

## Evaluation of effect of medium chain triglycerides on growth pattern of newborn in a tertiary care hospital

Saim Ali Khan<sup>1\*</sup>, Ajay Punj<sup>2</sup>, Astha Agarwal<sup>3</sup>

<sup>1</sup>Junior Resident III, <sup>2</sup>Professor, <sup>3</sup>Assistant Professor, Dept. of Pediatric, Subharti Medical College, Meerut, Uttar Pradesh, India

\*Corresponding Author: Saim Ali Khan

Email: saimtheheartthrob1990@gmail.com

### Abstract

**Introduction:** Most common causes for developmental delay and neonatal death are prematurity and low birth weight. Unfortunately, these neonates have feeding intolerance and should be fed very slowly. Slow weight gain and poor oral-motor ability to feed are common factors delaying discharge from hospitals in infants born prematurely. Improved weight gain is the most commonly and consistently reported effect of massage in preterm infants with significantly greater daily or overall weight gain found in infants who received massage compared to controls. MCT OIL (SIMYL MCT OIL) Medium Chain Triglyceride has been practiced routinely used for LBW babies to supplement fat calories in the diet as it is standard formula and widely used in India and Foreign countries, which help in increasing the weight of the babies.

**Materials and Methods:** An open label prospective, randomized control study was performed on 120 stable neonates from December 2016 to June 2018 in level III NICU of department of Pediatrics. Inborn neonates with gestation more than 30 weeks, weighing between 1800-2500 gm and who were haemodynamically stable were enrolled in the study. Neonates were divided into three groups which include daily massage with coconut oil, daily massage with Medium Chain Triglyceride oil and daily massage with Medium Chain Triglyceride oil+ oral intake of Medium Chain Triglyceride oil. The data generated was collected and analyzed for growth pattern of newborn among three groups.

**Result:** 120 neonates were enrolled, 40 neonates in each group. In comparison between group A and group B there was significant weight gain in group B (p-value-0.001) (83.5%) in comparison to group A (69.3%) since birth after 3 months of therapy. In comparison between group B and group C there was significant weight gain in group C (p-value-0.018) (88.7%) in comparison to group B. There was also significant weight gain in group C in comparison to group A (p-value-0.001). Other parameters like length, head circumference, neurodevelopmental outcome did not have any significant change after therapy.

**Conclusion:** In this study we found that medium chain triglyceride massage + oral intake have significant effect on weight gain more than the medium chain triglyceride massage and coconut massage therapy but oil massage therapy alone is also an effective method for weight gain but statistically significant data could not be obtained in terms of length, head circumference and neurodevelopment outcome.

**Keywords:** Preterm, Weight, Length, MCT oil, Massage therapy, Neurodevelopmental outcome.

### Introduction

Most common causes for developmental delay and neonatal death are prematurity and low birth weight.<sup>1-3</sup> Unfortunately, these neonates have feeding intolerance and should be fed very slowly.<sup>4</sup> Slow weight gain and poor oral-motor ability to feed are common factors delaying discharge from hospitals in infants born prematurely. Improved weight gain is the most commonly and consistently reported effect of massage in preterm infants with significantly greater daily or overall weight gain found in infants who received massage compared to controls.<sup>5-17</sup> MCT OIL (SIMYL MCT OIL) Medium Chain Triglyceride has been practiced routinely used for LBW babies to supplement fat calories in the diet as it is standard formula and widely used in India and Foreign countries,<sup>12,18-22</sup> which help in increasing the weight of the babies. Low birth weight is a major public health problem in all developing countries including India and it is one of the major cause of infant mortality rate. These low birth weight babies may face problems like hypothermia, sepsis, poor feeding and slow rate of weight gain hence to prevent the incidence and prevalence of mortality and morbidity of low birth weight babies it is necessary to take some fruitful interventions for these babies to increase the body energy by extra calories, conserving the energy and gaining weight, so in our study we have

evaluated the effect of Medium Chain Triglycerides massage and oral intake on growth pattern of low birth weight infants in form of weight gain, length and other parameters over a period of 12 weeks.

### Materials and Methods

An open label prospective, randomized control study was performed from December 2016 to June 2018 in a in level III NICU of department of Pediatrics in Subharti Medical College and hospital, Meerut, (Tertiary care hospital) India. Inborn neonates with gestation more than 30 weeks, weighing between 1800-2500 gm and who were hemodynamically stable were enrolled in the study and neonates with major congenital anomalies at birth, skin disease, neonates requiring mechanical ventilation or receiving supplementary oxygen therapy and having any neurological manifestations were excluded from study. Sample size of 120 neonates was calculated by formula  $n = \frac{(Z_{\alpha/2})^2 pq}{L^2}$  in which n=desired sample size,  $Z_{\alpha/2}$  = standard normal deviate (taken as 1.96 for confidence level of 95%), p = proportion in the target population estimated to have a particular characteristics (prevalence in percentage), q = 100-p, L = allowable error (5% – 20% of p), So to calculate prevalence was taken 25.2% and least allowable error was taken 8%,  $\{(1.98)^2 \times 25.2 \times 74.8\} \div 8 = 115 \sim 120$ .

The study protocol was approved by the Ethics Committee of the Institute. Neonates were divided into three groups between 1800gm-2500gm which include daily massage with coconut oil, daily massage with MCT oil and daily massage with MCT oil+ oral intake of MCT oil. Out of 250 low birth weight babies 120 were enrolled for the study as 130 were excluded 80 were unable to maintain follow up, 40 were below 1800gm and 10 had some underlying illness so in total 120 neonates were taken in which initial 40 neonates were given massage therapy with coconut oil, next 40 neonates were given MCT oil massage therapy, and next 40 neonates were MCT oil massage +oral intake therapy for 3 months. Consent was obtained by the parents of the neonates. Massage therapy consists of tactile and kinesthetic stimulation given by mothers who were trained for standardized steps of massage that was given for 15 minutes two times a day in the NICU and similarly mother was explained quantity and duration of feeds given to the baby and also trained for making the feeds by the expert nurses. In case of MCT oil oral intake it was mixed in feeds of the neonates@3ml/kg/day in 3-4 divided doses. Out of 120 neonates 100 neonates were breastfed (MCT oil was mixed in expressed breast milk), 9 were given mixed feed and 11 were top fed. Anthropometric data was collected by a physician in charge of neonatal care at the time of birth, on followup at 1 month and 3 months of age. Weight was measured naked with a digital scale with  $\pm 5$ gr accuracy monthly by a single observer and length was measured on

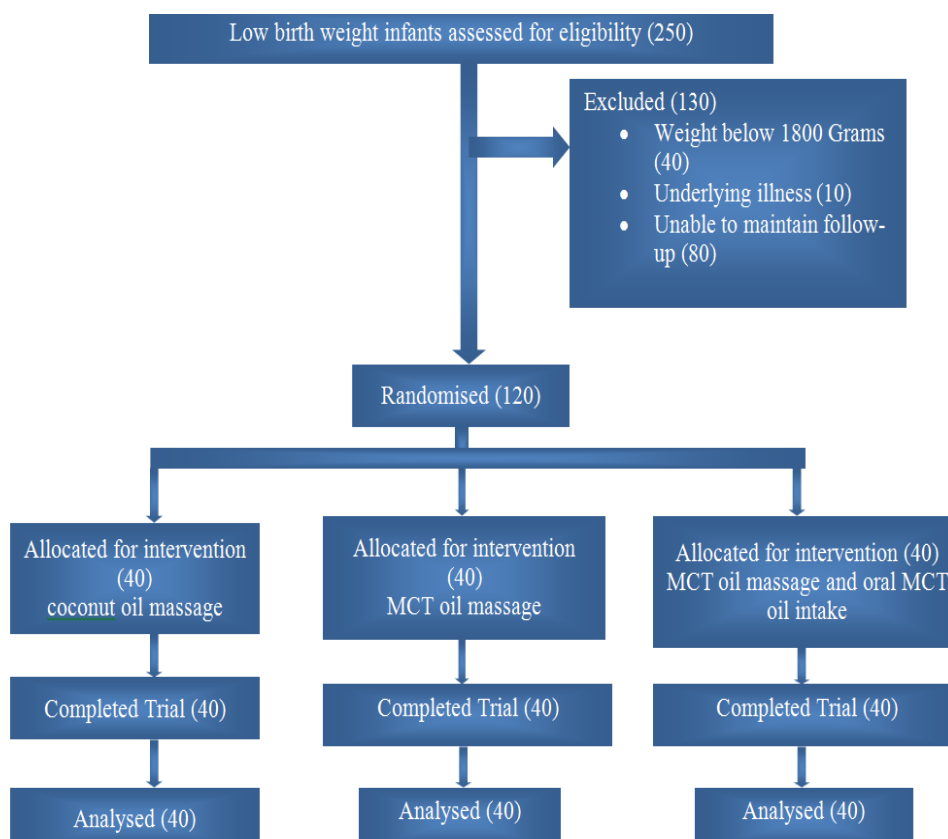
an infantometer in the supine position, the newborns head was held firmly against the headpiece, the legs were fully stretched and the feet were placed flat against the foot piece. The length was read on a millimetric ruler and the values were recorded in centimeters and head circumference by a non stretchable cloth tape. The tape was fitted around the infants head, going from the supraorbital ridge to the occipital protuberance. For assessment of neurodevelopment outcome neonates were assessed for parameters by a single observer after three months and by asking the parents about the milestones achieved for age although limitation to our study was no standardized assessment tool was used and prolonged follow-up was needed to study for long term neurodevelopmental effects.

Data were collected on structured proforma and managed using MS Excel software. Statistical analysis was performed using SPSS Version 21.0 statistical Analysis software. Statistical analysis was done using chi-square test, independent-t test and ANOVA. Statistical significance was considered if the p-value was  $<0.05$ . The quantitative data was expressed in mean $\pm$ SD and qualitative data was expressed in terms of frequency distribution.

## Result

A total of 250 neonates were considered in the studyout of 120 were excluded from the study (Flow chart 1).

**Chart 1**



**Table 1: Comparison of baseline characteristics of study subjects in three groups. (Statistical method-Annova, Chi-square)**

	Massage with coconut oil (Group A) (%) (n=40)	Massage with MCT oil (Group B) (%) (n=40)	Massage with oral intake (MCT oil) (Group C) (%) (n=40)	p-value
Mean Gestation at birth (weeks)	33.25±1.850	32.90±1.751	33.28±1.797	0.583
Mean birth weight (kg)	2.151±0.2236	2.108±0.2096	2.155±0.2088	0.613
Mean length at birth (c.m.)	44.5365±2.1506	44.56±1.7767	44.86±2.1138	0.75
Mean head circumference at birth(c.m.)	32.233±1.8527	31.825±1.8950	32.332±1.7663	0.428
Mode of delivery				
Vaginal-	33(82%)	32(80%)	32(80%)	0.948
LSCS-	7(18%)	8(20%)	8(20%)	
Gender				
Male-	24(60%)	19(47.5%)	24(60%)	0.430
Female-	16(40%)	21(52.5%)	16(40%)	
Feeding				
Breastfeed-	34(85%)	37(92%)	29(72.5%)	0.169
Mixed-	2(5%)	2(5%)	5(12.5%)	
Top feed-	4(10%)	1(2.5%)	6(15%)	

All three groups were found to be statistically comparable (Table 1).

**Table 2: Comparison between outcome in all three groups in terms of weight and length gain after three months of therapy (Statistical method- Independent t test)**

	Groups			p-value
	A	B	C	
Mean weight gain (kg)±SD	Weight gain at 1 month	0.3275±0.763 (15.22%)	0.3305±0.780 (15.7%)	0.862
	Weight gain at 3 months since birth	1.4910±0.2882(69.3%)	1.7640±0.2635(83.5%)	0.001
Mean length gain (c.m.)±SD	Length gain at 1 month	3.128±0.7038(7%)	3.023±0.5166(6.7%)	0.499
	Length gain at 3 months	8.278±1.6395(18%)	8.528±1.4896(19%)	0.477

	Groups			p- value
	B	C		
Mean weight gain (Kg)	At 1 month	0.3305±0.0780(15.7%)	0.3545±0.68±(16.45%)	0.146
	At 3 months	1.764±0.2635(83.5%)	1.912±0.2855(88.7%)	0.018
Mean length gain (c.m.) ±SD	At 1 month	3.023±0.5166(6.7%)	3.033±0.5967(6.76%)	0.936
	At 3 months	8.528±1.4896(19%)	9.038±1.8088(20%)	0.173

	Groups			p-value
	A C			
Mean weight gain (kg)	Weight gain at 1 month	0.3275±0.0763(15.22%)	0.3545±0.068(16.45%)	0.099
	Weight gain at 3 months	1.491±0.288(69.3%)	1.912±0.2855(88.7%)	0.001
Mean gain in length (c.m.)	Length gain after 1 month	3.128±0.7038(7%)	3.033±0.5967(6.76%)	0.517
	Length gain after 3 months	8.278±1.6395(18%)	9.038±1.8088(20%)	0.053

Table 2 showing comparison between all three groups in terms of weight and length gain after therapy. There was significant weight gain in group B than group A and significant weight gain in group C in comparison to both group A and B. In our study there was no significant change in length, head circumference (Table 3) neurodevelopmental outcome (Table 4) after therapy.

**Table 3: Showing gain in head circumference after three months since birth (Statistical method- Chi square)**

Mean gain in head circumference (c.m)	Gain in HC after 3 month	Groups			p-value
		A	B	C	
		5.135±0.44 (15.88%)	5.190±0.4662 (16.30%)	5.150±0.5468 (15.928%)	0.872

**Table 4: Showing neurodevelopmental outcome after three months of therapy. (Statistical method- Chi-square)**

Number of infants		Group			p value
		A	B	C	
Number of infants who have achieved following milestone at 3 month of age	head wobbling	4(10%)	4(10%)	2(5%)	0.646
	neck holding in prone position	36(90%)	36(90%)	38(95%)	0.646
	Alert to sound	39(97.5%)	40(100%)	40(100%)	0.365
	social smile	36(90%)	38(95%)	40(100%)	0.122
	cooing	37(92.5%)	37(92.5%)	38(95%)	0.875
	Recognizes mother	37(92.5%)	38(95%)	37(92.5%)	0.875

## Discussion

In this study we found MCT massage + oral intake have significant effect on weight gain more than the MCT and coconut massage therapy but oil massage therapy alone is also an effective method for weight gain but statistically significant data could not be obtained in terms of length, head circumference and neurodevelopmental outcome.

The present study is an open label randomized controlled study with the aim to see the effect of coconut massage therapy, MCT oil massage therapy and effect of both oral intake and massage therapy of MCT oil on growth pattern of newborn. Total of 120 neonates weighing 1.8-2.5kg were included in the study and divided into three groups:

Group A (Massage therapy with coconut oil)

Group B (Massage therapy with MCT oil)

Group C (Daily massage with MCT oil +oral intake of MCT oil).

Parameters like gestation age, feeding pattern, mode of delivery, gender distribution, birth weight, length at birth were found to be statistically comparable in all three groups. Comparison of growth pattern at 1 month and 3 months between these groups on follow-up and other parameters like diarrhea episodes since birth, and fever episodes requiring antibiotics, neurodevelopment outcome were also assessed.

In a study by Saedi et al (2014)<sup>18</sup> MCT oil massage therapy had significant effect on weight gain in comparison to only massage and control groups 7 days after therapy. In another study by Vaidya et al (1992)<sup>19</sup> MCT oil massage group had significant weight gain in comparison to safflower oil massage therapy. In a study conducted by Takako Yamada et al (1998)<sup>20</sup> infants who were given MCT oil gained body weight better than the control they also proved that MCT oil is rapidly absorbed and digested. Similar to our study Arora et al (2005)<sup>21</sup> did not find any significant gain in length, head circumference, neurodevelopmental outcome after therapy. Sankarnarayanan et al (2005)<sup>12</sup> also did not find any gain in head circumference and neurodevelopmental outcome after therapy.

In a study by EJ Sulkers (1992)<sup>22</sup> there was no significant weight gain in comparison between MCT and LCT oil. In a study by Arora et al (2005)<sup>21</sup> -The weight gain was greater in the oil massage group compared to the other two groups, but they were not significant which is in contrast to our study. Sankarnarayanan et al (2005)<sup>12</sup> also did not find significant gain in weight after massage therapy although there was significant gain in length after massage therapy.

## Limitation

Limitation in our study was that there was no control group and long term follow up was needed to assess neurodevelopmental outcome using standardized assessment score which is not used in our study.

## Conclusion

In the end we conclude that MCT oil massage therapy with MCT oil intake is significantly better than Only MCT oil massage in terms of weightgain. With only MCT oil massage having significant advantage over coconut oil. So MCT oil therapy can be a cost-effective method for gaining weight in low birth weight babies low income countries.

**Conflict of Interest:** Nil.

## References

- Dieter JN, Field T, Hernandez-Reif M. Stable preterm infants gain more weight and sleep less after five days of massage therapy. *J Pediatr Psychol* 2003;28(6):403-411.
- Sullivan BA, Grice SM, Lake DE. Infection and other clinical correlates of abnormal heart rate characteristics in preterm infants. *J Pediatr* 2014;164(4):775-803.
- Ofek Shlomei N, Reichman B, Lerner Geva L, Population-based study shows improved postnatal growth in preterm very low birth weight infants between 1995 and 2010. *Acta Paediatr* 2014;103(5):498-503.
- Johnson PJ. Review of Macronutrients in Parenteral Nutrition for Neonatal Intensive Care Population. *Neonatal Netw* 2014;33(1):29-34.
- Kumar J, Upadhyay A, Dwivedi A.K, Gothwal S, Jaiswal V, Aggarwal S. Effect of oil massage on growth in preterm neonates less than 1800 gm: A randomized control trial. *Indian J. Pediatr* 2013;80:465-469.

6. Fallah R, Akhavan Karbasi S, Golestan M, Fromandi M. Sunflower oil versus no oil moderate pressure massage leads to greater increase in weight in preterm neonates who are low birth weight. *Early Hum Dev* 2013;89:769-772.
7. Ang J.Y, Lua J.L, Mathur A, Thomas R, Asmar B.I., Savasan S, Buck S, Long M, Shankaran S. A randomized placebo-controlled trial of massage therapy on the immune system of preterm infants. *Pediatr* 2012;130:e1549-e1558.
8. Gonzalez A.P., Vasquez-mendoza G, Garcia-Vela A, Guzman-Ramirez A, Salazar-Torres M, Romero-Gutierrez G. Weight gain in preterm infants following parent-administered vimalamassage:A randomized controlled trial. *Am J Perinatol* 2009;26:247-252.
9. Field T, Diego M, Hernandez-Reif M, Dieter J.N, Kumar A.M, Schanberg S, Kuhn C. Insulin and insulin-like growth factor-1 increased in preterm neonates following massage therapy. *J Dev Behav Pediatr* 2008;29:463-466.
10. Chen L.L., Su Y.C., Su C.H., Lin H.C., Kuo H.W. Acupressure and meridian massage: Combined effects on increasing body weight in premature infants. *J. Clin Nurs* 2008;17:1174-1181.
11. Field T., Diego M.A., Hernandez-Reif M, Deeds O, Figuereido B. Moderate versus light pressure massage therapy leads to greater weight gain in preterm infants. *Infant Behav Dev* 2006;29:574-578.
12. Sankaranarayanan K, Mondkar J.A., Chauhan M.M., Mascarenhas B.M., Mainkar A.R., Salvi R.Y. Oil massage in neonates: An open randomized controlled study of coconut versus mineral oil. *Indian Pediatr* 2005;42:877-884.
13. Diego M.A, Field T, Hernandez-Reif M. Vagal activity, gastric motility, and weight gain in massaged preterm neonates. *J Pediatr* 2005;147:50-55.
14. Ferber S.G, Kuint J, Weller A, Fieldman R, Dollberg S, Arbel E, Kohelet D. Massage therapy by mothers and trained professionals enhances weight gain in preterm infants. *Early Hum Dev* 2002;67:37-45.
15. Wheeden A, Scafidi F.A., Field T, Ironson, G, Valdeon C, Bandstra E. Massage effects on cocaine-exposed preterm neonates. *J Dev Behav Pediatr* 1993;14:318-322.
16. Scafidi F.A, Field T, Schanberg S.M. Factors that predict which preterm infants benefit from massage therapy. *J Dev Behav Pediatr* 1993;14:176-180.
17. Ferber SG, Kuint J, Weller A, Feldman R, Dollberg S, Arbel E, et al. Massage therapy by mothers and trained professionals enhances weight gain in preterm infants. *Early Hum Dev* 2002;67:37-45.
18. Saeadi R, Ghorbani Z, ShapouriMoghaddam A. the effect of massage wit medium chain triglyceride oil on weight gain in premature neonates. *Acta Med Iran* 2015;53(2):134-138.
19. Vaidya UV, Hegde VM, Bhave SA. Vegetable oil fortified feeds in the nutrition of very low birth weight babies. *Indian Pediatr* 1992;29:1519-1527.
20. Yamada T, Nishida H, Sakamoto S, Okada A, Sakanous M, Suehiro M (1988). The effect of MCT oil supplement in very low birth weight infants, with evaluation by the 13 C-Labeled MCT breath test. *Pediatr Int* 30:564-568.
21. Arora J, Kumar A, Ramji S. Effect of oil massage on growth and neurobehavior in very low birth weight preterm neonates. *Indian Pediatr* 2005;42(11):1092-1100.
22. Sulkers EJ, von Goudoever JB, Leunisse C. Comparison of two preterm formulas with or without addition of medium-chain triglycerides (MCT). 1: Effects of nitrogen and fat balance and body composition changes. *J Pediatr Gastroenterol Nutr* 1992;15:34-41.

**How to cite this article:** Khan S. A, Punj A, Agarwal A. Evaluation of effect of medium chain triglycerides on growth pattern of newborn in a tertiary care hospital. *Int J Med Paediatr Oncol.* 2018;4(4):152-156.