patient using this equipment. They also found that this method was way more effective than the traditional method used for the treatment.

Figure 6.2 shows Feedback on the equipment from 4 doctors



STIMULATION OF EQUIPMENT

With help of ANSYS software we analyzed our calculation and we got the result same as our theoretical calculation. the below figures are the result we got from ANSYS analyses and that will be done using the area of the equipment, thermal conductivity and the thickness of the cloths used to get the desired output.

The below figures shows that the heat dissipation will be happened during the using of the heating equipment. when the coil producing the heat that will be passing through the layer by layer that time the heat is coming out of the equipment with some loss of heat. Based on the thermal conductivity and the thickness of the cloth the desired output will be coming out of the heating equipment. With the changing of the thickness and thermal conductivity we can get the desired output what we required for our applications requirements. Based on these analyses and the theoretical calculation we are selected the cloths for our project work with the consideration of the cost of the cloth.

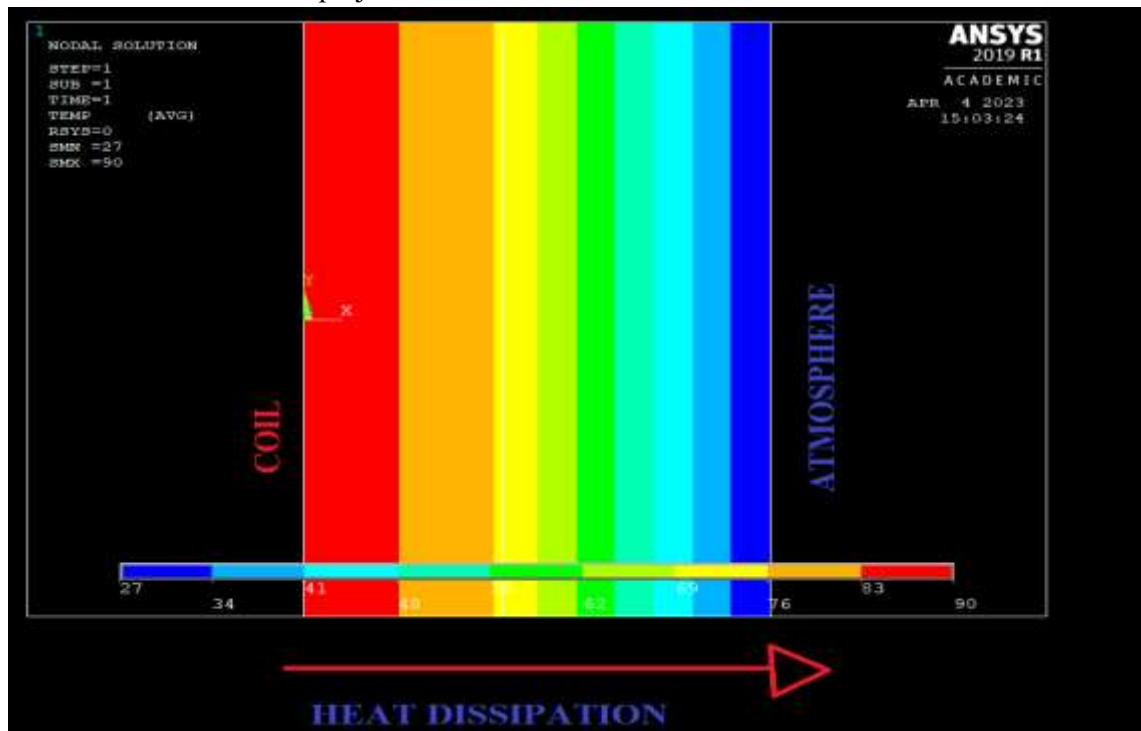


figure 6.3 shows the insulating side

As shown in above result stimulation ,it represents the heat transfer rate from coil side to atmospheric side. Coil has maximum temperature of 90°C ,as the heat developed by the coil during the supply of heat to atmospheric side through asbestos cloth and jeans cloth around 27°C heat released to atmosphere remaining heat will be retained within the equipment.

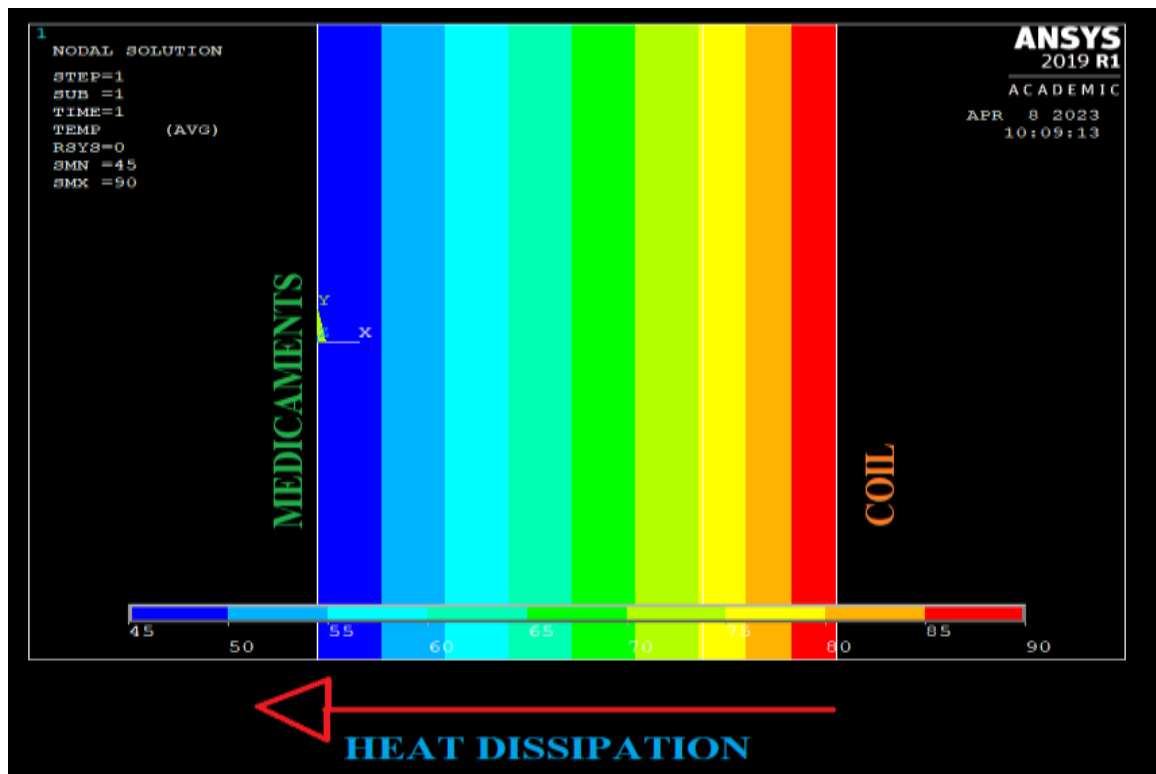


figure 6.4 shows the heating side

As shown in above result stimulation ,it represents the heat transfer rate from coil side to medicaments side. Coil has maximum temperature of 90°C ,as the heat developed by the coil during the supply of heat to medicaments side through asbestos cloth and nylon cloth desired amount of heat will be released to medicaments with respect to patient comfortable.

DISCUSSION:

Standard and consistency

Treatment Undergone using the equipment had higher effective rates ratherthan following traditional method. In this equipment, we have installed it with anautomatic power cut-off device and the heat flow can be monitored.

Technological Integration

By integrating the digital interface, we witnessed that it has more benefits thantraditional methods. This digital interface can be monitored and controlled by patientsas they desire.

Safety Features and Hygiene

It has an automatic circuit breaker when it reaches maximum temperature. Beyond the maximum temperature, the device will automatically shut down. It also contains a safety switch which can be used in emergency situation. It can be easily cleaned using a wet cloth over the heating surface.

Patient Comfort and Compliance

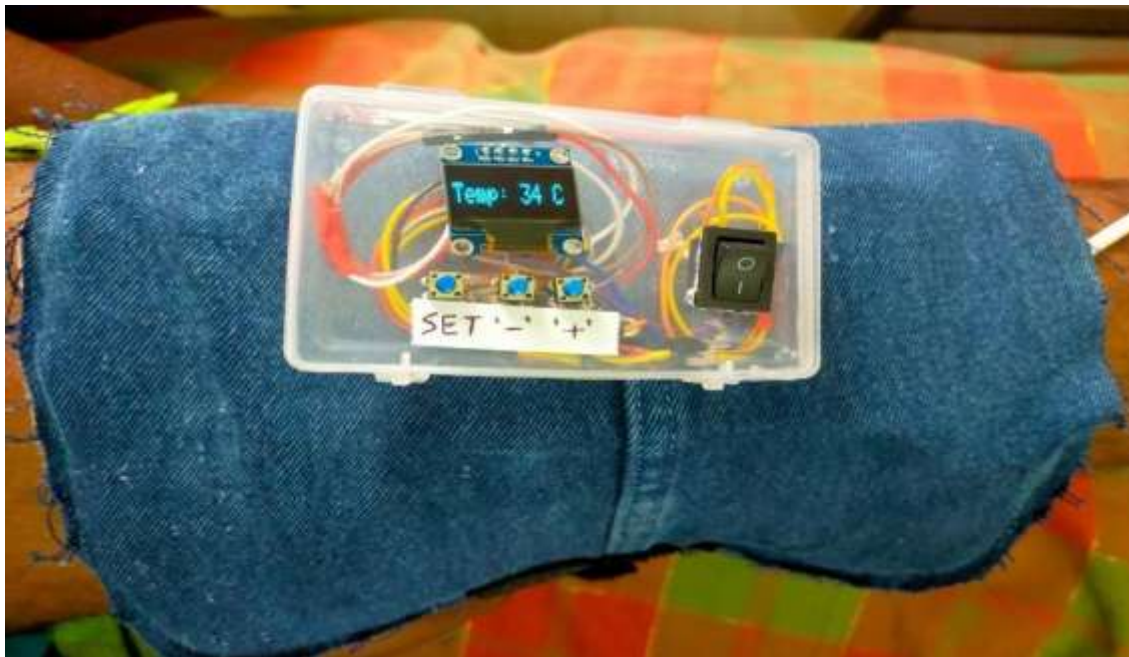
We have used light weight materials which is able to withstand high temperatureand device is portable so that it can be used everywhere at any point of time. The patients were very much comfortable using this equipment.

Integration into Healthcare Settings

This device has a huge potential for treating Upanaha Kalpana treatment. This device should undergo lot of testing over patients and collect data from both doctors as well as patients for further improvisation. Using this device for the treatment would reduce the time when compared to traditional method of treatment.

Future Directions

Equipment can be further improvised or developed by using some advance material which is biodegradable. It can be made using inbuilt rechargeable batteries which would be more convenient to use. On further research on the materials will have huge advantage and helps in increasing effectiveness of the treatment.



Final equipment

CONCLUSION

- The results of analytical method and numerical method was satisfied.
- The equipment made was successful in controlling the flow of heat and monitor the equipment
- It was able to transfer the required amount of heat to the affected area.
- The model should be tested on the patients and get their feedback and implement in future scope

FUTURE SCOPE

- The equipment can control the heat flow more precisely by using PWM concepts and using some accurate sensors.
- Can be use different materials to transmit heat efficiently and provide good electrical insulation.
- Can able to develop the equipment by embedding the ayurvedic paste used for arthritis in equipment itself.
- More environmentally friendly materials can be used so that it can be decomposed easily

REFERENCES

1. Agnivesha, Charaka Samhita with Ayurveda Deepika commentary of Chakrapani Datta, edited by Dr Ram karan Sharma, Vaidya Bagawan Dash, Chaukamba Sanskrit series office, Varanasi, reprint (2009), varanasi, Sutra Sthana 14/8, page no:270-271: <https://jaids.in/jaids/article/view/1882>

2. Vaidya Sodhala, Gadanigraha, The vidyotini hindi commentary, Ed Sri Ganga Sahaya Pandeya, Chaukhambha Sanskrit sansthan, Varanasi, Vatavyadhi nidana: 22, pp: 473:
https://www.researchgate.net/profile/Milind-Nisargandha/publication/346438864_Comparative_effect_of_Ashwagandha_With_ania_Somnifera_and_Chincha_Tamarindusindica_Matrabasti_in_Katigraha_Low_backache_A_study_Protocol/links/5fc1dddf458515b7977c509e/Comparative-effect-of-Ashwagandha-Withania-Somnifera-and-Chincha-Tamarindusindica-Matrabasti-in-Katigraha-Low-backache-A-study-Protocol.pdf
3. Dr.Swapna K.V, SDM College of Ayurveda and Hospital Hassan (2006) "Effect Of Devadarvyadi Upanaha In Janusandhigatavata".
<https://doi.org/10.1016/j.ijsr.2023.108315>
4. Dr.H.V.Happy Alvas Ayurveda Medical College And Hospital,(2019) Comparative Clinical Study On The Effect Of Mustadi And Devadarvadi Upanaha Sweda In Janusandhigatavata.
[DOI:https://doi.org/10.21760/jaims.v6i5.1483](https://doi.org/10.21760/jaims.v6i5.1483)
5. Dr.Divya.B, Alvas Ayurveda Medical College, Moodbidri (2015) "Comparative Clinical Study On The Effect Of Jatamayadi And Devadarvadi Upanaha Sweda In Janusandhigata Vata".[DOI:10.5958/2321-5763.2018.00179.8](https://doi.org/10.5958/2321-5763.2018.00179.8)
6. Agnivesha, Charaka Samhitha with English Translation and Critical Expositin Based on Chakrapani Datta's Ayurveda Deepika Commentary Ed RK. Sharma, Bhagawandash, Chaukhambha Sanskrit series, Varanasi,2013, vol15 chikitsasthana,28:37, pp:30 <http://go.microsoft.com/fwlink/p/?LinkId=255141>
7. Dr.Arun.T, Sjj Ayurveda Medical College and Hospital PG Studies and Research Centre, Koppal Comparitive study of Vachadi Upanaha Sweda and Short Wave Diathermy in Janusandhigata vata wsr to osteoarthritis of knee joint": [DOI: 10.1055/s-0042-1743507](https://doi.org/10.1055/s-0042-1743507)Dr. Priyanka.P.S Alvas Ayurveda Medical College And Hospital,(2017) "Randomized Clinical Trial to Evaluate the Combined Effect of upanaha with heating pad in janusandhigatavata":<http://hdl.handle.net/123456789/2968>
8. Sushrutha, Sushruta samhita text, English translation, By Kaviraj Kunjalal Bhishagratna, Chowkhamba Sanskrit series Office, Varanasi, Chikitsa sthana 32:10 pp: 659": <https://doi.org/10.1111/j.1469-7580.2010.01294.x>.
9. Tinnwatson,churchil living stone, Electrotherapy Evidence Based Practice, Jaypee Brothers Medical Publishers,edition(2008), page no:131.
<https://doi.org/10.1016/j.arth.2021.04.004>
10. Berman A, Synder.S, Koizer.B,Erb. G. Kozier and Erbs fundamentals of nursing,8th edition, New Jersey: prentice hall: in tech:2008. <https://doi.org/10.1016/j.arth.2021.04.004>
11. Agnivesha, Charaka Samhitha with English Translation and Critical Expositin Based on Chakrapani Datta's Ayurveda Deepika Commentary Ed R.K. Sharma, Bhagawandash, Chaukhambha chikitsasthana,28:37, pp:30 Sanskrit series, Varanasi,2013, vol5 <http://go.microsoft.com/fwlink/p/?LinkId=255141>
12. Vaidya Sodhala, Gadanigraha, The vidyotini hindi commentary, Ed Sri Gangal Sahaya Pandeya, Chaukhambha Sanskrit sansthan, Varanasi, Vatavyadhi nidana: 22, pp: 473. [DOI: 10.4103/ijar.ijar_23_22](https://doi.org/10.4103/ijar.ijar_23_22)
13. Yuging zhang, Joanne m, Jordan,Epidemology of osteoarthritis, Clinics in Geriatric Medicine, August 2010 voume 26,issue 3,pages355-369: [DOI:https://doi.org/10.1016/j.cger.2010.03.001](https://doi.org/10.1016/j.cger.2010.03.001)
14. Sushrutha Sushruthasamhitha with Nibandhasangraha Commentary of Dalhanacharya and Nyayachandrika Panjika of Gayadasa Acharya on Nidanasthana edited by Vaidya Yadawji Trikamji Acharya Choukamba Orientalia, Varanasi, reprint (2004), uttar Pradesh,Chikitsa Sthana 4/8-page no.420. [https://doi.org/10.1016/S0889-857X\(05\)70127-7](https://doi.org/10.1016/S0889-857X(05)70127-7)
15. Dr.Arun.T, Sjj Ayurveda Medical College and Hospital PG Studies and Research Centre, Koppal Comparitive study of Vachadi Upanaha Sweda and Short-Wave Diathermy in Janus andhigata vata wsr to osteoarthritis of knee joint". <https://doi.org/10.1080/21681163.2019.1647459>Agnivesha Charaka samhitha with English Translation and Critical Exposition Based on Chakrapani Datta's Ayurveda Deepika Commentary Ed R.K. Sharma, Bhagawandash, Chaukhambha Sanskrit series, Varanasi, 2012, Voll Sutrasthana 22:11, pp388:[DOI:](https://doi.org/10.1016/j.ijsr.2023.108315)

<https://doi.org/10.21760/jaims.v3i02.379>

16. P.Sushma,Ch.Sadanandam,Critical Review of Swedana Karma wsr to Physical Medicine, Int Journal of Ayu Pharm Chem, 2016 Vol-5 issue 2, published 10/9/16,(e [DOI:https://doi.org/10.1016/j.sjbs.2020.11.049](https://doi.org/10.1016/j.sjbs.2020.11.049)
17. ISSN 2350-0204),19/2/18. 16. Vaidya Sodhala, Gadanigraha, The vidyotini hindi commentary, Ed Sri Ganga Sahaya Pandeya, Chaukhambha Sanskrit sansthan, Varanasi, Svedadhikara [DOI: https://doi.org/10.21760/jaims.v4i05.743](https://doi.org/10.21760/jaims.v4i05.743)
18. Dr swapna.k .SDM Ayurveda college Hassan (2006),To evaluate the efficacy ofDevadarvyadi Upanaha in Sandhigata vata.. [DOI: https://doi.org/10.4108/eai.12-4-2021.169184](https://doi.org/10.4108/eai.12-4-2021.169184)
19. Dr.Ashwini.T.S Alvas Ayurveda Medical College (2014) " Comparative Clinical study on the effect of Kulathaadi and Devadarvadi Upanaha Sweda Janusandhigatavata <https://doi.org/10.55691/2582-3868.1001>.
20. http://www.iamj.in/posts/images/upload/1935_1940.pdf.
21. www.ncbi.nlm.nih.gov/pmc/articles/pmc5017174.
22. www.google.com