

Effect of Superficial Hot Versus Cold Application on Low Back Pain among Patients with Disc Prolapse

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Abstract: Low back pain is a common disorder involving the muscles and bones of the back. It affects about 80% of people at some point in their lives. Aim of the study was to determine effect of hot versus cold application on low back pain among patients with disc prolapse. Design a quasi experimental research design was utilized Setting: The study was carried out in neurosurgery out patient's clinic of University and Teaching hospitals of Menoufia governorate, Egypt. Subjects: A random sample of 150 adult patients of both sexes with disc prolapse was selected and assigned alternatively and randomly into three equal groups, 50 patients each. Tools: two tools were used for data collection: Interviewing questionnaire and Visual Analogue pain Scale. Results: There was an improvement in mean total knowledge score about disease process in group I and II from 3.44 and 3.26 before application to 4.8 and 5.8 5 days post application to 6.88 and 7.52 respectively post 2 weeks of application. There was an improvement in mean total knowledge score about compresses application in group I and II from 1.48 and 2.90 before application to 8.58 and 9.10 5 days post application to 9.40 and 9.48 respectively post 2 weeks of application. Also there was a decrease in pain score in group I from 7.24 before application to 5.20 5 days post hot application to 4.36 2 weeks post application . Conclusions: Total knowledge increased, level of Pain decreased among disc prolapse patients who use hot compresses than those who exposed to cold compresses and routine medical treatment. Recommendations: Supervised health teaching program should be carried out for patients with disc prolapse in the neurosurgery outpatient clinics about effect of hot application to improve their pain.

Keywords: Low back pain, Disc prolapse, hot and cold compresses.

1. INTRODUCTION

Low back pain is a common disorder involving the muscles and bones of the back. It affects about 80% of people at some point in their lives .It may be divided according to duration as acute, sub chronic, chronic. Or classified according to etiology as mechanical, non-mechanical, or referred pain ⁽¹⁾.

Prolapsed disc is the major health problem that causes intolerable low back pain .It is the most common cause of job-related debility and a foremost contributor to missed work. Fortunately, most occurrences of low back pain go away within a few days. Others take much longer to resolve or lead to more serious conditions. Once it occurs, it drives people to know what's wrong and what it will take to relieve the pain and prevent recurrence ⁽²⁾.

Back pain can arise when somebody lifts heavy object that causing a twist, strain, or spasm in one of the muscles or ligaments in the back. If the spine becomes compressed, a disc may rupture or protuberance outward. This rupture causes

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pressure that affecting more than half nerves rooted to the spinal cord that control body movements and spread signals from the body to the brain. When these nerve roots become compressed, back pain occurs ⁽³⁾

Treatment of prolapsed disc differs from person to another according to severity of condition and the age of the patient. There are two options either medical treatment or surgical treatment. Medical treatment measures include bed rest and limited activity for several days, gradual increase in activity is suggested over a period of time and Anti-inflammatory drugs are recommended, Steroids are sometimes prescribed for a short duration. In addition, medications that relax the surrounding muscles tension and spasms are also prescribed for some patients. Moreover massage and provide hot or cold may enhance pain management in early stages of injury. ⁽⁴⁾.

Superficial heat can be used to alleviate pain and reduce muscle spasm by the effect of vasodilatation which increasing blood flow to injured area. Also increasing metabolism, reducing oxygen tension, lowering pH level, increasing capillary permeability, and releasing histamine causing vasodilatation. While superficial cold therapy constricts the blood vessels and slows down the metabolism of the cells which lowers the need for the oxygen and nutrients, slows the rate of cell death and the resulting excess buildup of blood and fluid ^(5,6).

The nurse has the greatest role in relieving pain for patients has disc prolapse and low back pain that beginning from assessment of pain and clinical manifestations associated with it. And provide care through application of hot or cold therapy to reduce level of pain. Also the nurse should know that the body reaction to heat, cold application and method, duration of application, degree of temperature, client age and physical condition and one of the main nursing role is assessing the application's area to avoid damage of tissues especially if the area is traumatized ⁽⁷⁾.

Aim of this study:

To determine the effect of superficial hot versus cold application on low back pain among patients with disc prolapse.

Research hypotheses:

- 1-There will be a reduction in low back pain among patients using superficial hot or cold application compared to control group who will use the medical treatment only.
- 2-There will be a reduction in low back pain among patients using superficial hot application than patients using superficial cold application.

2. SUBJECTS & METHOD**Research Design:**

To achieve the aim of this study a quasi experimental research design was utilized (prospective study).

Research setting: The study was carried out in neurosurgery out patient's clinic of University and Teaching hospitals of Menoufia governorate, Egypt.

Subjects:

A random sample of 150 adult patients of both sexes with disc prolapse was selected and assigned alternatively and randomly into three equal groups, 50 patients each.

Group I (study group1):- patients received superficial hot application along with routine medical care. Group II (Study Group 2):- patients received superficial cold application along with routine medical care. Group III (control Group):- Patients were exposed only to routine medical care.

Sampling Technique:-

Based on the review of the relevant literature the prevalence of low back pain was 33% (El-Bahrawy et al.,2010 and Deyo et al., 2011) ^(8,9).The sample size was determined and calculated using EBI programme and it was 136 case and was increased to 150 case to increase the power of the study. The confidence interval was 80%.

Inclusion Criteria:-

-Adult's patients over 18 years complaining of low back pain either acute or chronic.

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-Able to cooperate and communicate.

-Be in preoperative period.

Exclusion Criteria:-

-Patient with any other orthopedic or neurological problem that may increase the level of pain.

- Patient with sciatica.

- Patient with sensory or motor deficit.

- Post laminectomy syndrome.

Tools:-

For collecting the necessary data and achieving the aim of the study, two tools were utilized. These tools are:-

Tool I: Interviewing questionnaire.

Tool II: Visual Analogue pain Scale.

Tool I: Interviewing questionnaire.

It was developed by the researcher to assess subject's knowledge about disc prolapse and compresses application. It consisted of three parts as the following:-

Part one: Sociodemographic Data: It was compromised of 6 questions includes data related to patients age, sex, marital status, occupation, level of education and residence.

Part two: Knowledge assessment: It contained questions to assess patient's knowledge about the following:-

- The disease process (definition, causes, clinical manifestation and treatment either surgical or medical).

- Effects, side effects, duration, frequency and method of hot application.

- Effects, side effects, duration, frequency and method of cold application.

Scoring system:-

The answers were classified as completely correct, incompletely correct, and incorrect answer. Each item given a score of two marks for complete correct answer, one mark for incomplete correct answer and zero mark for incorrect answer. Then the scores was summed up with a higher score indicated good knowledge.

Part three: Side effect of the used method of application:

It included a question about side effect that appeared after using hot application such as redness, inflammation of the skin, hotness, superficial burn and high body temperature. It also included side effects of cold application such as low body temperature, numbness & dryness of the skin.

Tool II: - Visual Analogue Pain Scale (VAS):

It was developed by **Bain et al ., (2005)**⁽¹⁰⁾.to rate the subjects level of pain intensity. The measurement was from zero to ten ,in which zero means no pain while score from 1to 3 denoted mild pain, score from 4 to 6 indicated moderate pain and score from 7 to 10 illustrated worst pain .

Methods:

Written approval: A written approval from ethical committee was obtained to carry out the study then an official letter from Menofia Faculty of Nursing was delivered to the responsible authorities of Menofia university and Shebin Elkom Teaching hospitals (hospital administrators and the head nurses of out patient's clinics) to obtain written approval to conduct this study from them after explaining the aim of study.

Tools Development: The first tool was developed by the researcher after extensive review of the relevant literature. It was written in Arabic while the second tool was developed by Bain et al.,(2005)⁽¹⁰⁾

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Reliability: All tools were tested using a test retest method and a person correlation coefficient formula was used. The period between each test was two weeks. It was 0.97 for tool one, 0.89 for tool two.

Pilot study: A pilot study was conducted prior to the actual study on 10% of the study sample (15 patients) to test the clarity and applicability of the tools and estimate the time needed to collect data. Necessary modifications were done. Data obtained from the pilot study was excluded from the current study.

Consent: A written consent was obtained from all participants to participate in this study after explanation of the purpose of the study. Each patient was reassured that any information obtained would be confidential and would only be used for the study purpose. The researcher emphasized that participation in the study was entirely voluntary and anonymity of the patients were assured through coding of data. Patients were also informed that refusal to participate in the study wouldn't affect their care.

Data collection:

- Data collection was extended over a period of six months from January to the end of July 2014.
- Patients who agreed to participate in the study and fulfilled the inclusion criteria were included in the study and they were selected randomly and divided randomly and alternatively into three equal groups: study group I exposed to hot application along with routine medical care, study group II exposed to cold application along with routine medical care and control group III exposed only to medical care. 50 patients each.
- The researcher initiated data collection by interviewing each participant of all groups separately for assessing patient's socio demographic by using tool I part one.
- Subjects of all groups were assessed for their knowledge about disease such as definition, manifestation, causes, treatment of disc prolapse. Also their knowledge about effects, side effects, duration and method of hot and cold application were assessed using part 2
- Every subject of all groups was assessed for intensity of low back pain using visual analogue scale (tool II).
- A colored booklet with pictures was prepared that includes information about the disease process (definition, manifestation, causes, treatment of disc prolapse). Also it contains types of compresses that may decrease low back pain (hot and cold). In each of compresses, detailed information about effects, side effects, duration, and method of application were illustrated.
- All subjects of group I were interviewed in the reception of neurosurgery outpatient clinic during a certain day (Sunday) for two session to instruct them about hot application as follow :

During the first session, instruction was about disease process definition, causes, clinical manifestation and treatment of disc prolapse.

During the second session, instructions were about the superficial hot application to decrease low back pain: side effect, method of application (moist hot backs) by immersing a towel in hot water (50°C) and wrap it with another towel and apply it in the site of pain once in the morning and the other before sleeping for 15 to 20 minute for five days.

- Also all subjects of group II were interviewed in the reception of neurosurgery outpatient clinic during a certain day (Thursday) for two sessions to instruct them about cold application as follow:

During the first session, instructions were about disease process: definition, causes, clinical manifestation and treatment of disc prolapse.

During the second session, instructions were about cold application to decrease low back pain: effect, side effect, method of application (cold backs) by immersing a towel in cold water (15°C) and wrap it with another towel and apply it in the site of pain in the lower back once in the morning and the other before sleeping for 10 to 15 minute for five days.

- All subjects of all groups interviewed individually after five days and 2 weeks of application to reassess their knowledge, side effects of hot and cold compress and intensity of low back pain.

A comparison between the three groups were done for knowledge, and low back pain pre, 5 days, and 2 weeks post compresses application to determine the effect of hot versus cold application on low back pain among patients with disc prolapse.

3. RESULTS

Table 1: Distribution of all groups regarding their sociodemographic characteristics:

Sociodemographic characteristics	Group I (n=50)		Group II (n=50)		Group III (n=50)	
	No	%	No	%	No	%
	Age					
Mean ±SD	42.68±8.76		40.20±10.55		40.66±9.08	
Sex						
Male	28	56.0	36	72.0	35	70.0
Female	22	44.0	14	28.0	15	30.0
Marital status						
Single	3	6.0	2	4.0	3	6.0
Married	41	82.0	40	80.0	44	88.0
Widow& Divorced	6	12.0	8	16.0	3	6.0
Education						
Illiterate	12	24.0	17	34.0	11	22.0
Read& write	7	14.0	7	14.0	6	12.0
Basic	4	8.0	9	18.0	8	16.0
Secondary	20	40.0	8	16.0	18	36.0
High	7	14.0	9	18.0	7	14.0
Occupation						
Manual work	22	44.0	25	50.0	26	52.0
Administrative work	15	30.0	18	36.0	17	34.0
Not working	0	0.0	1	2.0	1	2.0
Housewife	13	26.0	6	12.0	6	12.0
Residence						
Urban	14	28.0	12	24.0	11	22.0
Rural	36	72.0	38	76.0	39	78.0

Table 1: Distribution all of groups regarding their sociodemographic characteristics:

It was revealed that the mean age for group I was 42.68±8.76 years, while for group II was 40.20±10.55 years and group III was 40.66±9.08 years. More than half of all groups were male (56% for group I, 72% for group II, 70% for group III). The majority of all groups were married (82%, 80% and 88% respectively). Regarding educational level, it was observed that more than one third of group I & III had secondary education (40% and 36% respectively) and more than one third of group II were illiterate (34%). As regard occupation, 44% of group I, 50% of group II and 52% of group III worked manually. About three fourth of all groups (72%, 76% and 78% respectively) lived in rural areas.

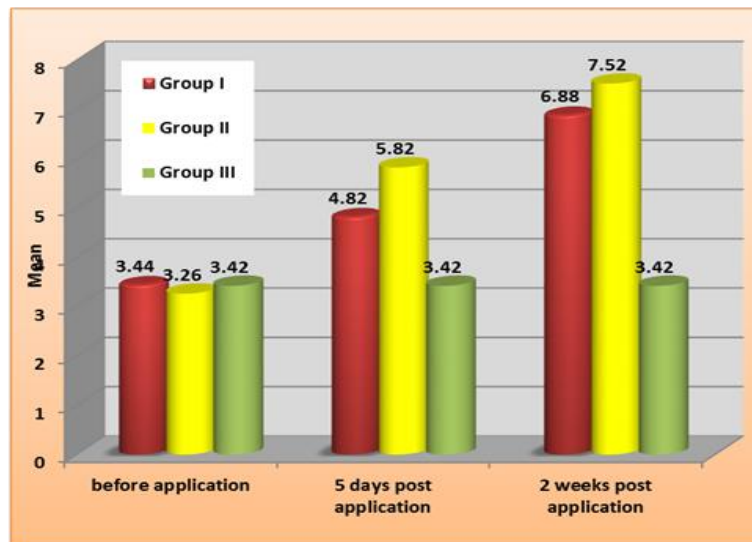


Fig (1): Mean of total knowledge score of studied samples about disease process at three intervals (before application, 5days and 2weeks post application).

Before application ($F=0.71$ $P=0.491$), 5 days post application($F=51.12$ $P<0.001$),after 2 weeks($F=279.50$) $P<0.001$

This figure showed that an improvement in total mean score of knowledge about disc prolapse among group I &II from 3.44 and 3.26 respectively before application to 4.82 and 5.82 respectively. 5 days post compresses application to 6.88 and 7.52respectively after 2 weeks of application .While group III did not improve in mean total knowledge score (3.42). Also There were statistically significant differences between all groups related to their mean total knowledge score about disc prolapse 5days and 2 weeks post application.

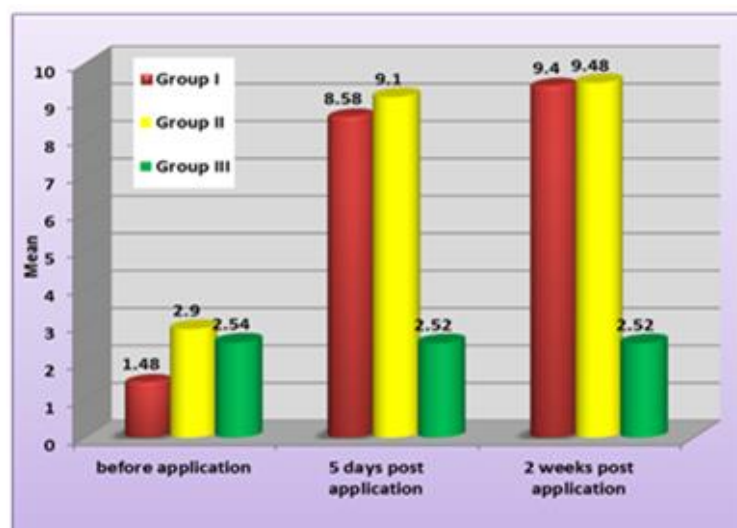


Fig (2): Mean total knowledge score about compresses application of all groups at 3 different intervals (before application, 5days and 2weeks post application).

(Before application: $Kruskal-Wallis =16.13$ $P<0.001$, 5 days post application: $Kruskal-Wallis =12.98$ $P<0.001$ and 2 weeks post application: $Kruskal-Wallis =1.77$ $P=0.183$).

This figure revealed that an improvement in total mean score of knowledge about compresses application among group I and II from 1.48and 2.90respectively before compresses application to 8.58 and 9.10 respectively , 5 days post application to 9.40 and 9.48 respectively, 2 weeks post application. While group III did not improve in mean total knowledge score 2.52There were statistically significant differences between all groups related to their mean total knowledge score about compresses before application, 5days and 2 weeks post compresses application.

Table 2: Distribution of side effects of hot compresses among group I after their application

	Side effects in Group I	
	No (50)	%
Localized hotness	6	12.0
Localized redness	8	16.0
Superficial burn	1	2.0
No	35	70.0

Table 2: Distribution of side effects of hot compresses among group I after their application

This table showed that two thirds of group I (70%) did not complain of side effect for hot compresses and minority of them (16% and 12%)complained of localized redness and hotness respectively.

Table 3: Distribution of side effects of cold compresses among group II after their application

	Side effects in Group II	
	No (50)	%
Localized coldness	13	26.0
Numbness	6	12.0
Pale skin	1	2.0
No	30	60.0

Table 3:Distribution of side effects of cold compresses among group II after their application:

This table revealed that more than half of group II (60%) did not complain of side effect for cold compresses 2 weeks post application and minority of them (26%) complained of localized coldness

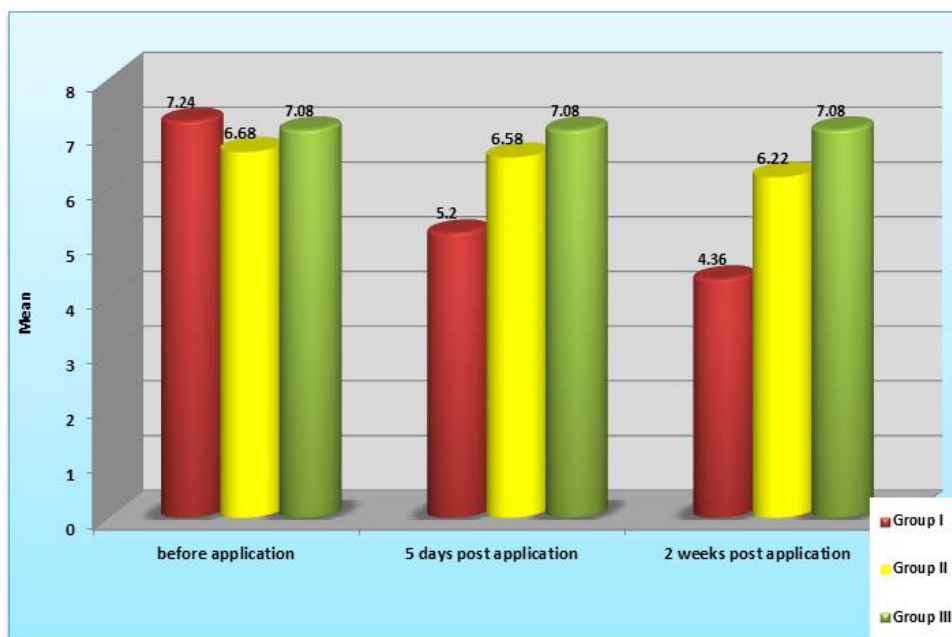


Fig 3 : Mean pain score of studied sample at three intervals (before application, 5days and 2weeks post application).

Before application Paired t Test = 19.11 P=0.024, 5 days post application Paired t Test =25.48P<0.001and 2weeks post application Paired t Test =6.46 P<0.001

Fig 3: Mean pain score of studied sample at three intervals (before application, 5days and 2weeks post application)

It was showed that a decrease in mean pain score among group I from 7.24 before application to 5.20 5 days post hot application to 4.36 2 weeks post application .While group II and III nearly did not improved in mean pain score.

4. DISCUSSION

Low back pain is very common among adults. Heat and cold application help relieve most types of low back pain by reducing inflammation. Often patients use cold, but some prefer heat. Both may be used alternately (peter, 2007)⁽¹¹⁾. The findings of the present study revealed that, the majority of both study and control groups were among age group between 30 to 50 years old. This findings was the same line with Prasad et al.,2006 and Mayeretal.,2005^(12,13) who stated that disc prolapse is common among age group between 20 to 50 years old . This also agree with Kamel, etal.(2003)⁽¹⁴⁾ who clarified that Egyptian who work in Electric and Plastic Company that the high risk of LBP was among age groups of 40 to 50 years. McGregor (2010)⁽¹⁵⁾ clarified that above the age of thirty the intervertebral disks tend to lose their moisture content and become thinner which put older people at high risk of injury. While, Harwood (2013)⁽¹⁶⁾ who stated that LBP can occur at any age

Concerning sex the present study found that , men are at a higher risk of low back pain than women. Gender differences may be a result of differences in lifting patterns and work methods between males and females .this agree with study by Taori, 2011 and Ibrahim (2006)^(17,18). who found that the prevalence of LBP affects a large proportion of the males population. On contrary (Taylor, Goode , George and Cook ,2014)⁽¹⁹⁾ stated that risk of low back pain increase with female than male. This may be due to the sample of (Taylor, Goode , George and Cook)⁽¹⁹⁾ was from working women. The majority of study subjects were married, this finding is expected with their age group.

Regarding to residence, the incidence of lumbar disc prolapse was more common in people from rural area. This was agreed with the conducted study by (Lahelma etal.2012)⁽²⁰⁾ .

Regarding to occupation The results suggest that repetitive work involving lifting heavy object bent positions , twisting , and working with vibrating tools increases the risk of future chronic low-back pain ,this was agreed with Schelerud , 2006⁽²¹⁾ who concluded that type of work has a significant effect on LBP occurrence. This finding is also supported by (Manusov, 2012)⁽²²⁾

Heavy manual work that demands lifting, bending, twisting, repetitive moments can be one of the reason to cause back pain. The National Research Council recently conducted rigorous epidemiologic reviews of the literature and have concluded that there is a clear relationship between back disorders and physical workload as carrying heavy object, frequent bending and twisting, physically heavy work. In order to address this problem, several measures are being taken to modify the workplace ergonomically. Postural training, back care programs have been conducted in order to prevent back problems (Mercier, 2008)⁽²³⁾

In relation to patients knowledge about the disease, heat and cold application, the current study showed that there was no statistically significance differences between study groups (I and II) and control group (III) regarding their knowledge and practice before teaching and most of them had poor knowledge score, but there was significant improvement in knowledge of group I and II than control group after 5 days and 2 weeks post teaching. This finding in line with (Davies, Williams, Graham, Dagg et al., 2010)⁽²⁴⁾ . It also was consistent with (Bach and Holten , 2009)⁽²⁵⁾ who stated that, a brief educational session resulted in an increase in patients' knowledge of disc prolapse , heat and cold application compared with a control group that received no intervention. From the researcher point of view this is may be related to providing teaching about disease, heat and cold application which supported by illustrative colored booklet.

Regarding side effect of hot application, the current study revealed that, side effect after hot application was mild inflammation and hyperthermia .this may be due to incorrect use of hot compresses by application for long period or using greater temperature of water. This finding in line with (Robins, 2011)⁽²⁶⁾ who reported that exposure to greater heat causes inflammation, burns, blisters, or pain .

As regard to side effect of cold application, the current study revealed that, side effect after cold application was Localized coldness and numbness .this may be due to incorrect use of cold compresses by application for long period. This finding in line with (Schmidt and Clark, 2014)⁽²⁷⁾.

Regarding pain assessment, the current study revealed that, the study group I showed a statistical significant difference and improvement in a total score of low back pain after 2weeks of hot application compared to group II and III. This finding in line with (Kent , 2006)⁽²⁸⁾ , who studied the effect of Heat wrap application to reduce pain and disability in

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patients with low back pain post five days from application. In addition to study by (Khadilkar, Odebiyi, Brosseau and Wells, 2008)⁽²⁹⁾ who mentioned that maintain the site of pain warm for a long period reduce level of pain for patients with chronic back pain. While (Kinkade ,2007)⁽³⁰⁾ showed that the application of ice and heat pack had the same effect on the patients suffering from low back pain .From the researcher point of view this is may be due to that most subjects of kinkade study were with acute low back pain and hot application more effective with chronic low back pain than acute ..

From the foregoing discussion it can be concluded that patients with disc prolapse and low back pain exposed to hot application was showed reduction of pain than the same patients who exposed to cold application and those who exposed to routine medical treatment only.

5. CONCLUSIONS

It can be concluded that:

1- The total knowledge score about disease process compresses application among study group I and II was significantly higher than group III (control group) at 5days and 2weeks post compresses application.

2- Low back pain significantly reduced with hot compresses application among study group I rather than study group II that used cold compresses and group III that used routine medical care only .

Recommendations: Supervised health teaching program should be carried out for patients with disc prolapse in the neurosurgery outpatient clinics about effect of hot application to improve their pain

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