Effectivity of Malunggay (Moringa Oleifera) Seeds Oil Extract Topical Application as Adjunct Therapy for Arthritic Pain

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Abstract

According to the Department of Health (DOH, 2011), the morbidity rate for Arthritis in the Philippines is increasing and the age group of 65 years and above has the highest morbidity. Despite the fluctuations in number of reported cases over the years, arthritis had been a rampant cause of pain to the elderly. However, therapy for this disease is considerably expensive; thus, the researchers utilized Moringa Oleifera seeds oil extract topical application as an adjunct therapy in providing relief of arthritic pain. Manual oil press was used to extract oil. The researchers conducted three trials with four assessments in various time intervals for 30 randomized samples for each group in three different localities, utilizing the true-experimental, Pretest-Posttest design. One Way Repeated Measures Analysis of Variance (ANOVA) showed p-value of 0.909 and 0.000 for Control and Experimental groups respectively. Paired T-test revealed p-value of 0.000 for Experimental group's pre-test and post-tests. T-test of independent samples however showed significant decrease in pain level only on 30 minutes and one hour after application. These results suggested highly significant decrease of pain perceived by subjects who received the adjunct therapy.

Keywords: MoringaOleifera, Malunggay, arthritis, pain, adjunct therapy

1.0 Introduction

Arthritis has become a widespread disease-causing disability and dependence on older adults especially the ones aging 65 years and above. Based on 2007-2009 data from the National Health Interview Survey (NHIS) an estimated 50 million (22%) of adults have self-reported doctor-diagnosed arthritis, 50% of them are 65 years or older (Cheng, Hootman, Murphy, Langmaid, & Helmick, 2010). Moreover, there are 11 million Filipinos with osteoarthritis (based on a prevalence rate of 16%) and about 50% of 65 years and older have symptoms of arthritis (Department of Health DOH, 2008).

DOH (2008) had shown the highest morbidity of arthritis 118 for males and 209 for females. According to Regional Disease Morbidity by Age and Sex Statistics 2011 of Department of Health, Region VII, the total number of morbidity for Arthritis in Cebu is 413 for males and 829 for females with a total of 1,242 while the total regional morbidity is 1,375. It is characterized by an inflammation of joints. Clients who have this disease experience inflammation of the joints and pain due to daily wear and tear of joint, muscle strains, fatigue or forceful movements of stiff painful joints (Spine, Disc & Pain Clinic, 2013).

Added to the increased number of incidence of arthritis in Cebu pharmacologic interventions that can address the pain of the clients are very expensive for some clients. Medications can help reduce inflammation in the joint which decreases pain and potential future damage but take a toxic toll on the rest of your body (liver) from the continued ingestion of chemicals (Fisher, 2010). Thus, others resort to alternative methods to help them control the primary symptom that disable the clients to perform some activities of daily living.

Moringa Oleifera, commonly known by Filipino as Malunggay, is traditionally used to prevent and treat inflammation associated with rheumatism, arthritis and joint pains (Guevara, Vargas &Uy, 2003). Almost every part of the plant can be used as food or with medicinal purposes (Anwar, Latif, Ashraf &Gilani, 2006). One of which is the use of the seeds oil extract in the inflammation inhibition as well as providing analgesic effects on the clients. Malunggay has also been found to inhibit inflammation in a controlled scientific study conducted by Philippine Department of Science and Technology (Guevara et al., 2003). When an aqueous seed extract of malunggay has been administered to a carrageenan induced inflammation, it was noted that the aqueous seed extract of the Malunggay (Moringa Oleifera) inhibited the development of edema in rat paw.

However, there are limited studies on the topical application of malunggay in preventing inflammation that eventually results to pain relief. This prompts the researchers to study the possibility of minimizing arthritic pain with the use of mentioned method of administration. The researchers of this study aim to ***utilize the topical application of Malunggay seeds extract (Moringa Oleifera) in minimizing pain in clients with arthritis as an adjunct therapy for them to perform activities of daily living.*** Thus, the clients will discover an alternative approach in managing the disease.

Literature Review

Various studies have proven the efficacy of *Moringa Oleifera* in reducing pain and inflammation of arthritis. However, these studies did not use Moringa Oleifera as a topical application. There are also limitations on studies indicating the duration and time of relief after the application. Hence, the study has rooted on researches and studies mentioning *M. Oleifera's* effect as analgesic.

In the recent study concerning *M. Oleifera,* phytochemical screening revealed the presence of saponins, free anthraquinones, and alkaloids on the seeds which have anti-inflammatory effects (Adejumo et al., 2012). It was supported by Muangnoi, Chingsuwanrote, Praengamthanachoti, Svasti, and Tuntipopipat (2011), that pro-inflammatory mediators produced during inflammatory response have been demonstrated to initiate and aggravate pathological development of several chronic diseases. Amelioration of inflammation associated chronic diseases can be possible with the potent anti-inflammatory activity of Moringa bioactive compounds. It also stated that considering potent anti-inflammatory activity of Moringa plant, it can be surmised that this plant shows profound influence on inflammation associated diseases and resultant symptoms. As a consequence, this plant shows beneficial effects on asthma, pain, and other resultant symptoms. Moringa seeds are used for their antibiotic and anti-inflammatory properties to treat arthritis, rheumatism, gout, cramp, sexually transmitted diseases and boils. The seeds are roasted, pounded,

mixed with coconut oil and applied to the problem area. Seed oil can be used for the same ailments (Kasolo, Bimenya, Ojok, Ochieng&Ogwal-Okeng, 2010).

In a research done by Kasolo , et.al (2010), Moringa tree contains many nutrients such as essential vitamins, essential minerals, amino acids, beta-carotene, anti-oxidants, anti-inflammatory nutrients, phytochemicals and it also contains both omega-3 and omega-6 fatty acids. Phytochemicals are non-nutritive chemicals that plants produce as a self-defense mechanism. Phytochemicals present in Moringa oleifera include catechol tannins, Gallic tannins, steroids, triterpenoids, flavonoids, saponins, anthraquinones, alkaloids and reducing sugars. These phytochemicals have been researched and are known to have medicinal values for humans such as detoxification and purification of water, antibiotics, skin therapy, anti-inflammatory, ulcers, blood pressure, diabetes, anemia and many other uses. The presence of this chemical indicates the possible healing properties of this species leaves and other parts of its tree.

Amongst alcoholic extract and its various fractions of seeds of M. Oleifera alcoholic extract showed potent analgesic activity which is comparable to that of aspirin at the dose of 25 mg/kg of body weight. From this study, it can be concluded that the seeds of M. Oleifera Lam. possess marked analgesic activity and is equipotent to standard drug (Aspirin) which establishes the use of M. Oleifera seeds as regular analgesic (Sutar, Bonde, Patil&Kakade, 2008).

According to Goyal, B., Goyal, R., Agrawal & Mehta (2007), the mature seeds of MoringaOleifera contain Crude protein, Crude fat, carbohydrate, methionine, cysteine, 4-(α-L-rhamnopyranosyloxy)-benzylglucosinolate, benzylglucosinolate, moringyne, mono-palmitic and di-oleic triglyceride 10 which also have anti-inflammatory effects. Other anti-inflammatory components include Vitamin A, Vitamin B1 (Thiamin), Vitamin C, Calcium, Magnesium Potassium and Zinc.

Moringa preparations have also been cited in the scientific literature as having antibiotic, antitrypanosomal, hypotensive, antispasmodic, antiulcer, anti-inflammatory, hypo-cholesterolemic, and hypoglycemic activities, as well as having considerable efficacy in water purification by flocculation, sedimentation, antibiosis and even reduction of Schistosomecercariae titer (Fahey, 2005) in the Johns Hopkins School of Medicine, Department of Pharmacology and Molecular Sciences, Lewis B. and Dorothy Cullman Cancer Chemoprotection Center.

Malunggay has been found to inhibit inflammation in a controlled scientific study conducted by Philippine DOST Scientists (Guevara et al., 2003). When an aqueous seed extract of malunggay has been administered to a carrageenan induced inflammation, it was noted that the aqueous seed extract of the Malunggay (MoringaOleifera) inhibited the development of edema in ratpaw. The Malunggay is traditionally used to prevent and treat inflammations associated with rheumatism, arthritis and joint pains.

Statement of the Problem

This study aims to evaluate effectiveness of topical application of M. Oleifera seeds extract as an adjunct therapy in the relief of pain in subjects with arthritis.

Specifically, this study aims to answer the following questions:

1. What is the mean pain score reported by subjects before and after the topical

application of M. Oleifera seeds extract?

2. Is there a significant reduction of pain manifested by the subjects from pretest to posttest ***within*** the control and experimental groups?
3. Is there a significant difference of pain reduction in terms of time of pain relief?
4. Is there a significant difference of pain relief ***between*** control and experimental group in the pretest and posttest?

2.0 Methodology

The study utilized true-experimental, Pretest-Posttest design characterized by randomization, observation and the presence of manipulation/ intervention. The researchers compared the final posttest results between the two experiments to determine the overall effectiveness of the intervention. The researchers compared the pain perception before, immediately, 30 minutes and one (1) hour after the application of Malunggay seeds oil extract.

The subjects of the study were chosen through Simple Random sampling through coding of names and computerized assignment of codes based on the set inclusion criteria per group: (1) voluntarily consented to be part of the study; (2) has self-reported arthritic pain; (3) medically diagnosed with osteoarthritis and/or rheumatoid arthritis; (4) age 65 years old and above; (5) had self -reported compliance with arthritic pharmacological regimen. The researchers have gathered a total of 60 subjects divided into control and experimental groups. Control Group consists of subjects who have qualified the above general criteria and received only the prescribed medication. While the experimental Group was composed of subjects who have the same characteristics as stated in criteria and received both the pharmacologic and adjunct topical application of Malunggay seeds oil extract.

The subjects were from three localities; Hipodromo, Kalunasan and Bacayan. These locations were selected based from the Barangay Arthritis Morbidity of City Health, Cebu, Philippines. Visual/Verbal Analogue Scale was utilized to determine pain intensity felt by the subjects before and after the application.

The *M. Oleifera* was procured and extracted through a cold compressor. Upon extraction, the oil was strained using cheesecloth to eliminate the shells. After which, the oil was placed in a clean 10-ml containers container ready for application.

The data gathered were analysed in accordance to the problems identified by the researchers. Paired T-test was utilized to compare the pain score within the experimental group while T-test of Independent Sample was utilized to get the difference of the pain score reported between the control and experimental groups. To identify the effects of time and duration of relief between the subjects in each trial, One way ANOVA was used.

Role of Researchers

The researchers had personally conducted the whole experimental process including the assessments of potential subjects, application of the topical oil extract as well the trials before and after application. There was no other individual involved except the paid third party for the manual extraction of Moringa Oleifera. The researchers coordinated with various Senior Citizen Association presidents to aid in the gathering of participants.

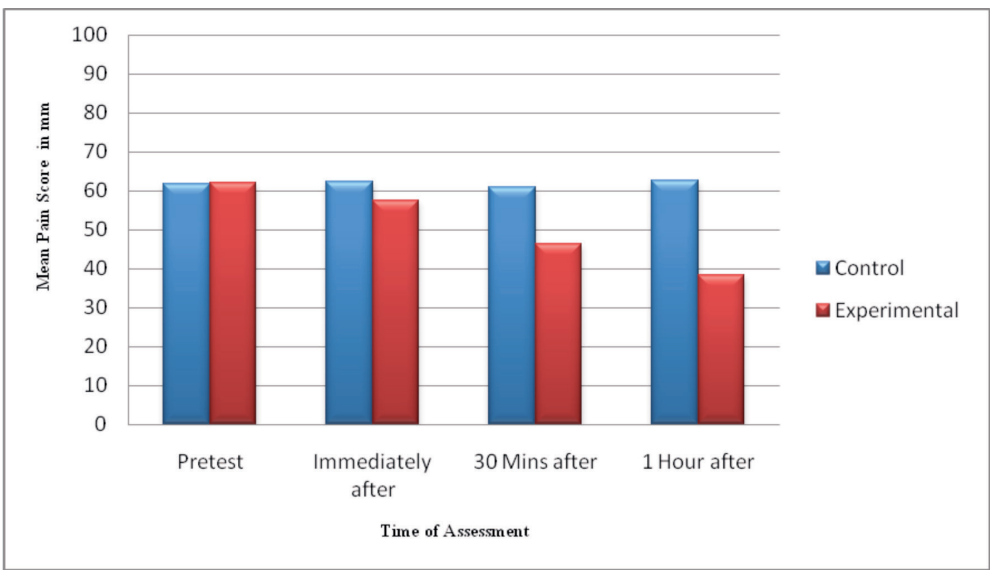
Ethical Consideration

Before the data gathering, the research panelists

reviewed, evaluated and approved the technical and ethical aspects of the completed proposal. Informed Consent and thorough explanation of the purpose of the research study was conducted. The researchers disclosed pertinent details such as the manner of application, the times of assessment, length of the data gathering and number of trials and the guidelines that should be followed during the conduct of the research such as temporary cessation of use of other palliative therapy to arthritis and religious compliance to prescribed pharmacologic regimen. Participants were given the freedom to discontinue their participation in the event of risks, discomforts and inconveniences without any compensation on their part. It was also stressed that the subjects would not receive any form of payment in the duration of research. Most importantly, the researchers ensured confidentiality of information gathered and such data would only be disclosed at the participants' permission. The subjects were given contact details of each researcher in cases of clarification of terms in the consent. The above mentioned terms were diligently followed throughout the whole experimental process.

3.0 Results

The Figure 3 below showed comparison of mean pain scores between two groups. The mean pain scores of the control group exhibited fluctuations especially on the 30 minutes mark of assessment; however remained on the 60-70 mm on the scale. This implied that the 30 subjects, experienced moderate pain within the three (3) trials. On the other hand, the experimental group showed a decreasing pattern of reported pain scores for each assessment. This indicated that the 30 subjects experienced a gradual pain relief from moderate to mild pain.



Note: Score Interpretation: (no pain) 0–4 mm, (mild pain)5– 44 mm, (moderate pain) 45–74 mm, and (severe pain)75–100 mm (Hawker et al., 2011)

Figure 3. Mean Pain Scores of the Experimental and Control Groups

Table 1. One-Way ANOVA Results on Both the Experimental and Controlled Groups

Source	DF	SS	MS	F	P
Experimental	3	10370	3457	21.29	0.000
Error	116	18832	162		
Total	119	29202			

Source	DF	SS	MS	F	P
Controlled	3	51.2	17.1	0.18	0.909
Error	116	10911.3	94.1		
Total	119	10962.5			

Note: DF- Degree of Freedom F- F ratio
SS- Sum of Squares P- Probability value
MS- Mean of Squares

Table 1 results showed that the reduction in the pain scores within the experimental group is significant. It implied that pain reduction has improved as time passed by as compared to the results of the controlled group. Hence, this suggested that the application of the Moringa Oleifera seed extract as an adjunct therapy had been effective.

Table 2. Paired T-test Results Comparison within Each Group

	Paired Differences					t	df	P
				95% Confidence interval of the difference				
	Mean	StdDev	Std Error	Lower	Upper			
Pair E1-								
Pre	62.01	12.03	2.20					
Immediately	57.38	12.30	2.24	3.489	5.778	8.28	29	0.000
Difference	4.633	3.064	0.559					
Pair E2								
Pre30 min. after	62.01	12.03	2.20					
Difference	46.44	12.55	2.29	13.24	17.90	13.66	29	0.000
	15.57	6.24	1.14					
Pair E3 –								
Pre 1 hour after	62.01	12.03	2.20					
Difference	38.23	13.99	2.55	20.78	26.77	16.23	29	0.000
	23.78	8.02	1.47					
Pair C1-								
Pre	61.72	11.00	2.01					
Immediately	61.72	11.00	2.01	0	0	*	29	*
Difference	0	0	0					
Pair C2-								
Pre	61.72	11.00	2.01					
30 min after	60.88	7.94	1.45	-1.87	3.56	0.64	29	0.530
Difference	0.84	7.27	1.33					
Pair C3-								
Pre	61.72	11.00	2.01					
1 hour after	62.72	8.44	1.54	-4.21	2.21	-0.64	29	0.529
Difference	-1.00	8.60	1.57					

Note:E1 to E3- refers to the experimental group. C1 to C3 refers to the control group

A multiple paired-samples t-test was conducted to compare the mean pain scores in clients that underwent therapy and those who did not, within a specific span of time. This test was done to know if time made a significant difference on the results within the same group. As shown from the table above, there was a significant difference in the pain scores manifested by the experimental group from the pre-test to the pain scores recorded immediately after therapy. This signified that the therapy may already be effective immediately after applying the Moringa oil. A gradual increase in the T-value 30 minutes and an hour after indicated that there is a significant decrease in pain level among the respondents who received the Moringa oil therapy. Thus, it implied the continuous effectivity of the therapy within an hour. On the other hand, results reflected that there was no significant difference of pain scores among the controlled group with regards to time. Since the controlled group did not receive any therapy, the pretest scores and results for the immediate assessment were just the same. The pain scores reported 30 minutes and an hour after remained around the same range thus, the respondents' pain remained on moderate level after an hour of application.

Table 3. T-Test of Independent Samples Results Comparison Between Groups

	Mean	StdDev	Std Error	95% Confidence interval of the difference		T	df	P
				Lower	Upper			
Pair C1- E1 *Pretest C1* *Pretest E1*	61.7 62.0	11 12	2 2.2	-6.25	5.67	-0.10	58	0.923
Pair C2- E2 *Immediate C2* *Immediate E2*	61.7 57.4	11 12.3	2 2.2	-1.68	10.37	1.44	58	0.155
Pair C3 -E3 *30 mins. after C3* *30 mins. after E3*	60.88 46.4	7.94 12.6	1.5 2.3	9	19.86	5.32	58	0.000
Pair C4-CE4 *1 hour after C4* *1 hour after E4*	62.72 38.2	8.44 14	1.5 2.6	18.52	30.46	8.21	58	0.000

Note: E1- E4 are experimental groups; C1-C4 are control groups*

As reflected above, the pain level during the pretest and immediate assessment showed no significant difference on both groups. This indicated that the therapy was not effective after immediate application of Moringa oil. However, after 30 minutes, the pain level showed a highly

significant difference between the two groups. This implied that the therapy was effective 30 minutes after the topical application. After an hour, assessment showed that the level of pain was still decreasing.

Discussions

As shown in Figure 3, the mean pain scores for the experimental group after each trial showed a decreasing pattern indicating the gradual relief of pain felt by the respondents within the time stated. This highly signified progressing effects that the topical application of Moringa Oil was effective in reducing arthritic pain as an adjunct therapy. There were no studies made specifically on the use of MoringaOleifera as a topical application however, other researches showed that when an aqueous seed extract of malunggay was administered to a carrageenan, it inhibited the development of edema in ratpaw (Guevara et al, 2003).

According to Kasolo (2010), Moringa seeds are used for their antibiotic and anti-inflammatory properties to treat arthritis, Rheumatism, gout and others. This was supported by the study of Adejumo et al (2012), which stated that Moringa seeds contain saponins, free anthraquinones and alkaloids which all have anti-inflammatory effects. Further results showed that the controlled group's pain scores had an intermittent rise and fall pattern but remained within a constant range. This indicated that the pain scores of those without therapy may vary but remained on the moderate pain level. This meant that since the respondents were experiencing chronic pain yet were not given any adjunct therapy of their medications, pain did not subside. This supported the statement of Pickering (2004) that pharmacological therapy for persistent pain is most effective when combined with non-pharmacological approaches.

Therapy was done for three (3) trials within three (3) consecutive days and for each trial, assessment for pain scores was done four times. To know whether time made a significant difference on the effect of MoringaOleifera oil to the level of pain manifested by the respondents, paired t-tests were done to compare the before and after results of therapy within the same group. Pretest results were then compared to the posttest results taken immediately, after 30 minutes and an hour after. Same comparison method was done to the controlled group who did not receive any therapy. Results would tell that pain was not greatly affected by time even without the topical application. This would also prove that the mature seeds of MoringaOleifera containing Crude protein, Crude fat, carbohydrate, methionine, cysteine, 4-(α-L-rhamnopyranosyloxy)-benzylglucosinolate, benzylglucosinolate, moringyne, mono-palmitic and di-oleic triglyceride would have its anti-inflammatory effects occur within a short span of time on the experimental group (Bennett et al., 2003;Goyal et al., 2007)

In addition, other components of MoringaOleifera which included glycosides, flavonoids, tannins, amino acids (alpha-4rhamnoloxy benzyl isothiocynate) (Sutar et al., 2008) have analgesic properties that have contributed to the reduction of pain felt by the subjects within the experimental group. Flavonoids involve the inhibition of the synthesis and activities of different pro-inflammatory mediators such as eicosanoids, cytokines, adhesion molecules and C-reactive protein (Serafini, Peluso, &Raguzzini , 2010). On the other hand, tannins have also been reported to exert other physiological effects, such as modulation ofimmunoresponses. They

also antagonized the permeability-increasing effects of certain mediators of inflammation and to inhibit the migration of leucocytes to an inflammatory site (Jeffers 2006; Mota, Thomas & Barbosa Filho, 1985). Phenylethanoid glycosides showed inhibitory effect on the lipopolysaccharide (LPS)-induced nitric oxide (NO) production in microglial cells. It is previously known that nitric oxide regulates inflammatory erythema and edema and has cytotoxic action against micro-organisms. In the inflamed joint, NO regulates the synthesis of several inflammatory mediators and functions of inflammatory cells. In addition, NO seems to mediate some destructive effects of proinflammatory cytokines such as interleukin-1 (Ze-dong, Ke-wu, She-po, Ming-bo, Yong, & Peng-fei, 2013). With these properties stated, presence of glycosides in Moringa can aid in halting inflammation thus reducing pain sensation.

During the trial period, most of the respondents from the experimental group verbalized that they felt pain relief minutes after the topical application and were able to move more freely. As shown and supported by the results in Table 2, the pain felt by the respondents within the experimental groups subsided gradually as shown on each assessment. However, the T-test for independent samples which was used to compare results between the two groups, showed that the results for immediate assessment were not significant. This contraindicated the results of the paired T-test which showed that pain level decreased significantly after immediate application of therapy within the same group. This suggested that the slight pain relief acquired by the respondents during immediate assessment may not be caused by the therapy but by external factors such as the type of pain and the respondents' tolerance to pain.

On the other hand, the subjects did not report any complication or side-effects during the entire experimental process. There was no complaint about the smell of the oil and its texture.

Since the study was only limited for an hour of observation, further assessment regarding the extent of the effectivity of the therapy was not done. However, the researchers took note of the feedbacks of 70% of the participants. Some respondents reported that the effect of the therapy lasted for3-4 hours after the application. On the contrary, one respondent verbalized that she did not feel any relief of pain until hours later after the application. Also, one respondent had reported that she felt worse pain that escalatedafter application of the remedy.

The researchers considered the duration of action of the medications taken by the respondents. The medications taken were Diclofenac (46.67%) that would take effect for 8 hours, Naproxen Sodium (21.66%) for 12 hours and Acetaminophen (31.67%) for 4 hours. Other respondents, who were applying liniment oils as remedy for pain, were encouraged to stop the application temporarily for the three-day trials. The results then provedthat the level of pain relief was altered neither by the drugs taken by the respondents nor by the liniments usually applied.

Since most of the pharmacologic interventions to control primary symptom of arthritis are expensive, clients with such disease opted to use herbal plants. It was supported by statement from Guevara et al (2003) that MoringaOleifera was traditionally used to prevent and treat inflammation associated with rheumatism, arthritis and joint pains in the Philippines.

It had been observed that the uses of natural remedies have been gaining the attention

in the medical approach for certain diseases. Easy cultivation of Moringa within adverse environmental condition and wide availability attracted attention for economic and health related potential, in developing countries. This study discussedthe medicinal alternative potential of MoringaOleifera and its prospective as a commercial medicinal remedy for athritic pain management. Although, many bioactive compounds had been discovered from Moringa, the knowledge of its topical uses was still not fully explored.

With further research, this study would be of great breakthrough on the medical and nursing field.This study could be utilized in aiding the pain management of the elderly people who have arthritis in a cost effective manner since each 10-ml vial of extract cost Php. 21.00. Perhaps, future rigorous studies directed towards the commercialization of Moringa bioactive compounds could lead to the development of remedies for Arthritis and other several ailments. Thus, the study could also prove the validity of traditional use of MoringaOleifera in reducing the pain brought by the said disease.

The nurses could benefit from this study by familiarizing the use of Moringa Oleifera in traditional medicine, presenting the findings of these evidence-based studies, and provide implications for clinical practice.This study can also be utilized by future nurse researchers as a basis and reference for further or related studies regarding Moringa Oleifera as an adjunct therapy for arthritic pain.

Critique to the Results

In the light of observed and experienced limitations of the study, the future researchers may consider the use of placebo for the control group to test the psychological effects of therapy of chronic arthritic pain. In addition, a greater number of samples and longer time of assessment to determine the duration of effect may warrant more reliable source of data. Furthermore, the oil concentration must be measured. Lastly, the compliance of their pain medication is relying only on self reports.

4.0 Conclusion

Moringa oil extract has potent analgesic effects resulting to reduction of pain felt by the subjects who utilized the said adjunct therapy. Its efficacy ranges from 30 minutes and an hour onwards from application. Hence, the use of this intervention contributed to a more cost-effective management of pain and could alleviate the financial burden on economically-challenged clients with arthritis.

This study has improved the current literature by enhancing the areas of alternative modalitiesspecifically the use of herbal plants. This study however, had certain limitations. Given the study site, the findings might not reflect the experiences of all clients with arthritis locally and internationally. Nonetheless, this study surfaced trends worthy of further investigation.

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