

# Comparative Study on Ginger Supplement and Aerobic Exercise on Primary Dysmenorrhea: The Case of Debre Markos University Students, Amhara Regional State, Ethiopia

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## ABSTRACT

**Background:** Primary dysmenorrhoea is a chronic cyclical pelvic pain associated with menstruation in the absence of an identifiable pathological condition. Dysmenorrhea is one of the most common complaints of gynecological problem worldwide among young females. The purpose of this study was to investigate the effects of 12 week ginger supplement and aerobic exercise on primary dysmenorrhea the case of Debre-Markos university students.

**Methods:** Forty (40) female students who had the history of primary dysmenorrhea aged between 19-22 years from departments of sport science and Stastics students in Debre Markos University were selected by using purposive sampling technique. The selected subjects were divided into aerobic group (20) and ginger supplement group (20). Ginger supplement group consumed ginger tea for five days per week with once a day and aerobic group underwent aerobic exercise three days a week within 60 minutes for 12 weeks. Pre and post test was conducted on variables such as VAS, MSQ and BMI. The data collected from subjects were analysed by SPSS version 20.0 and the comparison of mean value results were carried out by paired sample t-test. The level of significance was  $p \leq 0.05\%$ .

**Results:** The finding of the present study indicates that MSQ test from pre to post test showed positive significant change for ginger supplement group. Also VAS pre to post test showed significant change (MD,0.900) for aerobic group and (MD,1.600) for ginger supplement group and BMI pre to post test showed (MD,0.725) for aerobic group and (MD, 0.642) for ginger supplement group. The result of the study showed that ginger group was more significant change than aerobic group

in menstrual symptom questionnaires.

**Conclusion:** It was concluded that 12 week ginger supplement and aerobic exercise had positive effect on primary dysmenorrhea to reduce pain during menstruation.

**Summary:** Exercise causes to delay the start of prostaglandins gathering and reduced the menstrual pain by increasing endorphins and reducing stress and sympathetic nervous activity, and also by increasing the blood flow to the pelvic.

Research suggests that compounds found in ginger may help to protect against the increases in inflammation, by inhibiting the body's production of prostaglandins (a class of pro-inflammatory chemicals involved in triggering the muscle contractions that help the uterus shed its lining).

Treatments of primary dysmenorrhea in students with ginger tea and aerobic exercise for 12 weeks were significant effect on reducing intensity and duration of pain during menstruation and BMI.

Ginger tea group shows more significant change than aerobic exercise group on reducing pain intensity during and before menstruation.

**Key words:** Aerobic exercise, Ginger supplement, Primary dysmenorrhea

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## ABBREVIATIONS

BMI: Body Mass Index; DMU: DebreMarkos University; HRQoL: Health Related Quality of Life; MSQ: Menstrual Symptom Questionnaire; NSAID: Non Steroid Anti Inflammatory Drug; PD: Primary Dysmenorrhea; PG: Prostaglandin; PoT: Post Test; PT: Pre Test; SPSS: Statistical Package for Social Science; VAS: Visual Analogue Scale

## INTRODUCTION

Menstrual period is a natural phenomenon which occurs throughout the reproductive years of every woman. Most females experience certain degree of pain and distress during their menstruation period (Kaur S, *et al.* 2015). Dysmenorrhea is a painful/cramping sensation in the lower abdomen often accompanied by other biological symptoms including dizziness, fatigue, sweating, backache, headache, nausea, vomiting, and diarrhea all occurring just before or during the menstruation. The term dysmenorrhea is derived from Greek words dys (difficult, painful or abnormal) mena (month) and reha (flow). It is considered as very common gynecological problems (Latha S and Venkatesan L, 2016).

Dysmenorrhea may be categorized into two types as primary and

secondary. Primary dysmenorrhea is defined as painful menses among females with normal pelvic anatomy, frequently beginning during adolescence. It is observed only in ovulatory cycles, frequently emerging within 6 to 12 months after menarche with no pathology or organic basis. Secondary dysmenorrhea is a menstrual pain associated with underlying pathology and its onset might be years after menarche (Sharma N, *et al.*, 2014).

Primary Dysmenorrhea begins when young girls first experience the ovulatory cycles at puberty and its prevalence increases during adolescence (15-17 years) and reaches to its highest in 20-24 years and decreases progressively thereafter. Primary Dysmenorrhea is characterized by cramping lower abdominal pain that may radiate to lower back and upper thighs and is commonly associated with nausea, headache, fatigue and diarrhea. Primary dysmenorrhea affects 60% of females, with systemic symptoms such as headache 60% lower back pain, nausea and vomiting 80% diarrhea 50% irritability 30% and adynamia 45% (Yeh ML, *et al.*, 2013). According to Ethiopian standard treatment guideline, dysmenorrhea occurs in about 50% of menstruating women. Dysmenorrhea in some years following menarche is usually primary, but the secondary characteristically occurs many years after menarche (Gebeyehu

MB, et al., 2017).

Ginger is known as an effective medicine in several traditional herbal remedies, such as the treatment of nausea, increasing appetite, treatment of indigestion, fever, and infections, and body cleansing. Researchers have reported that regular exercise is effective in reducing the symptoms of Premenstrual Syndrome, as well as the duration and intensity of primary dysmenorrhea pain (Azmoddeh BE, et al., 2019). The present study aimed to compare the effectiveness between aerobic exercise and ginger supplement over pain and menstrual symptoms in subjects with primary dysmenorrhea.

## MATERIALS AND METHODS

The study was conducted at Debre Markos University. The University is found at Debre Markos town which is located in north western part of Ethiopia. Debre Markos town is 300 Km Northwest of Addis Ababa, the capital city of Ethiopia, and 265 Km Southeast from Bahir Dar, the Regional capital city of Amhara regional state.

### Study design

Completely randomized comparative trial, consisting of a pre-test and post-test evaluation without control group was employed.

Study population, sampling and sampling technique

The Study populations were 265 sport science and statistics female students of Debre Markos University. Forty (40) volunteer students with in the age of 19-22 were selected by purposive sampling technique.

### Inclusion and exclusion criteria

The subjects who are not taking any medicine, free from any pelvic problem and give positive response for the exercise readiness questionnaire were included. However, Subjects who haven't primary dysmenorrhea, taking home remedies for dysmenorrhea, taking oral analgesics for the dysmenorrhea, under medical treatment and age above and below the gap were excluded.

### Data collection procedures

Ethical clearance was obtained from concerning body and meets the participants of the study, during the familiarization session; participants were informed of all procedures and familiarized with all measurement techniques before conducting the study. Next to this before the participants were going to aerobic exercise and ginger supplement work outs the pre general history towards primary dysmenorrhea test was taken and recorded by the help of data recorders. Subjects were included in the study and grouped in to two groups' aerobic exercise group which are sport science students and ginger consumption groups which are statistics departments. The training program of aerobic exercise was given for 12 weeks, three days a week and the duration was 60 minutes in a day and also ginger consumption was given for 12 weeks, five days in a week. Ginger was consumed in the dose of 2 g of ginger and 2 g of tea is boiled with 100 ml of water for 10 minutes and cooled. Add brown sugar to ginger tea then, the amounts of ginger tea is 100 ml was taken one times a day totally five times a week. The study was recorded data by the help of assistant data recorder.

### Instruments

Visual Analogue Scale (VAS) Questionnaires: A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous ± their pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest. It was to capture this idea of an underlying continuum that the VAS was de-

vised (Wewers ME and Lowe N, 1990). Assess the severity of menstrual Pain by using numerical pain rating scale. No pain 0, mild pain 1-3, moderate pain 4-7, severe pain 8-10. Based on the response it has been scored as No symptoms (1), Mild symptoms (2), Moderate symptoms (3), severe symptoms (4). The VAS score is determined by measuring in millimetres from the left hand end of the line to the point that the patient marks.

Body mass index: BMI is calculated by taking a person's weight and dividing by their height squared.

### Equipment

- Scales
- Stadiometer as for weight and height.

### Procedures to measure body mass index

1. First measure weight in kilogram and height in meter
2. Then divide a person's weight in height

Formula: weight (kg)/[height (m)]<sup>2</sup>

### Statistical analysis method

The data collected through questionnaire, visual analogue scale and body mass index were analysed and interpreted in to amending full idea using computer to compare aerobic exercise and ginger consumption on the mean value by using paired T-test and SPSS version 20.0 Software at level of significance  $p \leq 0.05\%$ .

## RESULTS AND DISCUSSION

The purpose of this study was to compare the effects of 12 weeks aerobic exercise and ginger supplement on primary dysmenorrhea the case of Debre Markos University. Forty subjects were selected from department of sport science and Stastics students. They were randomly assigned in to two groups of aerobic group and ginger supplement group with 20 subjects for each group. Pre and post-test were conducted on variables such as VAS, MSQ and BMI. The data collected from subjects were analysed by SPSS version 20.0 and the comparison of mean value results were carried out by paired sample T-test.

There was significant change in pre-post test results. the result was seen on physical symptom mean differences values due to 12 week ginger supplement and aerobic exercise training, in which the subjects were engaged in. the mean value for Tiredness of aerobic group before training was  $2.40 \pm 0.882$ , while the ginger group was  $1.90 \pm 0.788$  (Table 1).

**Table 1: Mean and standard value of pre and posttest for physical symptoms of primary dysmenorrhea**

Variable	PT aerobics	Ginger supplement	POT aerobics	Ginger supplement
Tiredness	2.40 ± 0.883	1.90 ± 0.788	2.75 ± 1.069	2.40 ± 0.940
Headache	2.30 ± 0.923	2.40 ± 0.883	2.800 ± 0.951	3.30 ± 1.031
Sleeplessness	2.40 ± 0.940	2.50 ± 1.235	2.850 ± 0.587	3.50 ± 1.051
Felling fullness in lower abdomen	2.30 ± 0.923	2.40 ± 0.995	2.900 ± 0.640	2.90 ± 0.911
Back pain	2.40 ± 0.882	2.25 ± 1.0196	3.15 ± 0.933	3.20 ± 0.894
Tenderness of breast	2.350 ± 0.875	2.55 ± 1.234	2.60 ± 0.882	3.30 ± 1.080
Knee pain	1.950 ± 0.826	1.75 ± 0.716	2.65 ± 0.988	2.10 ± 0.788

Swelling of legs	2.300 ± 0.924	2.05 ± 0.686	2.70 ± 0.801	2.85 ± 0.745
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Post-test mean of aerobic group and ginger supplement group was 2.75 ± 1.069, 2.40 ± 0.940 respectively after 12 weeks ginger supplement and training program. Based on the result significance were recorded on ginger supplement group. The mean value for headache of aerobic group before training was 2.30 ± 0.923, while ginger supplement group was 2.40±0.882 and the post-test mean was aerobic and ginger supplement group was 2.80 ± 0.951, 3.30 ± 1.031 respectively. The result shows that a significant change between groups and there was a change on pre and post-test. When we compare aerobic group and ginger supplement group, ginger supplement group was significant than aerobic group.

The pre-test mean value of Sleeplessness for aerobic group was 2.40 ± 0.940; ginger supplement group was 2.50 ± 1.236. Post-test mean of aerobic group was 2.85 ± 0.587; ginger group was 3.50 ± 1.051. The result shows that both groups were significant but ginger supplement group was a significant than aerobic group. The pre-test mean of Felling fullness in lower abdomen for aerobic group was 2.30 ± 0.923; ginger supplement group was 2.40 ± 0.994. Post-test mean of aerobic group and ginger supplement group was 2.40 ± 0.994; 2.90 ± 0.911 respectively. The results were show significance in both groups.

The pre-test result for Back pain of aerobic group was 2.40 ± 0.882. Ginger supplement group was 2.25 ± 1.019. Post-test mean of aerobic and ginger supplement group was 3.15 ± 0.933; 3.200 ± 0.894 respectively. Both groups were significance. When we compare both groups ginger supplement group was significant change than aerobic group. The pre-test response for Tenderness of breast of aerobic group was 2.35 ± 0.875, while ginger supplement group was 2.55 ± 1.234. Post-test mean of aerobic and ginger supplement group were 2.60 ± 0.882, 3.30 ± 1.080 respectively. The result shows that ginger supplement group was apposite effect than aerobic group.

The pre-test mean for Knee pain of aerobic group was 1.950 ± 0.826. Ginger supplement group was 1.75 ± 0.716. Post-test mean of aerobic group and ginger group were 2.65 ± 0.988, 2.10 ± 0.788 respectively. The result shows that both groups were significance. The pre-test means for Swelling of legs of aerobic and ginger group were 2.30 ± 0.923, 2.05 ± 0.686 respectively. Post-test mean result of aerobic group was 2.70 ± 0.801; ginger supplement group was 2.85 ± 0.745.

The post test result of both group were show significance. When we compare two groups ginger supplement group was significance than aerobic group. Finally the result shows that the effects of aerobic exercise and ginger supplement on primary dysmenorrhea were indicate apposite effect when compare to pre-test and post-test result. When we compare the significance of two groups ginger supplement group was a significant change than aerobic group. The finding of this study showed that ginger could significantly reduce the physical symptom of primary dysmenorrhea. So according to the availability and the safety of ginger, ginger can be an appropriate treatment in reducing symptoms of primary dysmenorrhea.

Research suggests that compounds found in ginger may help to protect against the increases in inflammation, by inhibiting the body's production of prostaglandins (a class of pro-inflammatory chemicals involved in triggering the muscle contractions that help the uterus shed its lining). Because the onset of menstrual cramps appears to be linked to excessive production of prostaglandins, it's thought that consuming ginger in dietary supplement or tea form can help reduce menstrual pain.

Many findings support the fact that exercise has positive effect on dysmenorrhea. Studies have shown that physical exercise is beneficial to

adolescents with primary dysmenorrhoea. Exercise causes to delay the start of prostaglandins gathering and to increase the rate of accumulation of waste from the body. It reduced the menstrual pain by increasing endorphins and reducing stress and sympathetic nervous activity, and also by increasing the blood flow to the pelvic (Shahnaz S and Rahman SH, 2010).

There was significant change between pre-post test results on ginger supplement group and aerobic group. So the result indicates that physical symptom of primary dysmenorrhea was significantly reduced after 12 weeks ginger supplement and aerobic exercise. Pre-test mean value for Loss of appetite of aerobic group was 2.20 ± 0.894; ginger supplement group was 2.05 ± 0.887. Post-test mean of aerobic and ginger supplement group were 2.90 ± 0.968, 2.40 ± 0.994 respectively. The results indicate that both groups were a significant change (Table 2).

**Table 2: Mean and standard deviation value of pre and posttest for gastrointestinal symptom of primary dysmenorrhea**

Variable	PT aerobic	Ginger supplement	POT aerobic	Ginger supplement
Loss of appetite	2.20 ± 0.894	2.05 ± 0.887	2.90 ± 0.968	2.40 ± 0.995
Nausea	2.30 ± 1.031	2.150 ± 0.812	3.05 ± 0.945	2.750 ± 0.786
Vomiting	2.70 ± 0.979	2.150 ± 0.746	3.10 ± 1.020	3.100 ± 0.640
1.950 ± 0.826	1.950 ± 0.826	1.950 ± 0.826	1.950 ± 0.826	1.950 ± 0.826

The pre-test mean value for nausea of aerobic group was 2.30 ± 1.0311; ginger supplement group was 2.15 ± 0.812. Post-test mean result of aerobic group was 3.050 ± 0.944; 2.75 ± 0.786 for stretching. The results were show significant difference was observed between aerobic and ginger supplement group of pre and post-test. When we compare two groups, ginger supplement group were significant than aerobic group. The pre-test mean value of vomiting was 2.70 ± 0.979 aerobic group; 2.15 ± 0.745 ginger supplement group. Post-test mean value was 3.10 ± 1.020 aerobic groups, 3.10 ± 0.640 ginger supplement group. Both groups were a change between the pre and post-test.

Finally the result indicates that ginger was more significant on nausea and vomiting than aerobic exercise. In addition, (Trivedi H and Sijo S, 2016) studied the effectiveness of dietary ginger v/s active exercise on primary dysmenorrhea among adolescent girls. The results showed that active exercise increased the blood flow and metabolism of the uterus during exercise which may be effective in the reduction of dysmenorrhea symptoms. Moreover, the study observed that dietary ginger is more effective than active exercise among adolescent girls in primary dysmenorrhea.

Table 3 indicates that there was a significant change observed in psychological symptom of primary dysmenorrhea pre-post-tests means values score of 12 weeks ginger supplement and aerobic exercise. The mean value pre-test results of depression 2.00 ± 0.918 were aerobics group and 1.80 ± 0.834 was ginger supplement group. Post-test mean value of aerobics and ginger supplement group were 2.70 ± 0.979, 2.65 ± 0.812 respectively. The result indicates that both groups were significant.

**Table 3: Mean and standard deviation value of pre and posttest for psychological symptom of primary dysmenorrhea**

	group	group	group	group
Depression	2.00 ± 0.918	1.80 ± 0.834	2.70 ± 0.979	2.65 ± 0.812
Mood swing	2.25 ± 1.251	1.95 ± 0.759	3.10 ± 0.788	2.65 ± 0.587



Irritability	2.30 ± 0.86	2.15 ± 0.745	2.95 ± 0.945	2.35 ± 0.670
In ability of concentration	2.30 ± 1.080	2.10 ± 0.788	2.80 ± 0.523	2.40 ± 0.883
Nervousness	1.95 ± 0.945	1.70 ± 0.864	2.35 ± 0.988	2.20 ± 0.768

The pre-test means of mood swing of aerobics was 2.25 ± 1.251 while 1.95 ± 0.759 was ginger group. Post-test mean of 3.10 ± 0.788 was aerobics group 2.65 ± 0.587 was ginger supplement group. The result shows that both groups were significant and also there was a change in pre and post-test in both groups. Irritability of pre-test mean value was 2.30 ± 0.865 aerobics group and 2.15 ± 0.745 ginger supplement groups. Irritability post-test mean value was 2.95 ± 0.945 and 2.35 ± 0.670 for ginger supplement group. When we compare the two groups aerobic group was significant than supplement group.

In ability of concentration of pre-test mean value were 2.30 ± 1.080 aerobics and 2.10 ± 0.788. In ability of concentration post-test mean value was 2.80 ± 0.523 and 2.40 ± 0.882 for ginger supplement group. The result indicates that both groups were significant. Nervousness of pre-test mean value was 1.950 ± 0.945 aerobics group and 1.70 ± 0.865 ginger group.

Nervousness post-test mean value of aerobic group was 2.35 ± 0.988 and 2.20 ± 0.768 for ginger supplement group. The result shows that a significant change in reduce symptoms of the subjects due to ginger supplement and aerobic exercises to compare psychological symptoms of primary dysmenorrhoeal of pre and post test results of the subjects after 12 weeks of ginger supplement and aerobic exercise.

Finally mean value of pre-post test results show that the effects of ginger supplements on primary dysmenorrhea were significant change comparing to aerobic group. Exercise may increase concentration and improve mood and behavior (Chaudhuri A, et al., 2013) Primary dysmenorrhea (PD) is a very common and serious problem that can often directly affect the quality of life for women, interfering in activities such as working or studying.

Table 4 shows that there was a change in pre and post-test mean value of both groups. Mean value of Body mass index before training was 20.275 ± 1.848 for aerobic group and 20.157 ± 2.1209 was ginger supplement group. Post-test mean value of body mass index for aerobics group was 19.55 ± 1.486 and 19.515 ± 1.289 was ginger supplement group.

**Table 4: Mean and standard deviation value of pre- post test result of BMI on primary dysmenorrhea**

Variable	PT		POT	
	Aerobic group	Ginger group	Aerobic group	Ginger group
BMI	20.275 ± 1.848	20.157 ± 2.1209	19.55 ± 1.486	19.515 ± 1.289

The result shows that both groups were a significant change between pre and post test results after 12 week ginger supplement and aerobic exercise. Active ingredients in ginger are known to speed up the metabolism, specifically due to their thermogenic qualities (Haller CA, et al., 2005).

This can increase your body's level of passive fat-burning and aid weight loss efforts; ginger is also known to suppress the appetite, which can further help you shed those pounds. In order to maintain your weight after weight loss, experts recommend that you do 60 to 90 minutes of daily moderate-intensity physical activity while continuing to eat nutritious foods that do not exceed your calorie requirements. Studies show that physical activities are very important to successful

long term weight control.

The pre-test mean value 7.40 ± 1.188 was aerobic group and 7.20 ± 1.105 ginger supplement group. Post-test mean value of aerobics group and ginger supplement group were 7.40 ± 1.539; 5.60 ± 1.465 respectively. So the result shows both groups were significant (Table 5).

**Table 5: Mean and standard deviation value of pre and post test result of vas on primary dysmenorrhea**

Variable	PT		POT	
	Aerobic group	Ginger group	Aerobic group	Ginger group
VAS	7.40 ± 1.188	7.20 ± 1.105	7.40 ± 1.539	5.600 ± 1.465

Studies have shown that women who experience higher levels of pain have higher levels of inflammatory prostaglandins or hormone-like substances in their bodies. High levels of prostaglandins can promote painful uterine contractions, decreased blood flow to the uterus, and pain. So in many cases, the solution for menstrual cramps is to avoid foods that increase inflammation, and emphasize foods that decrease inflammation. So ginger was used for anti-inflammatory purpose to reduce pain level. The anti-inflammatory properties of ginger have been known and valued for centuries (Atashk S and Rashidi S, 2018).

Ginger supplement and aerobic exercise shows positive effect on menstrual symptom of primary dysmenorrhea. But when comparing ginger supplement group and aerobic group, ginger supplement was more significance than aerobic exercise (Table 6). Evidence suggests that aerobic exercise reduces negative effect on women who exercise regularly exhibit lower levels of negative effect and physical symptoms across the menstrual (Cerdeja P, et al., 2011; Chaudhuri A, et al., 2013). The finding shows that Ginger supplement was a significant change to reduce pain during menstruation (Table 7).

**Table 6: Mean deference and significance of aerobic and ginger supplement group for MSQ of primary dysmenorrhea**

Physical symptom	MD		Significance	
	Aerobics	Ginger supplement	Aerobic	Ginger supplement
Tiredness	-0.35	-0.5	0.11	0.008
Headache	-0.5	-0.9	0.008	0.002
Sleeplessness	-0.45	-1	0.025	0.013
Felling fullness in lower abdomen	-0.6	-0.5	0.004	0.047
Back pain	-0.75	-0.95	0.003	0
Tenderness of breast	-0.25	-0.75	0.309	0.036
Knee pain	-0.7	-0.35	0.072	0.015
Swelling of legs	-0.4	-0.8	0.003	0.001

Values in the form of MD=Mean difference, PT=Pre training test, POT=Post training test

**Table 7: Mean deference and significance of aerobic and ginger supplement group for gastrointestinal symptom of primary dysmenorrhea**

Gastrointestinal Symptom	MD		Significance	
	Aerobic	Ginger group	Aerobic	Ginger group
Loss of appetite	-0.7	-0.35	0.002	0.015
Nausea	-0.75	-0.6	0.004	0
Vomiting	-0.4	-0.95	0.072	0

Values in the form of MD=Mean difference, PT=Pre training test, POT=Post training test

Table 8 shows that both variables (Aerobic exercise and Ginger supplement) showed positive effect on psychological symptom of depression and mood swing because of 12 week ginger supplement and aerobic exercise. So the result of 12 week treatment was

**Table 8: Mean deference and significance of aerobic and ginger supplement group for psychological symptom of primary dysmenorrhea**

Psychological symptom	MD		Significance	
	Aerobic	Ginger supplement	Aerobic	Ginger supplement
Depression	-0.7	-0.85	0.001	0.002
Mood swings	-0.85	-0.7	0.002	0.005
Irritability	-0.65	-0.2	0.006	0.104
In ability of concentration	-0.5	-0.3	0.038	0.11
Nervousness	-0.4	-0.5	0.148	0.029

Table 9 indicates that both groups aerobic and ginger supplement was a positive effect on body mass index. When we compare ginger supplement group and aerobic group, ginger supplement group was a significant change than aerobic group. The relation between dysmenorrhea and BMI was found to be highly significant with increased prevalence of dysmenorrhea in low and high BMI group. Overweight, especially BMI was over 35 it was likely that are not getting regular periods and also the intensity of pain was severe because of increased fat mass or adipose tissue produces extra oestrogen that was partly responsible for problems on ovulation and missed periods. Also underweight was not getting regular periods. Finally overweight and underweight on the body that causes hormonal changes that interfere with ovulation. This also causes Avery low oestrogen level, which is especially bad for bone health.

**Table 9: Mean deference and significance of aerobic and ginger supplement group of BMI on primary dysmenorrhea**

BMI	MD		Significance	
	Aerobic group	Ginger group	Aerobic group	Ginger group
	0.725	0.642	0.016	0.014

Values in the form of MD=Mean difference, PT=Pre training test, POT=Post training test

Both variables (Aerobic exercise and Ginger supplement) showed positive effect on Primary Dysmenorrhea because of 12 week Ginger supplement and Aerobic exercise (Table 10). So the result of 12 week treatment was a significant change in order to reduce pain during menstruation. The finding of the current study showed that both aerobic exercise and ginger supplement were effective in reducing the intensity of pain during menstruation. But ginger supplement was more significant change than aerobic exercise to reduce pain intensity during menstruation. So students can use either of them depending of their condition and interest.

**Table 10: Mean deference and significance of aerobic and ginger supplement group of VAS on primary dysmenorrhea**

VAS	MD		Significance	
	Aerobic group	Ginger group	Aerobic group	Ginger group
	0.9	1.6	0.07	0

Values in the form of MD=Mean difference, PT=Pre training test, POT=Post training test

Laboratory studies suggest that ginger has some compounds that inhibit lipoxigenase and cyclooxygenase pathway and has effects on the arachidonic acid metabolism which is a precursor of prostaglandins

production. Ginger has possibly anti-inflammatory and antioxidant effects by inhibiting the production of prostaglandins and leukotriene, prostaglandins during menstruation period (Rahnama P, *et al.*, 2012) A lack of exercise can increase the severity and duration of symptoms associated with dysmenorrhea. In addition to a regular physical exercise regimen, a good moving meditation can help balance the emotions, reduce stress, strengthen the organs, and regulate menstruation. Regular exercise, including exercise right before and during your menstrual cycle can and will help lessen the severity of menstrual cramping (Daley A 2009).

**CONCLUSION**

Based on the major finding of this study the following points were stated as conclusions.

- 12 weeks ginger supplement and aerobic exercise significantly reduce intensity and duration of pain during and before menstruation. But ginger was more significant change than aerobic exercise on reducing pain intensity during and before menstruation.
- Ginger supplement was a positive effect on menstrual symptom of primary dysmenorrhea when comparing with aerobic exercise.
- Both Aerobic and Ginger supplement groups were had a positive effect on BMI and VAS.

**RECOMMENDATIONS**

- Health care providers can recommend these ginger remedies to women's for management of dysmenorrhea. However, well-designed studies about roles, doses, and side effects of ginger remedies should be conducted.
- Students use ginger because ginger preparation was an easily available and effective home remedy which has significant effect in relieving primary dysmenorrhea. So, it is important to enhance the usage of natural and home remedies for management of dysmenorrhea with less expensive, less side effects and easily available methods.
- Further studies should be conducted on effects of ginger supplement and aerobic exercise on primary dysmenorrhea on large number of population.

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**AVAILABILITY OF DATA AND MATERIALS**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

**AUTHORS' CONTRIBUTIONS**

EJ contributes in the design of the study, analysis and write up of the manuscript. DK made the data analysis, drafting, interpretation and edition of the data, monitoring the study and edition of the manuscript. Both authors critically revised the manuscript and have approved the final manuscript.

**ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

Ethical clearance was obtained from the Institutional Review Board (IRB) of Debre Markos University, College of computational and natural sciences. A written informed consent was obtained from the participants. All participants got the right to opt out of the research. This was done by explaining the objective and importance of the study as it would be beneficial for quality service delivery for future encounters. Neither the case records nor the data extracted was used for any other purpose. The confidentiality and privacy of participants were assured

throughout by removing identifiers from data collection tools using different codes.

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