

Evaluation of Body Mechanics Ergonomic Posture Training and Education on Back Injury Prevention (Beeb) Intervention on Low Back Pain Among Staff Nurses

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Abstract: Background: Low Back Pain (LBP) among nursing profession is very common. The major causes of low back among nurses were attributed to the frequency of transfers as well as repositioning and handling of patients. In clinical nursing practice, low back pain has been reported in 56-80% of registered nurses.

Aim: The aim of the study is to evaluate the Body mechanics, Ergonomic posture training and Education on Back injury prevention (BEEB) Intervention, on low back pain among Nurses.

Objectives: To assess the level of low back pain among nurses in the experimental and control group and to evaluate the effectiveness of BEEB intervention on the level of low back pain among nurses in the experimental group and to find out the association between the level of low back pain with selected demographic variables in the experimental group.

Methodology: The research approach used in the study was quantitative approach by using True -experimental research design. The study was carried out in two phases. The first phase was a descriptive survey which was carried out among nurses from various units from six randomly selected hospitals in Najran Region. Second phase: Experimental phase. A total of 560 nurses among 300 nurses with low back pain were assigned to two groups, namely, control group (150) and experimental group (150) The experimental group received a BEEB (Body mechanics Ergonomic posture training, Education on Back injury prevention) intervention for 3 months, weekly 2 sessions and follow up and the control group received routine follow up care. Their low back pain level was assessed by McCaughey pain scale before as well as after the intervention in both groups. The tools used for the data collection was demographic variables, McCaughey pain scale and a self-administered questionnaire on BEEB intervention. Data were analyzed by using descriptive and inferential statistics through SSP statistical package.

Results: In total, we included 300 nursing staffs from the control group (150) and experimental (150) samples. The pre- test of the experimental group 44(29.3%) had severe back pain and 66(44%) had moderate back pain and 40(26.6%) had mild back pain, respectively in experimental post -test 32(21.3%) had severe back pain and 46(31%) had moderate back pain and 72(48%) had mild back pain .In control group pre- test 38(25.3%) had severe back pain 66(44%) had moderate back pain and 46(31%) had mild back pain, respectively in control group in post- test 31(21%) had severe back pain 63(42%) had moderate back pain and 56(37%) had mild back pain. The comparison of pain level in the control and experimental group pre and post- test. The pre-test mean value of experimental group was 6.16 with 1.192 SD and the post-test mean value was 4.12 with 2.143 S.D respectively the mean of control pre-test was 6.464 with 2.327 ($p=0.1164$) and the difference was not statistically significant. After the intervention, the control group post -test mean value was 6.212 with 2.213 S.D and experimental post -test mean 4.12 with 2.143 $T=2.04$ ($P<0.001$).The difference was highly significant ($P<0.001$).The control group pre and post test was compared by the paired test and it was not significant ($p=0.0561$).

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The experimental pre -post test was also compared and it was highly significant ($P=0.001$) showing that the effectiveness of BEEB intervention in reducing the level low back pain among the nurses. There is no significant change in the control group pain score. There was no significant difference in the BEEB intervention questionnaire among both groups. There is no significant relationship between the levels of back pain with selected demographic variables.

Keywords: BEEB (Body mechanics Ergonomic posture training, Education on Back injury prevention) Intervention, low back pain, nurses

INTRODUCTION

Low Back Pain (LBP) among nursing profession is very common health problem occurring in the musculoskeletal system and it is associated with moving and handling patients during their routine basic care. 56-80% of registered nurses are reported low back pain and several programs have been implemented to reduce the risk associated with occupational work related physical ailments resulting in the clinical settings. Low back pain is classified based on the duration, intensity persistence, and onset. Specifically, it has a regular aggravating pain that is often assumed because it is mild.

Today, musculoskeletal disorders are one of the most frequent health problems associated with intensification of work, changes in their duty schedule, nature of the workplace, raising demands on employees and technological advancement which resulting the situation additional pressure, stress, occupational work-related diseases, musculoskeletal problems, occupational burnout, chronic exhaustion, and depression.

Low back pain is categorized three types of pain, such as acute pain, subacute pain, and chronic pain. Chronic low back pain is defined as persisting pain that exists for more than 10-12 weeks (National Health Service, 2011). The factors contributing towards low back pain among nurses such as patient-handling task, manual handling, lifting weights beyond the individual's capacity, regular routine care includes bed making, bathing, transferring, lifting, shifting, turning, holding, bending-twisting, and kneeling. All these maneuvers have consistently increasing the spinal flexion and disc compression leads to degeneration of the spine which increases twisting of the muscle resulting persistent of back pain. These activities were carried out with an insufficient number staffs, improper use of body alignments, and lack of training and education.

The prevalence of low back pain globally, over of 50% of nurses working in different clinical settings have reported LBP; this is even higher among nurses working in ICU (June & Cho, 2011). Saudi Arabia shows a high prevalence of low back pain Dajah & Al (2013) states that the occurrence of LBP among the nurses is approximated at 53.2% with moderate low back pain representing 31.8% of the nurses in Riyadh. A majority of whom suffer LBP extending over a week; this has been linked to 53.9% of sick leaves. Another study conducted in Jeddah, 65.7% of LBP has been reported to face nurses working at King Abdul-Aziz University Hospital (Attar, 2014). Similarly, Moath et al., (2016) reported 74.2% of LBP among nurses in Makah region at Saudi Arabia. The prevalence of low back pain among nurses in Saudi Arabia nurses were 21.9% to 24.6 (Ghilan et al., 2013). The worldwide consensus shows that nurses experience a high prevalence of the musculoskeletal disorders and especially low back pain. Attar, (2014) conducted a study on Examine the factors that cause low back pain among clinical nurses and he concluded that ' inadequate knowledge on manual handling of patients, lack of skills on lifting patients due that 20 – 30% of nurses resulting the low back pain.

Many other studies have proved the other methods to alleviate LBP within this group. Numerous studies have suggested different approaches to reducing LBP among nurses in clinical areas. Some of the interventional studies like exercise, manual moving and handling education, stress management, and multidimensional interventions (Chiou, Chiang, Huang, Wu, & Chien, 2013). Prevention is better than cure by understanding the underlying principles of body mechanics, and to maintain the proper ergonomic posture in day to day activities

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which helps to prevent the further back injuries among the staff nurses. Many types of research have shown that proper body mechanics and ergonomics training can reduce the work related back pain among nurses. Training and education play a vital role in reducing the LBP Bejia, I, Younes, (2010) reported that training and education have good effects on preventing the back injuries among the nurses.

Nurses are well known about preventive measures of low back pain by doing regular exercises to strengthen their back muscles and maintaining the ergonomic adjustment, still, back pain among nursing profession is very common. Hence the investigator felt need to conduct a research on effectiveness of BEEB (body mechanics ,ergonomic training and education on prevention of back injury)intervention on low back pain among staff nurses with the objectives of to assess the level of low back pain among nurses in the experimental and control group and to determine the effectiveness of BEEB intervention on level of low back pain among nurses in the experimental group and to find out the association between the level of low back pain with selected demographic variables in the experimental group.

METHODS AND MATERIALS

Study Design

The study design used for the study was an interventional study with follow-up period of 3 months. The study was carried out in two phases. The first phase a descriptive survey was carried out among nurses from various units from six randomly selected Ministry of Health hospitals in Najran Region. Second phase an experimental phase. Among 560 based on the inclusion criteria, 300 nurses with low back pain were selected for the study and randomly assigned to two groups, namely, control group (150) and experimental group (150).

Study Population

The Inclusion criteria were as follows: Staff nurses who were working more than 2 years, in the MOH hospitals, suffering from lower back pain and complaints of back pain for past 3 months, staffs willing to participate, and staff with different age groups were included. The exclusion criteria were as follows: The staffs those who are pregnant , the intention of the staffs of resigning their job, the staffs on regular analgesic treatment and staffs who were undergone vertebral surgery, and staffs those who work under the managerial level were excluded.

The research approach used for the study was quantitative approach by using True experimental research design. The study was carried out in two Phases. A descriptive survey was carried out among nurses from various units from six randomly selected MOH hospitals in Najran Region. Second phase: an experimental phase: A total of 560 nurses among 300 nurses with low back pain were and assigned to two groups, namely, control group (150) and experimental group (150). The homogeneity of the sample was matched by based on the age, gender, and educational status and working hours. The intervention group participants received a BEEB intervention (Body mechanics Ergonomic posture training, and Education on Back injury prevention) for 3 months period weekly 2 sessions with continuous follow-up care and the control -group carried out their routine activities. The aim of the study was explained to the study participants, and they were asked to sign the consent form unless if they agree to participate. There was no consequences loss for their regular work and all the staffs continued their routine work. Complete details of the participant including telephone number mobile number, e-mail address, was obtained. Reinforcement was done through regular visiting, calling and mailing.

Tools for Data Collection

Three different tools were used to collect data which includes socio -demographic variables, a self-administered questionnaire on knowledge on BEEB intervention and Mc Caffery- pain Scale.

The tool I: socio-demographic characteristics of study participant such as age, years of experience, qualificaion, area of assignment, working hours, body mass index, the intensity of the pain, body part discomfort.

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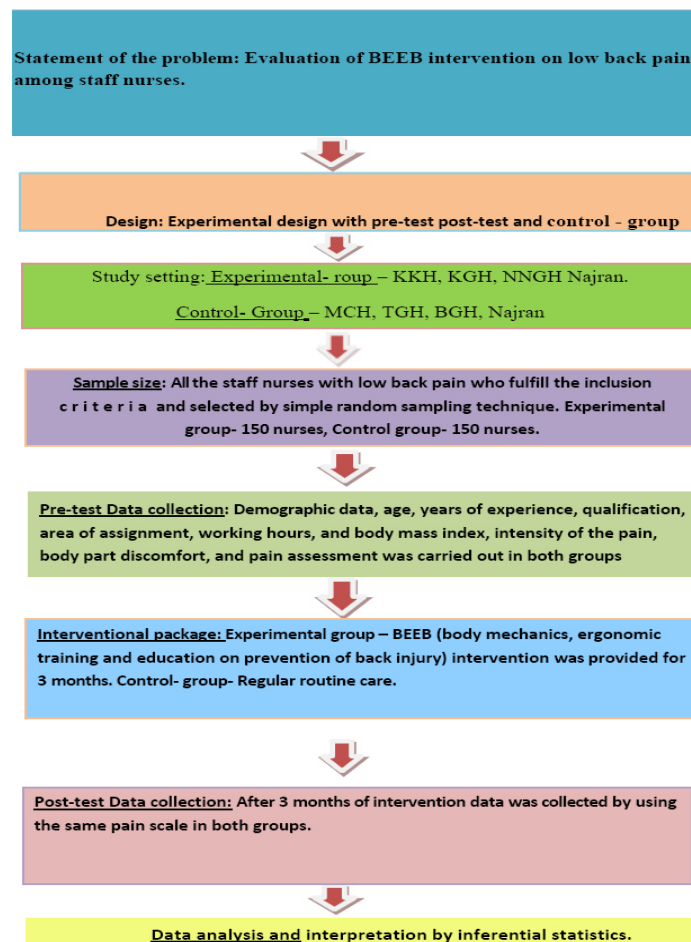
Tool II: Self-administered structured Questionnaire on Knowledge on BEEB intervention it was developed by the researchers based on the related literature review to assess the nurse's knowledge on BEEB intervention. The questionnaire consists of 25 questions, which includes body mechanics, principles, importance, rules, techniques and proper body alignment. Ergonomic posture training includes Training on proper back postures of the vertebra while, sitting, standing, bending and walking, and training on patient handling and moving techniques, positioning and moving patient in bed, transfer the patient from bed to wheelchair, transfer a patient from bed to trolley. Education on Back injury prevention includes the application of correct body posture, lifting the patients together as a team, and following the back strengthening exercises to prevent the muscular-skeletal problems. The tool was printed in both languages English and Arabic language.

Tool III: Mc Caffery -Pain Assessment Scale was used to assess the initial pain assessment regarding back pain, description of the pain.

Content Validity of the Tool

The questionnaire was prepared by the researcher by her reviews. The demographic variables, the knowledge questionnaire on BEEB intervention, and Mc Caffery -Pain Assessment Scale was translated in both English and Arabic language. The tool was reviewed by an orthopedics, orthopedic surgeon, physician, physiotherapist and nursing experts. The expert's suggestions were carried out and incorporated in designing the final tool.

Schematic representation of Research Plan



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Scoring Systems

1. Demographic variables by assessing the BMI through measuring weight, height and calculate the body mass index (BMI) according to the WHO (2000) classification: normal BMI= 18.5-24.9 kg/ M², overweight BMI= 25.0-29.9 Kg/M², obesity BMI= 30.0-39.9 kg/M² and the extreme obesity BMI=40.0kg/M².
2. Knowledge questionnaire on BEEB intervention: Total score ranged from (0-25). The score was interpreted as follows: 0-9 inadequate knowledge, 10 -17 moderate knowledge, and 18-25 adequate knowledge.
3. Mc Caffery -pain scale was used to assess pain level. It is a numerical scale where the user has the option to verbally rate the scale from 0-10 or to place a mark on a line indicating their level of pain. 0 No Pain, 0- 3 Mild Pain, 4- 6 Moderate Pain, 7-10 Severe Pain

DATA COLLECTION PROCEDURE

The importance of the study was explained to the authorities of the hospitals and obtained permission to conduct the study. The research procedure was explained to the staff nurses and informed consent was obtained from them. They were assured that the information collected from them would be kept confidential.

The Data was Collected in the following Phases

Phase I: Pretest data collection: All the nurses with complaints of low back pain were assembled and made the sample frame for 300 staff nurses based on the inclusion criteria. The purpose of the study was explained to the study participants. The staffs were allotted by randomly into two groups namely control group and experimental groups. The nurses were asked to assemble and collected the socio- demographic variables. Pain scale was administered and classified as mild pain, moderate pain, and severe pain and on the same day staffs were interviewed with the knowledge questionnaire on BEEB intervention. The pretest was done for the experimental group.

Phase II: The experimental group study participants were made comfortable to receive the BEEB intervention program. The intervention focused on body mechanics, principles, importance, rules, techniques and proper body alignment. Ergonomic posture training includes: Training on proper back postures of the vertebra while, sitting, standing, bending and walking, and training on patient handling and moving techniques, including positioning and moving patient in bed, transfer patient from bed to wheelchair, transfer patient from bed to trolley was demonstrated for 30 – 45 minutes for 2 sessions weekly for the period of 3 months. All the participants were willing to learn ergonomic posture training. Education on Back injury prevention includes application correct body posture, lifting the patients together as a team, and following the back strengthening exercises to prevent the muscular -skeletal problems with the help of the power point presentation and their doubts were clarified.

Phase III: On the next visit the experimental group participants were made comfortable in the assigned area and ask them to demonstrate the BEEB intervention. The participants understood the BEEB intervention and assured that they will follow the intervention regularly.

Phase IV: On the next visit the participants were given reinforcement on education on BEEB intervention. Regular follow -up care was a monitor for the experimental group.

Phase V: Based on the inclusion criteria staffs were asked to assemble, demographic data were collected, administered pain scale and classified as mild, moderate, and severe pain and on the same day staffs were interviewed with the knowledge questionnaire on BEEB intervention. The pretest was done for the control group.

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Phase VI: On the next visit the participants were visited for their regular routine care for the control groups

Phase VII: After 12 weeks completion post- test was carried out, assessed the pain level by using the same scale for the both groups. After completion of the study period, BEEB intervention was taught for the control group.

STATISTICAL METHODS

The data from 300 participants (150 experimental group, 150 control group) were coded and entered in the Microsoft excel sheets. The data were analyzed by using descriptive and inferential statistics. Frequency and percentage distribution was used to describe the demographic variables and level of pain. Paired and unpaired test was used for the comparison of means between the experimental and control group, (SPSS.USA) statistical package was used.

RESULTS

In total, we included 300 nursing staffs from the control group (150) and experimental (150) samples. The pre- test of the experimental group 44(29.3%) had severe back pain and 66(44%) had moderate back pain 40(26.6%) had mild back pain, respectively in experimental post -test 32(21.3%) had severe back pain 46(31%) had moderate back pain 72(48%) had mild back pain .In control group pre- test 38(25.3%) had severe back pain 66(44%) had moderate back pain and 46(31%) had mild back pain, respectively in control group in post- test 31(21%) had severe back pain 63(42%) had moderate back pain and 56(37%) had mild back pain. The comparison of the level of pain in the control and experimental group pre and post- test. The pre-test mean value of experimental group was 6.16 with 1.192 SD and the post-test mean value was 4.12 with 2.143 S.D respectively the mean of controlgroup pre -test was 6.464with 2.327 (p=0.1164) and the difference was not statistically significant. After the intervention, the control group post -test mean value was 6.212 with 2.213 S.D and experimental post -test mean 4.12 with 2.143 T=2.04 (P<0.001).The difference was highly significant (P<0.001).The control group pre and post test was compared by the paired test and it was not significant (p=0.0561).The experimental pre -post test was also compared and it was highly significant (P=0.001) showing that the effectiveness of BEEB intervention in reducing the level low back pain among the nurses. There is no significant change in the control group pain score. There was no significant difference in the BEEB intervention questionnaire among both groups. There is no significant relationship between the levels of back pain with selected demographic variables.

Table1. Level of low back pain among the control group in pre and post- test

Control group post test level of low back pain			Control group Pre- test level of low back pain		
%	N	Pain level	%	N	Pain level
21	31	Mild Pain	25	46	Mild pain
42	63	Moderate Pain	44	66	Moderate Pain
37	56	Sever Pain	31	38	Severe Pain
100	150	Total	100	150	

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Table2. Level of low back pain among the experimental group in pre and post-test

Experimental group post test level of low back pain			Experimental Pre test level of low back pain		
%	N	Pain level	%	N	Pain level
48	72	Mild Pain	26.3	40	Mild pain
31	46	Moderate Pain	44	66	Moderate Pain
21	32	Sever Pain	29.3	44	Severe Pain
100	150	Total	100	150	

Table3. Comparisons of the two groups mean score according to their level of low back pain before and after BEEB intervention

Group	Mean	SD	t-value	p-value	Significant
Control group Pre -test	6.46	2.327	1.104	p=0.1164	No
Control group Post- test	6.21	2.213			
Experimental group Pre -test	6.16	1.192	4.910	P<0.001	Yes
Experimental group Post- test	4.12	2.143			

Table4. Comparison of the experimental group mean score before and after BEEB intervention

Group	Mean	SD	„t“ value	„p“ value	Significant
Experimental group Pre- test	6.16	1.192	4.910	P<0.001	Yes
Experimental group Post- test	4.12	2.143			

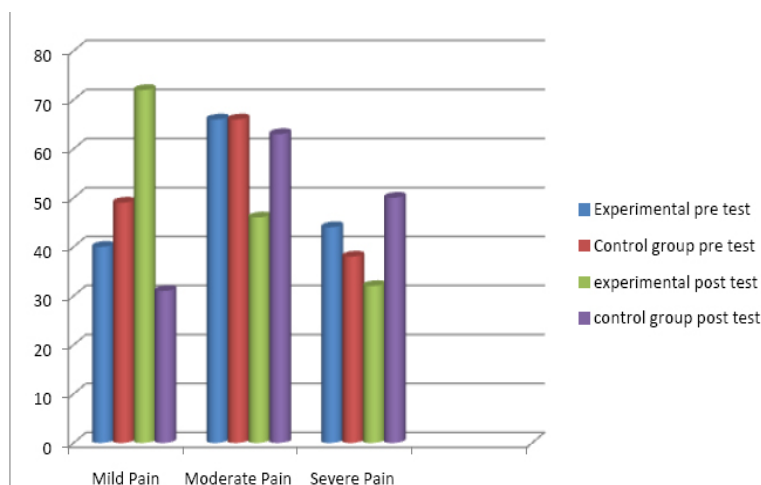


Fig1. Comparison between Pre and post test level of low back pain among experimental and control group

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DISCUSSION

After a 3-month period, BEEB (Body mechanics Ergonomic posture training, Education on Back injury prevention) Intervention, showed that has a good effect on decreasing the level of back pain among nurses by training them. Nurses play an important role in protecting, maintaining and improving individual's health and also preventive, protective and improving actions for their own health so that they can provide quality nursing care effectively to the individual, family, and society. The intervention focused on Body mechanics and ergonomic posture training and education on back injury prevention which can help the nursing staffs to implement these techniques while caring the patients in a day to day practice. Similarly, much more research has proven that maintaining the correct vertebral postures, and training on education can prevent the back pain among the nurses.

In line with our study showed that BEEB intervention significantly reduce the low back pain among nurses, with regarding the pretest assessment level of the pain score of the experimental group 44(29.3%) had severe back pain 66(44%) had moderate back pain 40(26.6%) had mild back pain respectively In control group pretest 38(25.3%) had severe back pain 66(44%) had moderate back pain 46(31%) had mild back pain. This study was supported by Lamina and Hanif (2009) conducted a study on assessment of low back pain among ICU nurses by using quasi-experimental research. The results revealed that 90%of them had pain in lumbar region about two third of them 65% had LBP for 8-30 days, majority of them 77.5%, 80% had reduced in work and leisure activities related to LBP and half of them 50% were seen by physiotherapist. Emmanuel NM, Ezhilarasu(2015) conducted a study on low back pain among nurses in tertiary care hospital. Cross sectional survey was carried out. The results analyzed were 53.4 % of the nurses had LBP and 17.1 % of them were at high risk. Halim et al (2008) conducted a study on the most common site to develop back pain among nurses, and he reported that lower back area is the commonest site to develop back pain due to lumbar region receive the highest pressure when a person manually lifting. In related with our second objective was to evaluate the effectiveness of BEEB intervention on the level of low back pain among nurses in the experimental group in our study the intervention focused on body mechanics, principles, importance, rules of body mechanics, techniques and proper body alignment. Ergonomic posture training includes: Training on proper back postures of the vertebra while, sitting, standing, bending and walking, and training on patient handling and moving techniques, including positioning and moving patient in bed, transfer patient from bed to wheelchair, transfer patient from bed to trolley was demonstrated for 30 – 45 minutes for 2 sessions weekly for the period of 3 months. Education on Back injury prevention includes application correct body posture, lifting the patients together as a team, and following the back strengthening exercises to prevent the muscular skeletal problems with the help of the power point presentation. The results showed that there was a significant reduction in their pain level compare with their pre and post test. The comparison of the level low back pain in the control and experimental group pre -test and post -test. The pre-test mean value of experimental group was 6.16 with 1.192 SD and the post-test mean value was 4.12 with 2.143 S.D .The mean of control group pre- test was 6.464with 2.327 (p=0.1164) and the difference was not statistically significant. After the intervention, the control group post- test the mean value was 6.212 with 2.213 S.D and experimental post -test mean 4.12 with 2.143 respectively with T=2.04 (P<0.001).The difference was highly significant (P<0.001).The control pre and post -test was compared by the paired test. It was not significant (p=0.0561).The experimental pre -post test was also compared and it was highly significant (P=0.001). The results have been supported by many studies focusing on training and education and several interventional studies on body mechanics, ergonomic exercise and exercise programs have a major role in the reduction of back pain among nurses. Azize and Kahan et al (2013) conducted a study on Effectiveness of education program on prevention on low back pain among nurses using a one-group, pretest/posttest design The results revealed that the mean knowledge scores of the

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nurses before, just after, and 3 months after the training program targeting prevention of low back pain among nurses. The mean knowledge score was 15.33 before training; increased to 20.97 after training. Similarly Reda Abd and Elsaay (2016) conducted a study on the Effect of a body mechanics training program for intensive care nurses in reducing low back pain. A quasi- experimental research design was used for the study, results revealed that about two third of them 65% had low back pain for 8-30 days, majority of them 77.5%, 80% had to reduce in work and leisure activities related to low back pain the body mechanics training programme was more effective in reducing the level of back pain $p < 0.001$. Similarly, Sarallah and Sedigheh (2017) conducted a study on multidisciplinary work place intervention for chronic low back pain among nursing Assistant, by using True experimental research design. The results revealed that there was a significant reduction of work related low back pain intensity following the multidisciplinary program, with scores of 5.01 ± 1.97 to 3.42 ± 2.53 after 6 months on the visual analog scale in the intervention group ($p < 0.001$) and no significant change in control groups. The third objective of the study is to find out the association between the level of low back pain with selected demographic variables in the experimental group however there is no significant association between the level of pain with selected demographic variables. There are many interventional studies, theory based approaches, educational programs available, in the field of low back pain despite this, and we really need to motivate the nurses to apply all these evidences in their day to day practice and to reduce the back pain as well as to promote their health. There were several limitations that may affect the study results. We assessed the pain score based on the pain scale and assessed their knowledge based on their self-administered questionnaire. Furthermore, biochemical parameters such as assessing the serum calcium may interpret the causes of back pain and no where reported about the complications, and other non pharmacological interventions in reducing the pain level.

CONCLUSIONS

To conclude the showed that Body mechanics Ergonomic posture training, Education on Back injury prevention (BEEB) Intervention showed that there was significant reduction in the level of low back pain among nurses. Thus, our data indicate that these interventions are suitable for reducing the low back pain among nurses working in hospital settings.

Conflict of Interest

No potential conflict of interest relevant to this study.

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