

## Effectiveness of rhythmic skin tapping on pain during intra muscular (IM) injection among male adults in a selected hospital at Mangalore

Alin Thomas Cherian

Lecturer, Department of Medical Surgical Nursing, Bombay Hospital College of Nursing, Indore, Madhya Pradesh, India

### Abstract

Injections are currently the gold standard for administering various medications parenterally. According to World Health Organization, Intramuscular injection is an administration of medications parenterally through a skin puncture by a syringe and a needle deep into a large muscle of the body for prophylactic or curative purposes. The major side effect related to intra muscular injections is the accompanying pain due to the penetration of the skin by the needle and the mechanical and chemical effects of the drug during and after its injection. Purpose of this study was to evaluate the Effectiveness of Rhythmic Skin Tapping on pain in male adults during IM injection. Forty male adults receiving at least two doses of IM injection were selected. The group was control for itself, the Rhythmic Skin Tapping was omitted on one occasion after intramuscular injection, while instituted on another occasion. After the intervention, level of pain was assessed subjectively by Numerical Pain Rating scale and Verbal Pain Intensity scale. The findings of Numerical Pain Rating scale revealed that 37.5% had moderate pain before Rhythmic Skin Tapping and after the intervention, 5% had moderate pain. Verbal Pain Intensity scale revealed that 32.5% had moderate pain before Rhythmic Skin Tapping and after the intervention none had moderate pain. Findings acknowledged that Rhythmic Skin Tapping was effective in reducing the pain level of the male adults.

**Keywords:** Effectiveness, Rhythmic Skin Tapping, Pain, IM injection, Male adults, Hospitals

### Introduction

“The art of life is the art of avoiding pain; and he is the best pilot, who steers clearest of the rocks and shoals with which it is beset”.

-Thomas Jefferson.

Pain is the most common reason that people seek medical attention. But it is actually hard to define because it's a subjective feeling. The International Association for the study of Pain defines it as “An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such harm”. Every person born in the world, has suffered some type or degree of pain. People with pain feel distress or suffering and seeks relief<sup>[1]</sup>.

Procedural pain is an important source of discomfort for patients in nursing care settings. Administering injection is one of the basic and important duties of a nurse and is always associated with pain. Medications administered by Intramuscular injections have been existing for more than a century. This route of administration is most used and preferred, particularly when the medications are administered in small amount. However, as outlined with any injection, this is an invasive practice with regards to breaking the body's natural barriers; there is always a risk of soreness and discomfort<sup>[1]</sup>.

Providing pain relief is considered a most basic human right and it is the responsibility of the nurse to use most effective approach to pain control. Nurses have ethical and legal responsibility for managing pain and relieving suffering. Effective pain management not only reduces physical discomfort, but also improves quality of life<sup>[2]</sup>.

Different methods are used by the Nurses to reduce pain during Intramuscular injections such as applying pressure,

taping the skin, giving injections to a relaxed muscle, applying heat and cold. Application of pressure produces non painful stimuli which block the transmission of painful stimuli to the Central Nervous System resulting in less pain perception. Tapping over the skin is one of the various techniques to keep the muscles relaxed. It is an accepted fact that, there is reduced pain while giving injection into a relaxed muscle. Each method will have differences in their effect on the level of pain during Intramuscular injection<sup>[2]</sup>.

### Background of the study

Injections are currently the gold standard for administering various medications parenterally. According to World Health Organization, Intramuscular injection is an administration of medications parenterally through a skin puncture by a syringe and a needle deep into a large muscle of the body for prophylactic or curative purposes. The most significant side effect related to Intramuscular injections is the accompanying pain which is related to the penetration of the skin by the needle and to the mechanical and chemical effects of the drug during and after the injection<sup>[3]</sup>.

Injections are the most frequently used medical procedure, with an estimated 16 billion administered throughout the world on an annual basis. The annual ratio of injections per person ranged from 1.7 to 11.3. Of these 5% or less are for immunization and rest are given for curative purposes. In India, a survey conducted found that 96% of all injections given by private doctors were of antibiotics, vitamins and analgesics. A conservative estimate of the average number of injection ranges from 0.9 to 8.5 per person per year, with a median of 1.5 injections per person per year<sup>[3]</sup>.

Pain is common in hospitalized clients. It is unknown if any

population of hospitalized clients are at low risk for pain. It is estimated that the percentage of pain is anywhere from 50 - 80% of all hospitalized clients. In one study, nearly 50% of severely ill hospitalized clients reported pain, almost 15% of whom said they had moderately or extremely severe pain, at least half the time [4].

Pain during an IM injection generally, is expected. However, persistent pain at the injection site is not an expected event. Patients on the receiving end of Intramuscular injections are often apprehensive in part due to the potential painfulness of the procedure. One estimate reports that persistent pain may occur in 23 percent of the patients who have complications [5].

### Need for the study

Intramuscular injection is one amongst the various procedures that Nurses often carry out, which causes pain and anguish to the recipient. Pain originating from Intramuscular (IM) injection should not be underestimated, because an aching injection might provoke severe fear of injection, which may lead a client to delay seeking medical help [6].

A publication in year 2000, has highlighted poor patient satisfaction with the frequent use of Intramuscular injections. Where researcher looked at the drug prescription charts of all patients on 10 surgical wards on two separate occasions found that out of 422 clients, 135 were given Intramuscular analgesic or anti emetic drugs. Of these, 54 patients had received a total of 74 Intramuscular injections. In summary, 40% of the total number of Intramuscular injections was reported as painful by patients. A separate questionnaire revealed that Intramuscular injections are painful; the Intramuscular route is frequently the preferred method of prescribing postoperative drugs. During the clinical experience, the investigators had visualized that all patients experienced pain and discomfort (in varying degrees) during IM injection. Since IM injection, has an associated, negative connotation of pain, many patients verbalized some amount of fear and muscle contractions prior to receiving the injection [7].

On literature review, the researcher found that almost 100% of patients expected and experienced pain due to IM injection, though transitional in nature. Various researchers have reported that approximately 6-23% of patients have persistent pain, post IM injection; perhaps because of the complications, reactions, or inadequate technique of injection. The International Association for the Study of Pain suggests that, "the pain relief should be considered as a human right, thus, all invasive procedures; however, minor should be performed keeping the goals of pain management in mind" [7].

Pain management is one of the main facets of nursing care, where Nurses must be competent. Nurses are obligated to alleviate every kind of pain, even the "minor" procedural pain. Certainly, procedural pain is an important source of discomfort for hospitalized patients from which, all instinctively try to escape [2].

The goals of any pain management are to relieve or alleviate suffering through Complimentary/Alternative systems of medicine and Indigenous techniques. Today, a wide variety of therapeutic options have been incorporated to a greater or lesser degree into the Conventional Medical practice. The

integration of Indigenous Medical care system, into an expanded concept of Medical care has helped in different ways in diagnosing and managing health care. For e.g. Acupuncture, Meditation; Exercise treatment; Biofeedback; Aroma Therapy, Massage, Pressure, and Skin Tapping technique, etc. [8].

Skin Tapping is one of the mechanical stimulation over the skin that can alter the balance between the small width fibres that carry pain to the brain, and the large width fibres that do not carry pain. The non-pain large width fibres obstruct the slower small width pain carrying fibres. A study was conducted in USA, by an emergency room nurse on painless injection technique; the investigator tapped the gluteus maximus muscle before inserting the needle and while removing the needle. Study revealed that by following Skin Tap technique patients experienced less pain while receiving Intramuscular injection [2].

Further investigation into the incorporation of these Indigenous systems into our modern armamentarium is warranted. It will also be of importance to study the possible adverse effects of combining these traditional remedies with the Conventional remedies [7].

Thus, the researchers thought of exploring the effect of Skin Tapping Therapy, one of the Indigenous therapies, on the pain perception of the patients while receiving IM injection.

### Statement of the problem

"Effectiveness of Rhythmic Skin Tapping on pain during Intra Muscular (IM) injection among male adults in a selected hospital at Mangalore".

### Objectives of the study

1. To evaluate the effectiveness of Rhythmic Skin Tapping on pain in male adults during IM injection.
2. To compare the level of pain in male adults during IM injection with and without Rhythmic Skin Tapping.
3. To find out association between the level of pain with selected demographic variable

### Operational Definitions

- i) Effectiveness:** In this study, effectiveness refers to the extent to which the rhythmic skin tap technique helps to reduce the pain caused by IM injection as measured by numerical pain rating scale and verbal pain intensity scale.
- ii) Rhythmic skin tap technique:** It is a technique in which the investigator taps the muscle which is intended to use with the palmar aspect of fingers 16 times before the insertion and 3 counts while removing the needle during IM injection.
- iii) Pain:** In this study, pain is an unpleasant subjective sensational situation experienced by individuals while, receiving IM injection and, is measured by numerical pain rating scale and verbal pain intensity scale, soon after the withdrawal of needle.
- iv) Male adults receiving IM injection:** In this study, it refers to male adults who receive injection tramadol, voveran or dynapar intramuscularly by the insertion of 22 gauge needles at 90 degree angle into gluteal muscles at the inpatient department.

### Assumptions

The study assumes that

- IM injections produce pain
- Non pharmacological interventions reduce pain perception of clients.

### Hypotheses

**H1** - There will be a significant difference between pain score of male adults receiving IM injection with and without rhythmic skin tapping.

**H2** - There will be an association between the levels of pain with selected demographic variables of male adults receiving IM injection.

### Delimitation

The study would be limited only to male adults receiving IM injection, tramadol, voveran or dynapar in the general wards.

### Scope of the study

1. The study will assess the pain levels of male adults from a selected hospital at Mangalore.
2. The study aims at assessing the effect of rhythmic skin tapping on pain level among male adults receiving IM injection from a selected hospital at Mangalore.
3. The findings of the study will encourage the authorities of hospital to implement rhythmic skin tapping to all male adults receiving IM injection.

### Materials and Methods

#### Research Approach

Evaluative approach was used for the study.

#### Research Design

To evaluate the effect of Rhythmic Skin Tapping technique on pain reducing approaches, the investigator selected one group pre-test post-test design. It involves obtaining a pre-test measure of the outcome of interest prior to administering some treatment, followed by a post test on the same measure after treatment occurs.

In this study, male adults were observed and measured for pain levels with and without Rhythmic Skin Tapping technique.

#### Variables under study

The variables under the study includes,

- i) Independent variable:** The independent variable in this study was Rhythmic Skin tapping technique, the modality for the reduction of pain during IM injection.
- ii) Dependent variables:** The dependent variable in this study was the pain during IM injection.
- iii) Extraneous variables:** In current study, age, level of education, frequency of hospital admissions, duration of present hospital stay, support to the client in the hospital, previous experience of Intra muscular injections, and presence of any other co morbid conditions were the extraneous variables.

#### Setting of the study

The study was conducted at K. S. HEGDE charitable Hospital, Mangalore which has 1200 beds and is a teaching

hospital for Medical, Nursing and Paramedical students. About thirty male adults receive injection per day, out of which 16 - 20 male adults receive IM injection Tramadol, Voveran or Dynapar.

### Population

The population for this study was adult males who receive IM injection.

### Sample and Sampling Technique

In this study, sample consisted of forty adult males on IM injection (Tramadol, or Voveran or Dynapar), who fulfilled the inclusion criteria.

Purposive sampling technique was used to allocate the subjects for the study

### Sampling Criteria

**Inclusion criteria:** Male adults,

- Aged between 20 - 50 years.
- who receive any one of the IM injections such as Tramadol, Voveran or Dynapar

**Exclusion criteria:** Male adults who,

- Have undergone any painful procedure before 1 hour of the intervention.
- Have any sensory, perceptual alterations.
- Are from post-operative ward.
- Have undergone any major surgeries.

### Protection of Human Subjects Rights

- The study proposal was presented to the ethical committee for ethical consideration and obtained permission.
- Permission for the study was obtained from concerned authority of hospital at Mangalore.
- Informed consent is obtained from the participants for the study, after proper explanation of the purpose, usefulness of the study and, assurance was given about the confidentiality of their responses.

### Data Collection Process

Forty male adults from general ward, who were receiving at least two doses of IM injection, were selected using, purposive sampling technique, to implement the Rhythmic Skin Tap technique. After obtaining the consent, male adults were given injection without Rhythmic Skin Taping and assessed the level of pain using Verbal Pain Intensity scale and Numerical Pain Rating scale, and another dose of IM injection was given to male adults on the next day at the same time, with Rhythmic skin tapping and assessed the level of pain using Verbal Pain Intensity scale and Numerical Pain Rating scale.

### Result

The data collected from the male adult were organized and presented under the following sections:

**Section I:** Description of the sample characteristics.

The frequency of samples by their demographic characteristics is presented in Table-1.

**Table 1:** Distribution of samples according to Demographic Characteristics n = 40

Demographic Characteristics		Frequency	Percentage	
Area of living	Rural	18	45	
	Urban	22	55	
Educational Status	No formal education	5	12.5	
	Primary	7	7.5	
	High school	4	10	
	Higher Secondary	10	25	
	Graduation and above	14	35	
Type of family	Nuclear family	29	2.5	
	Extended family	11	27.5	
Occupation	Daily wager	14	35	
	Government employer	6	15	
	Private employer	13	32.5	
	Others	7	17.5	
Support in the Hospital	Family members	36	90	
	Friends	4	10	
	Hospital staffs	--	--	
	No support	--	--	
Previous experience of IM injections	Yes	39	97.5	
	No	1	2.5	
Usual behaviour during pain	Shows tolerance	30	75	
	Seeks diversions	7	17.5	
	Disturbs others	3	7.5	
Anxious at current State	Yes	12	30	
	No	28	70	
Presence of co-morbid conditions	Diabetes mellitus	Yes	7	17.5
		No	33	82.5
	Heart disease	Yes	6	15
		No	34	85
	Cerebral defect	Yes	--	--
		No	40	100
	Others	Yes	--	--
		No	40	100

The above table describes the following findings:

1. Minimum age of the male adults was 20 and the maximum was 49.
2. 80 was the maximum weight and 56 was the minimum.
3. Among the male adults, 180 was the maximum height and 150 was the minimum.
4. Maximum numbers of hospital admission among the male adults were 12.
5. Minimum duration of present hospital stay was 1 and the maximum was 8.
6. Majority of the male adults; 22 (55%) belong to urban area, rural area consisting of 18 (45%) subjects only.
7. Most of the male adults; 14 (35%) have completed graduation, 10 (25%) completed higher secondary education, 4 (10%) with high school education, 7 (17.5%) with primary education, and 5 (12.5%) with no formal education.
8. Mainly the male adults; 29 (72.5%) belong to nuclear family, followed by 11 (27.5%) in the extended family.
9. Most of the male adults; 14 (35%) were daily wagers, followed by 13 (32.5%) private employers, 7 (17.5%) was having other occupations, and only 6 (15%) were government employers.
10. Majority of male adults; 36 (90%) had support from family members, 4 (10%) from friends.
11. 30 (75%) male adults showed tolerance to pain, 7 (17.5%) sought diversion, and 3 (7.5%) disturbed others.
12. Majority of male adults; 39 (97.5%) had previous exposure to IM injection and only 1 (2.5%) had no previous exposure to IM injection.
13. Mostly 28 (70%) male adults were not anxious at the current state of hospitalization and 12 (30%) were anxious.
14. Only 7 (17.5%) were having diabetes mellitus and 28 (70%) were without the disease.
15. 6 (15%) had heart disease and 34 (85%) were without the disease and none were having cerebral defects

**Section II:** Comparison of level of pain in male adults during IM injection with and without rhythmic skin tapping  
To compare the level of pain in adult clients during IM injection with and without Rhythmic Skin Tapping, Frequency and Percentage was used.

**Table 2:** Level of pain by using Numerical Pain Rating scale n = 40

Pain Level	Without Rhythmic Skin Tapping (%)		With Rhythmic Skin Tapping (%)	
	Frequency	Percentage	Frequency	Percentage
No pain	--	--	5	12.5
Mild pain	25	62.5	33	82.5
Moderate pain	15	37.5	2	5
Severe pain	--	--	--	--

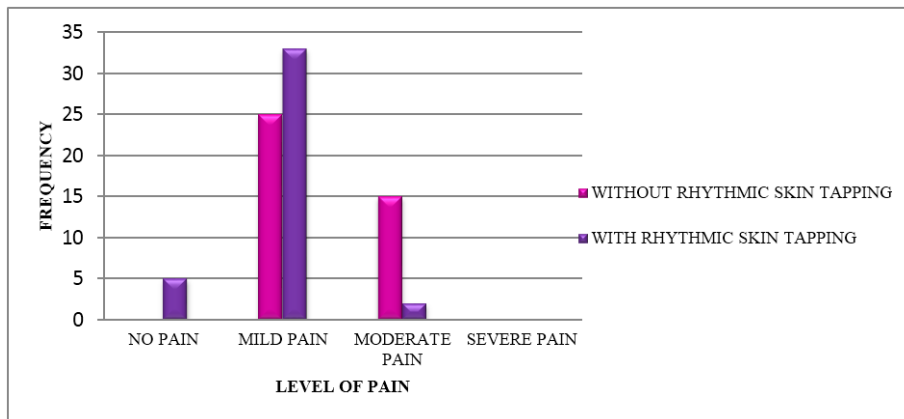


Fig 1: Bar diagram showing the frequency of pain level in Numerical Pain rating scale.

Table 3: Level of pain by using Verbal Pain Intensity scale n = 40

Pain Level	Without Rhythmic Skin Tapping (%)		With Rhythmic Skin Tapping (%)	
	Frequency	Percentage	Frequency	Percentage
No pain	1	2.5	6	15
Mild pain	26	65	34	85
Moderate pain	13	32.5	--	--

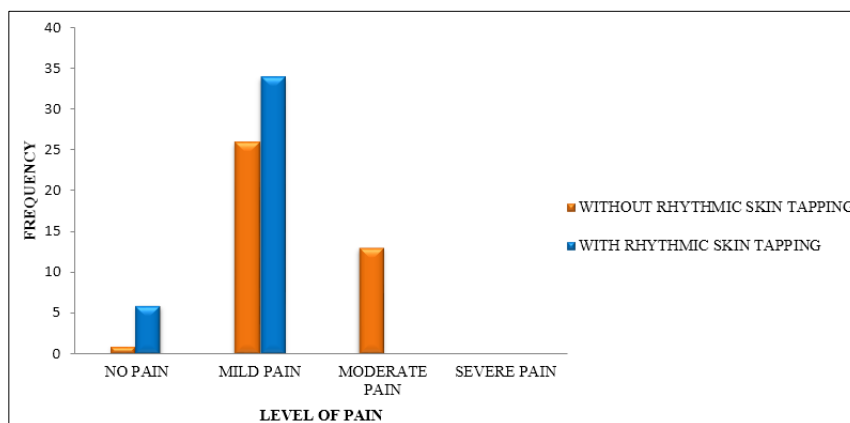


Fig 2: Bar diagram showing the frequency of level of pain using Verbal Pain Intensity scale.

Table 4: Comparison between the levels of pain assessed by using Numerical Pain rating scale and Verbal Pain Intensity rating scale

Verbal Pain Intensity scale	Numerical Pain Rating scale		Total of Verbal Pain Intensity scale	Fisher’s exact	p value
	Mild	Moderate			
No pain	1	0	1	17.989	<0.001
Mild pain	22	4	26		
Moderate pain	2	4	4		
Total of numerical pain rating scale	5	8			

Since the p value is <0.05 there is a difference in pain assessed by using the two different tools at 5% level of significance

**Section III: Effectiveness of Rhythmic Skin Tapping on pain during IM Injection**

The effectiveness of Rhythmic Skin Tapping on pain during IM injection was analyzed using Wilcoxon Signed Rank Test.

Table 5: Effectiveness of rhythmic skin tapping on pain by using Wilcoxon Signed Rank Test n = 40

	Level of Pain	Median	IQR	P Value
Numerical pain rating Scale	Without rhythmic skin Tapping	2	2 to 3	< 0.001
	With rhythmic skin tapping	2	2 to 2	
Verbal Pain Intensity Scale	Without rhythmic Skin Pping	2	2 to 3	< 0.001
	With rhythmic skin tapping	2	2 to 2	

The data represented in the table shows the median for level of pain with and without rhythmic skin tapping as 2 and the IQR ranges from 2 to 3 the p value is <0.05 which shows a significance. Hence there is a difference in pain scores

measured by using both the tool before and after the rhythmic skin tapping. Hence the rhythmic skin tapping is effective in reducing pain among the male adults during IM injection.

**Section IV:** Association between the levels of pain with selected demographic variables  
 In order to find the association between the level of pain and selected demographic variables Chi square and Fisher’s exact

test was used.  
 To test the association, following hypothesis was stated.  
**H2:** There will be an association between the levels of pain with selected demographic variables.

**Table 6:** Association of the levels of pain in Numerical Pain Scale with selected Demographic variables using Chi square and Fisher’s exact test. n = 40

Demographic Variables		Mild	Moderate	Test Statistic	P Value
Age	20-30 years	13	7	2.205 (Fisher’s Exact)	0.150
	30-40 years	5	6		
	40-50 years	7	2		
Area of living	Rural	12	6	0.242 (Chi square)	0.747
	Urban	13	9		
Type of family	Nuclear Family	18	11	0.283 (Fisher’s Exact)	0.613
	Extended family	7	4		
Education status	No formal education	2	3	3.423 (Fisher’s Exact)	0.528
	Primary	6	1		
	High school	2	2		
	Higher Secondary	7	3		
Occupation	Graduation	8	6	4.591 (Fisher’s Exact)	0.218
	Daily wager	8	6		
	Government employer	3	3		
	Private employer	11	2		
Weight	Others	3	4	2.858 (Fisher’s Exact)	0.284
	50 – 60	4	6		
	60 – 70	13	5		
Height	70 – 80	8	4	5.349 (Chi square)	0.064
	150 – 160	5	4		
	160 – 170	14	3		
Frequency of hospital admissions	170 – 180	6	8	0.039 (Fisher’s Exact)	0.080
	<5	14	13		
Duration of Present hospital stay	>5	1	2	0.059 (Fisher’s Exact)	0.117
	<4	17	14		
Support to the client in the hospital	<4	8	1	0.378 (Fisher’s Exact)	0.516
	Family members	22	14		
	Friends	3	1		
	Hospital staffs	--	--		
Previous experience of IM injections	No support	--	--	0.375 (Fisher’s Exact)	0.375
	Yes	25	14		
Usual behaviour exhibited during pain	No	--	1	3.044 (Fisher’s Exact)	0.187
	Shows tolerance	21	9		
	Seeks diversions	3	4		
	Disturbs others	1	2		

**Table 7:** Association of the levels of pain levels in verbal pain intensity scale with selected demographic variables using chi square and fishers exact. n = 40

Demographic Variables		No Pain	Mild	Moderate	Test Statistic	P Value
Age	20-30 years	0	14	6	3.885 (Fisher’s Exact)	0.454
	30-40 years	0	6	5		
	40-50 years	1	6	2		
Area of living	Rural	1	12	5	1.404 (Fisher’s Exact)	0.502
	Urban	0	14	8		
Type of family	Nuclear family	0	3	1	8.415 (Fisher’s Exact)	0.421
	Extended family	0	8	2		
Education status	No formal education	0	2	3	2.700 (Fisher’s Exact)	0.288
	Primary	0	20	9		
	High school	1	6	4		
	Higher Secondary	1	5	1		
Occupation	Graduation	0	8	1	6.373 (Fisher’s Exact)	0.374
	Daily wager	1	8	5		
	Government employer	0	4	2		
	Private employer	0	11	2		
Weight	Others	0	3	4	5.359 (Fisher’s Exact)	0.181
	50 – 60	0	4	6		
	60 – 70	1	13	4		
Height	70 – 80	0	9	3	5.298 (Fisher’s Exact)	0.179
	150 – 160	0	5	4		
	160 – 170	0	14	3		
	170 – 180	1	7	6		

Frequency of hospital admissions	<5	0	16	11	3.962 (Fisher's Exact)	0.140
	>5	1	10	2		
Duration of Present hospital stay	<4	1	18	12	2.883 Fisher's Exact)	0.400
	<4	0	8	1		
Support to the client in the hospital	Family members	1	23	12	0.995 (Fisher's Exact)	0.630
	Friends	0	3	1		
Previous experience of IM injections	Yes	1	26	12	3.866 (Fisher's Exact)	0.350
	No	0	0	1		
Usual behaviour exhibited during pain	Shows tolerance	1	21	8	3.981 (Fisher's Exact)	0.529
	Seeks diversions	0	4	3		
	Disturbs others	0	1	2		

The calculated chi square value for the variable, area of living is 0.242 and it is less than the chi square table value (3.841) also the 'p' value is more than 0.05. Hence, there is no association between area of living and the level of pain during IM injection.

From the above table (Table 6), it is clear that height (calculated chi square value 5.349 is less than chi square table value 5.991) does not have an association with level of pain during IM injection.

For the remaining selected demographic variables Fisher's exact test was used with pain score. The p value is more than 0.05 (Table 6, 7). Hence, these variables are not associated with pain at 5% level of significance.

### Conclusion

Pain at the injection site is one of the most commonly reported local reactions associated with administration of IM injections. Once the clients experience pain after intramuscular injection because of any of the related factors for causing pain, they become scared of getting the injections via the IM route in future.<sup>8</sup>

It has been evident that Rhythmic skin tapping is effective in reducing the pain levels of clients receiving IM injection. Rhythmic skin tapping involves the tapping of skin over the injection site before and during the procedure. There is reduced pain in giving injection into a relaxed muscle. Tapping over the skin is one of the various techniques to keep the muscles relaxed [2].

From this study, researcher found that Rhythmic Skin Tapping is effective in reducing the pain levels of clients receiving IM injection.

### Acknowledgement

It gives me great pleasure to thank with deep sense of gratitude and respect, my guide Mrs. Cleeta Pinto, Asst. Professor, Department of Medical Surgical Nursing, Nitte Usha Institute of Nursing Sciences, for her inspiring guidance, suggestions, timely help, constant encouragement, patient listening, and co-operation during each phase of the study.

Grateful acknowledgement is extended to Dr. Sanal T. S, Statistician, Kshema for his valuable help in statistical analysis for this study. Words are not sufficient to acknowledge his guidance without which it would not have been possible to complete this work.

### References

- 1 Potter PA, Perry AG. Fundamentals of nursing. New Delhi, 2005.
- 2 Sr. Serena. Rhythmic skin tapping: An effective measure to reduce procedural pain during IM injection. Available from: URL: <http://www.tnaionline.org/aug-10/6.htm>.

- 3 Kamalesh R. Clinical practice guidelines intramuscular injection guideline for evidence based technique. Indian Paed. [Internet]. 2003 Sep [cited 2014 Sep 24]; 40 (5): Available from: URL:<http://www.indianpediatrics.net/sep2003/sep-835-845.htm>
- 4 Desbiens NA. The symptom burden of seriously ill hospitalized patients. SUPPORT Investigators. Study to Understand Prognoses and Preferences for Outcome and Risks of Treatment. J Pain Symptom Manage. [Internet]. 1999-2014, 17(4) Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10203877>
- 5 Kanika K, Helen Rani, Shobha Prasad. Effect of massage on pain perception after administration of Intramuscular Injection among adult patients. Pubmed. [Internet]. 2011-2014; 10(2) Available from: <http://medind.nic.in/nad/t11/i2/nadt11i2p84.pdf>.
- 6 Zainab Suhrabi. Effect of Acupressure on pain intensity in intramuscular injections. Iran J Nurs Midwifery Res. Internet. 2014, 19(1) Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3917181/>
- 7 Lakhani, Rita. The Intensity of pain experienced by respondents given intramuscular (IM) injection with/without skin tapping technique. Virginia Henderson International Nursing e-Repository. [Internet]. 2014 Feb 2014, 15(3) Available from: [https://www.nursinglibrary.org/vhl/bitstream/10755/312899/3/intramuscular+\(IM\)+injection.pdf](https://www.nursinglibrary.org/vhl/bitstream/10755/312899/3/intramuscular+(IM)+injection.pdf)
- 8 Kanika *et al.* Effect of massage on pain perception after administration of Intramuscular Injection among adult patients. Available from: URL: <http://medind.nic.in/nad/t11/i2/nadt11i2p84.pdf>