International Journal of PharmaO2
Journal Home Page: http://www.ijpo.in/
(IJPO: A Peer-reviewed Bi-monthly online journal)

**Research Article**

# The Effect of Tila and Bala Taila Abhyanga on Full Term Neonate

Dr. Satish B. Nirmal*

Assistant Prof., Kaumarbhritya-Balrog Department, Matoshri Asarabai Darade Ayurved College, Babhulgaon, Tal. Yeola, Dist. Nashik, Maharashtra, India.

ARTICLE INFO

Article history:
Received: 03/11/2020;
Revised: 14/12/2020
Accepted: 15/01/2021;
Available online: 29/01/2021.

*Key Words:*
Til taila,
Bala taila,
Abhyanga,
Arm recoil,
Popliteal angle.

**Please cite this article as:** Nirmal, S. B., (2021). The Effect of Tila and Bala Taila Abhyanga on Full Term Neonate. 3(1), 021-034.

ABSTRACT

Ayurveda describes Til taila (sesame oil) as a best amongst vegetable oils. But Ayurved specifies 'Bala taila' for Abhyanga in neonates, instead of til taila. The reasons remain obscure. Bala (*Sida cordifolia*), as a name suggests is a drug used to increase strength, promote growth and it is also best in 'Vatashamana'. This effect of Bala will augment the benefits of Abhyanga in nutrition and vatashamana. Hence 'Bala taila' looks more useful in full term babies. To find its efficacy over Til taila present study is design and Infants were selected with the weight above 2.5 kg at Birth. The group A receiving Til Taila and group B receiving Bala Taila for Abhyanga. Abhyanga was performed for 15 min. with 15-20 ml of oil once a day morning up to 60 days of life. Infants were observed for weight, Height, Head circumference, activity on initial 3days and later on 15, 30, 45, 60 days. 30 patients from both groups each were selected for statistical analysis. Both groups showed minimal weight loss in initial days and birth weight regain on 6 day on an average. When both groups were taken together mean gain in skin texture, lanugo, plantar creases, arm recoil, popliteal angle, weight, height, head circumference were selected for statistical analysis. Due to vatashaman sleep pattern of both group babies shows improvement. Skin becomes Snigdha in both Taila applications. Muscle tone and popliteal angle has shown slightly more effective in Bala Taila Abhyanga. Weight increases in both groups equally effective both groups. Hence effect of Bala taila and Til Taila Abhyanga is similar with respect to growth. Highly significant result observed in both the group of babies with the p-value <0.001. Bala taila Abhyanga is better than Til Taila Abhyanga in adjusting behaviour.



*Corresponding author: Dr. Satish B. Nirmal, Assistant Prof., Kaumarbhritya-Balrog Department, Matoshri Asarabai Darade Ayurved College, Babhulgaon, Tal. Yeola, Dist. Nashik, Maharashtra, India. Contact- +919552538383; e-mail: satish.nirmal2005@gmail.com

## Introduction

Ayurveda had described neonatal and infant care in details. Many of its regimes are for prevention of diseases. Abhyanga means application of oil on body. Due to abhyanga body becomes strong, soft and smooth skinned. According to charakacharya (ch.su.5) abhyanga promotes nourishment, induces sleep, increases skin

strength and tone. Abhyanga in the neonatal and infancy period has been practiced globally. The positive effects stated are better growth, good sleep, better strength and prevention of disease. Abhyanga described in neonatal care is useful in vatashaman and gives nourishment to tissues. Hence useful in full term neonates. In the recent studies Abhyanga is found useful in full term, preterm and low birth weight infants. But the effect is profound with the use of Til taila. Abhyanga is best in vata shamana. It is also useful for nourishment of body tissues. Ayurveda specifies Bala taila for Abhyanga in new born. Hence study was conducted to compare the effect of Bala taila Abhyanga and Til taila Abhyanga in Full Term Neonates. This effect of Abhyanga is found oil specific.

**Material and Methods**

For a clinical study 'comparative study of efficacy of tila taila and bala taila abhyanga on full term neonate' following material and methods were used.

**Chemical and Instruments**

Til taila and Bala taila was purchased from GMP approved company along with their analytical values. The Electronic digital weighing machine (±2g Accuracy) and non-flexible measuring tape was used which was correct for ± 1 mm.

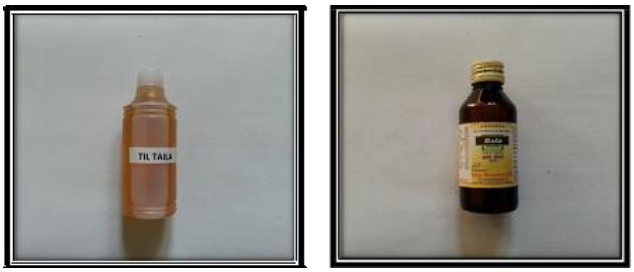


**Fig.1: Til and Bala Taila**

**Patients**

Babies born with birth weight of more than 2.5kg were examined, and parents of babies qualifying for study were consulted. They were explained the objective and methodology. First written consent was obtained from Parents i.e. mother and father. Parents were asked for detailed history of antenatal and peri-natal period, previous illness, family illness, socioeconomic status and baby was examined from head to foot. Gestational age was assessed by maturational examination i.e. New Ballard Score, as accuracy of menstrual history remains unreliable.

Patients/babies were selected by following criteria;

*Inclusion Criteria* - It includes, age from birth to 60days, Full term (Gestational age 37 to 42 weeks) babies delivered normally or by cesarean Section, Selection irrespective of sex and socio-economic status, Selection of babies will be done with full family consent and All babies exclusively on breast feed.

*Exclusion Criteria*- It includes, having any congenital anomalies which is life threatening, birth asphyxia, preterm baby (before 37 weeks of gestation age), IUGR baby (less than 2.5kg) and mother having diabetes mellitus or any other infective disease.

**Division of Patient in Trial and Control Group**

Babies were randomly allotted to trial and control group to receive Tila taila or Bala taila abhyanga. Detailed case study of patient done. Case was taken according to case format. For Abhyanga and to enroll in the study consent was taken from the mother or father. Total 60 cases were considered for study. Cases were divided in to two groups, 30 for Group A and 30 for Group B.

**Group A**

This is an Abhyanga group total 30 cases were taken for the Tila taila application. Proper consent was taken from mother and father for involving in study and to do Abhyanga on the baby. After delivery or caesarian section haemo-dynamically stable babies taken for Abhyanga. First Abhyanga was started daily morning on the very next days after birth. Abhyanga was done under warmer. Abhyanga was done once a day, early in the morning for 60days. First 3 days Abhyanga was done by vaidya and then training was given to Mother.

After 3 days mother done Abhyanga on baby himself or by care taker. Baby kept NBM or not given feed ½ to 1 hour before and after Abhyanga. Any other oil than prescribed, soap, powder application is avoided Complete for 2 months

**Group B**

This is an Abhyanga group total 30 cases were taken for the Bala Taila application. Routine care with breast feed, kept warm and dry, daily bath

given with warm water. Consent was taken for involving in case study and to regular follow up. Case taking, observation and Follow-up were taken as per standard case format.

**Procedure of Abhyanga**

*Pre-Procedure*

Two clean towels or cloths, Warm water, Bala tail in stainless steel bowl (warm), Tub for bath, watch. Kept nil by mouth (NBM) for ½ to 1hr. All these things kept ready.

*Procedure*

Selected baby has taken for Abhyanga after consent and full family support. Abhyanga given to neonates once a daily in morning. Abhyanga done in warm a room. Abhyanga given in anulom gati (Fig. 2).

**Fig. 2: Anulom Gati**

Baby should not take any feed one hour before and one hour after Abhyanga. First three days Abhyanga done by vaidya (self). Then from fourth day to day of discharge Abhyanga done by mother or by caretaker under observation of mother. No other oil, soap, powder application done. Duration of massage (Dose 15-20ml) 15-20minutes. In cases of the infant passed urine or stool during abhyanga it had been cleaned using tissue paper and procedure will be continued.

*After Abhyanga*

To remove remaining oil on skin baby bath was given with warm water (Koshna jal). After the bath, baby was cleaned with smooth and cotton cloths. Specially talu, nasa, karna, cord, genitalia, kaksha, janga was cleaned and dried with cloths. After this baby was wrapped with smooth cotton cloths and given to mother for sleep. Mother was asked to observe this procedure for first 3 days. Then she was asked to do Abhyanga at home for remaining days. Injection sites were avoided for next 2 - 3 days after completion of dose to avoid complications. Babies were allowed to receive standard medical treatment of concomitant illness.

INSTRUCTIONS TO MOTHER

Keep baby clean and warm. Avoid unhygienic conditions. Exclusively breast feeding only. Proper burping after feeding. Take sufficient quantity of milk and food. Contact investigator immediately for related problems.

IMMUNIZATION

BCG and OPV were given to all babies.

FURTHER MANAGEMENT

Patients were asked to continue Abhyanga with available oil. Vaccination as per schedule.

**Subjective Parameters**

The following are the subjective parameters for the study undertaken they are- sleep in 24hr, interval in sleeps, sleep pattern, activity and number of feedings per day.

Assessment for Sleep Pattern concentrating on deep sleep or light sleep. The activity assessment did by observing awake & quiet, awake & crying, awake & playful during day/night

**Objective Parameters**

The following are the objective parameters for the study undertaken they are- skin texture, lanugo, plantar creases, muscle tone arm recoil, popliteal angle and weight: The weight of the child in the nude was recorded accurately on electronic type of weighing scale. Weight was recorded in kilograms up to 2 decimal places (i.e. up to grams).

Height (length): The child was placed supine on a rigid measuring table. The head was held firmly in position against a fixed upright head board. Legs were straightened keeping feet at right angles to legs with toes pointing upward. A free foot board was brought into firm contact with the child's heels. Length of the baby was measured by measuring the distance between two boards. HC, CC, and Height were recorded in centimeters up to 1 decimal place (i.e. up to mm). Head circumference (HC): The maximum

circumference of the head from the occipital protuberance to the supra-orbital ridges on the forehead was recorded.

Chest circumference (CC): The chest circumference was measured at the level of the nipples, midway between inspiration and expiration, with the child in recumbent position.

All parameters were recorded as an average of 2 readings to avoid human error.

Skin texture of assessment did by;

| | |
|---|---|
| Very thin and gelatinous | 0 |
| Smooth, medium thickness with superficial peeling | 1 |
| Thick with peeling and Cracking over hands and feet | 2 |

Lanugo of assessment did by;

| | |
|---|---|
| Nil/Scanty | 0 |
| Abundant lanugo | 1 |
| Thining lanugo at places | 2 |
| Scanty lanugo with areas of baldness | 3 |

Plantar Creases of assessment did by;

| | |
|---|---|
| Nil | 0 |
| Faint red marks over anterior 1/3rd to ½ of Sole | 1 |
| Deep identations through the sole | 2 |

Muscle Tone of assessment did by two parameters Arm recoil and Popliteal Angle;

*Arm Recoil*

| | |
|---|---|
| No recoil or only random movements | 0 |
| Arm returns to incomplete flexion or sluggish response | 1 |
| Arm briskly returns to full Flexion | 2 |

*Popliteal Angle*

| | |
|---|---|
| $180^0$ | 0 |
| $180\text{-}150^0$ | 1 |
| $150\text{-}120^0$ | 2 |
| $120\text{-}90^0$ | 3 |

Weight gain in Kg- From the time of birth to 60 completed days of treatment.

| | |
|---|---|
| below 0.8 kg | 0 |
| above 0.8 kg | 1 |
| above 1 kg | 2 |
| above 1.5 kg | 3 |

Length or Height - At the time of Birth and then on Follow up after 60 days of treatment.

| | |
|---|---|
| Below 3 cm | 0 |
| 3 cm to 4 cm | 1 |
| 4 cm to 4.5 cm | 2 |
| 4.5 cm and above | 3 |

Head Circumference- At the time of Birth and then on Follow up after 60 days of treatment.

| | |
|---|---|
| No change | 0 |
| 1 cm | 1 |
| 2 cm | 2 |
| 3 cm | 3 |

**Observation**

Observational parameters were recorded on $1^{st}$ day, $2^{nd}$, $3^{rd}$, $15^{th}$ day, $30^{th}$ day and $45^{th}$ day of 'Abhyanga' and $60^{th}$ day of life of infant. They were recorded under the headings Follow-Up 1, 2, 3, 4, 5, 6 and 7respectively.

**Statistical Analysis**

As grading used for the parameters were ordinal in nature, 'Wilcoxon Signed Rank test' is used for intra-group comparison (i.e. after birth and after treatment of a group), while for inter-group comparison, (i.e. for comparing two groups with each other) 'Mann- Whitney U test' is used. For dichotomous variables, 'Mc Nemar chi - square test' for intra group analysis and 'Pearson Chi-square test' for inter group analysis. Author tested a hypothesis for each parameter and result is interpreted accordingly. The level of significance is kept at 0.05.

**Results and Discussion**

**Group A** (Total 30)

There were 12 males babies (40%) and 18 were female (60%). Regarding Socio-Economic Status, 3 babies were from rich class (10%), 17 babies were from middle class (57%) and 10 were belonging to poor class (33%). The average birth weight of babies was 2.95 ± 0.186 kg.

**Group B** (Total 30)

There were 12 males babies (40%) and 18 were female (60%). Regarding Socio-Economic Status, 5 babies were from rich class (17%), 13 babies were from middle class (43%) and 12 were belonging to poor class (40%). The average birth weight of babies was 2.91 ± 0.126 kg.

**Incidence of Length at birth**

For group A, average length at birth of babies was 46.95 ± 0.371 cm while for group B, it was 46.53 ± 0.297 cm.

**Incidence of Head Circumference at Birth**

For group A, average Head circumference at birth of babies was 35.17±0.203cm while for group B, it was 35.18 ±0.153 cm.

**Incidence of Chest Circumference at Birth**

For group A, average chest circumference at birth of babies was 32.71±0.407 cm while for group B, it was 32.36±0.243 cm.

**Sleep in 24hours**

**Table 1: Sleep in 24 hours of 60 Patients**

| Sleep in 24 hours | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| **Group A** | After Birth | 10.77 | 30 | 0 | < 0.001 |
| | After treatment | 15.57 | | | |
| **Group B** | After Birth | 10.13 | 30 | 0 | < 0.001 |
| | After treatment | 15.20 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis – H0 : Median increase in Sleep in 24 hours after treatment is zero.

H1 : Median increase in Sleep in 24 hours after treatment is greater than zero.

For group A, the median increase in Sleep in 24 hours after treatment is significant (P-value < 0.001) at 5% level of significance. Results indicate that, there is significant increase in Sleep in 24 hours for Group A. For group B, the median increase in Sleep in 24hours after treatment is significant (P-value<0.001) at 5% level of significance. Results indicate that, there is significant increase in Sleep in 24hours for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0: Increase in Sleep in 24hours scores for group A and Group B are equal (equally distributed).

H1: Increase in Sleep in 24 hours scores for group A and Group B are not equal (not equally distributed).

| Group | Mean of difference (afb-aft) | S.D. of difference (afb-aft) | Mann-Whitney U statistic | P-Value |
|---|---|---|---|---|
| **Group A** | 4.80 | 1.448 | 500.5 | 0.437 |
| **Group B** | 5.07 | 1.143 | | |

Distribution of "increase in Sleep in 24 hours" for group A and group B isn't significantly

different. (p –value = 0.437 Thus group A and group B can be considered as equally effective in increasing Sleep in 24 hours at 5% level of significance.

**Interval in Sleeps**

**Table 2: Interval in sleeps of 60 Patients**

| Interval in sleeps | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P- Value |
|---|---|---|---|---|---|
| Group A | After Birth | 1.13 | 30 | 0 | < 0.001 |
| | After treatment | 2.00 | | | |
| Group B | After Birth | 1.00 | 30 | 0 | < 0.001 |
| | After treatment | 2.00 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis-

H0 : Median increase in Interval in sleeps after treatment is zero.

H1 : Median increase in Interval in sleeps after treatment is greater than zero.

For group A, the median increase in Interval in sleeps after treatment is significant (P-value < 0.001) at 5% level of significance. Results indicate that, there is significant increase in Interval in sleeps for Group A. For group B, the median increase in Interval in sleeps after treatment is significant (P-value<0.001) at 5% level of significance. Results indicate that, there is significant increase in Interval in sleeps for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0: Increase in Interval in sleeps scores for group A and group B are equal (equally distributed).

H1: Increase in Interval in sleeps scores for group A and group B are not equal (not equally distributed)

| Group | Mean of difference (afb-aft) | S.D. of difference (afb-aft) | Mann-Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 0.87 | 0.346 | 510 | 0.042 |
| Group B | 1.00 | 0.000 | | |

Distribution of "increase in Interval in sleeps" for group A and group B is significantly different. (p –value = 0.042) at 5% level of significance. Thus group B can be considered as more effective in increasing Interval in sleeps as compared to group A.

**Sleep Pattern**

**Table 3: Sleep Patterns of 60 Patients**

| Group | After Birth | After Treatment | | d.f. | Chi squared (Mc Nemar) | P-value |
|---|---|---|---|---|---|---|
| | | Deep sleep | Light sleep | | | |
| **Group A** | Deep sleep | 3 | 3 | 1 | 7.579 | 0.006 |
| | Light sleep | 16 | 8 | | | |
| **Group B** | Deep sleep | 13 | 7 | 1 | 0 | 1 |
| | Light sleep | 7 | 3 | | | |

In group A, there are 16 patients such that they were having light sleep pattern after birth and were observed to be having deep sleep pattern after treatment. As McNemar's Chi-squared test at 5% level of significance shows significant change in distribution (P- value = 0.006). Results indicate that, there is significant improvement in Sleep pattern for group A.

In group B, there are 7 patients such that they were having light sleep pattern before treatment and were observed to behaving deep sleep pattern after treatment. As McNemar's Chi Square test at 5% level of significance shows non-significant change in distribution (P- value = 1). Results indicate that, there isn't significant improvement in Sleep pattern for Group B.

Above table can be summarized in contingency table as below.

| Sleep pattern | Group | Deep sleep | Light sleep | d.f. | Chi-squared statistic (corrected) | P-value |
|---|---|---|---|---|---|---|
| After Birth | Group A | 6 | 24 | 1 | 11.47 | < 0.001 |
| | Group B | 20 | 10 | | | |
| After treatment | Group A | 19 | 11 | 1 | 0 | 1 |
| | Group B | 20 | 10 | | | |

Before treatment distribution of sleep pattern for group A and group B was significantly different (P-value < 0.001) at 5% level of significance. After treatment distribution of sleep pattern for group A and group B was not significantly different (P-value = 1) at 5% level of significance. Thus considering distributions of group A and group B after birth and after treatment, it can be claimed that group A treatment is more effective than group B treatment with sleep pattern.

**Awakening Activity**

**Table 4: Awakening Activity of 60 Patients**

| Activity | | Awake and crying | Awake and quite | Awake and playful | d.f. | Chi- squared statistic | P-value |
|---|---|---|---|---|---|---|---|
| Group A | After Birth | 13 | 8 | 9 | 2 | 16.80 | < 0.001 |
| | After treatment | 0 | 12 | 18 | | | |
| Group B | After Birth | 12 | 11 | 7 | 2 | 22.19 | 0.06 |
| | After treatment | 0 | 28 | 2 | | | |

For group A, distribution of activity after birth and after treatment was significantly different (P-value < 0.001) at 5% level of significance. For group B, distribution of activity for after birth and after treatment was significantly different (P-value < 0.001) at 5% level of significance.

*Comparative analysis*

| Pattern of awakening | Group | Awake and crying | Awake and quite | Awake and playful |
|---|---|---|---|---|
| After treatment | Group A | 0 | 12 | 18 |
| | Group B | 0 | 28 | 2 |

As one of the column total is 0, we cannot compute chi-square statistics, thus by grouping above table can be written as,

| Pattern of awakening | Group | Awake and quite /crying | Awake and playful | d.f. | Chi- squared statistic (corrected) | P-value |
|---|---|---|---|---|---|---|
| After treatment | Group A | 12 | 18 | 1 | 16.88 | < 0.001 |
| | Group B | 28 | 2 | | | |

Thus treatment B can be considered as more effective in improving activity of child as compared to treatment A.

**Number of Feeds/24 hours**

**Table 5: Number of feeds per 24 hours of 60 Patients**

| Number of feeds per 24 hours | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 6.87 | 30 | 0 | < 0.001 |
| | After treatment | 13.60 | | | |
| Group B | After Birth | 6.37 | 30 | 0 | < 0.001 |
| | After treatment | 14.20 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis–

$H_0$ : Median increase in Number of feeds per day after treatment is zero.

$H_1$ : Median increase in Number of feeds per day after treatment is greater than zero.

For group A, the median increase in Number of feeds per day after treatment is significant (P-value<0.001) at 5% level of significance. The result indicates that, there is significant increase

in Number of feeds per day for Group A. For group B, the median increase in Number of feeds per day after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Number of feeds per day for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0: Increase in Number of feeds per day for group A and group B are equal (equally distributed)

H1: Increase in Number of feeds per day for group A and group B are not equal (not equally distributed)

| Group | Mean of difference (afb-aft) | S.D. of difference (afb-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| **Group A** | 6.73 | 1.172 | 697 | < 0.001 |
| **Group B** | 7.83 | 0.791 | | |

Distribution of 'increase in Number of feeds per day' for group A and group B is significantly different (p –value < 0.001) at 5% level of significance. Thus Group B treatment can be considered as more effective in increasing Number of feeds per day as compared to Group A treatment.

**Skin Textures**

**Table 6: Skin textures of 60 Patients**

| Skin textures | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 0.93 | 30 | 0 | < 0.001 |
| | After treatment | 2.00 | | | |
| Group B | After Birth | 0.80 | 30 | 0 | < 0.001 |
| | After treatment | 2.00 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

H0 : Median improvement in Skin textures after treatment is zero.

H1 : Median improvement in Skin textures after treatment is greater than zero.

For group A, the median improvement in Skin textures after treatment is significant (P-value<0.001) at5% level of significance. The result indicates that, there is significant improvement in Skin textures for Group A. For group B, the median improvement in Skin textures after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant improvement in Skin textures for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0: Improvement in Skin textures for group A and group B are equal (equally distributed)

H1: Improvement in Skin textures for group A and group B are not equal (not equally distributed)

| Group | Mean of difference (afb-aft) | S.D. of difference (afb-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 1.07 | 0.521 | 501 | 0.311 |
| Group B | 1.20 | 0.407 | | |

Distribution of 'improvement in Skin textures' for group A and group B isn't significantly different (p –value = 0.311) at 5% level of significance. Thus Group A and Group B drug can be considered as equally effective in improving Skin textures.

**Lanugo**

**Table 7: Lanugo of 60 Patients**

| Lanugo | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 2 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |
| Group B | After Birth | 2 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Lanugo after treatment is zero.

$H_1$ : Median increase in Lanugo after treatment is greater than zero.

For group A, the median increase in Lanugo after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, is significant increase in Lanugo for Group A. For group B, the median increase in Lanugo after treatment is significant (P- value<0.001) at 5%levelofsignificance. The result indicates that, is significant increase in Lanugo for GroupB.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

$H_0$ : Increase in Lanugo for group A and group B are equal (equally distributed)

$H_1$ : Increase in Lanugo for group A and group B are not equal(not equally distributed)

| Group | Mean of difference (afb-aft) | S.D. of difference (afb-aft) | Mann- Whitney Ustatistic | P-Value |
|---|---|---|---|---|
| Group A | 1 | 0 | 450 | ≈ 1 |
| Group B | 1 | 0 | | |

Distribution of "increase in Lanugo" for group A and group B isn't significantly different (p–value≈1) at 5% level of significance. Thus Group A and Group B drug can be considered as equally effective in improving Lanugo.

**Plantar creases**

**Table 8: Plantar creases of 60 Patients**

| Plantar creases | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 2 | | | |
| Group B | After Birth | 1 | 30 | 0 | < 0.001 |
| | After treatment | 2 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Plantar creases after treatment is zero.

$H_1$ : Median increase in Plantar creases after treatment is greater than zero.

For group A, the median increase in Plantar creases after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, is significant increase in Plantar creases for Group A. For group B, the median increase in Plantar creases after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, is significant increase in Plantar creases for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

$H_0$ : Increase in Plantar creases for group A and group B are equal (equally distributed)

$H_1$: Increase in Plantar creases for group A and group B are not equal (not equally distributed)

| Group | Mean of difference (abr-aft) | S.D. of difference (abr-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 2 | 0 | 0 | < 0.001 |
| Group B | 1 | 0 | | |

Distribution of "increase in Plantar creases" for group A and group B is significantly different (p –value ≈ 1) at 5% level of significance. Thus Group A drug can be considered as more effective in improving plantar creases as compared to Group B drug.

**Arm recoil**

**Table 9: Arm recoil of 60 Patients.**

| Arm recoil | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 1 | 30 | 0 | < 0.001 |
| | After treatment | 2 | | | |
| Group B | After Birth | 1 | 30 | 0 | < 0.001 |
| | After treatment | 2 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Arm recoil after treatment is zero.

$H_1$ : Median increase in Arm recoil after treatment is greater than zero.

For group A, the median increase in Arm recoil after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, is significant increase in Arm recoil for Group A. For group B, the median increase in Arm recoil after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, is significant increase in Arm recoil for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

$H_0$: Increase in Arm recoil for group A and group B are equal (equally distributed).

$H_1$: Increase in Arm recoil for group A and group B are not equal (not equally distributed).

| Group | Mean of difference (abr-aft) | S.D. of difference (abr-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 1 | 0 | 450 | ≈ 1 |
| Group B | 1 | 0 | | |

Distribution of 'increase in Arm recoil' for group A and group B isn't significantly different (p–value≈1) at 5% level of significance. Thus Group A and Group B drug can be considered as equally effective in improving Arm recoil.

**Popliteal angle**

**Table 10: Popliteal angle of 60 Patients**

| Popliteal angle | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 1 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |
| Group B | After Birth | 1 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Popliteal angle after treatment is zero.

$H_1$: Median increase in Popliteal angle after treatment is greater than zero.

For groupA, the median increase in Popliteal angle after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Popliteal angle for Group A. For group B, the median increase in Popliteal angle after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Popliteal angle for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

$H_0$: Increase in Popliteal angle for group A and group B are equal (equally distributed).

$H_1$: Increase in Popliteal angle for group A and group B are not equal (not equally distributed).

| Group | Mean of difference (abr-aft) | S.D. of difference (abr-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 2 | 0 | 450 | ≈ 1 |
| Group B | 2 | 0 | | |

Distribution of "increase in Popliteal angle" for group A and group B isn't significantly different (p –value ≈ 1) at 5% level of significance. Thus Group A and Group B drugs can be considered as equally effective in improving Popliteal angle.

**Weight**

**Table 11: Weight of 60 Patients**

| Weight | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| **Group A** | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |
| **Group B** | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Weight after treatment is zero.

$H_1$ : Median increase in Weight after treatment is greater than zero.

For group A, the median increase in Weight after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Weight for Group A. For group B, the median increase in Weight after treatment is significant (P- value<0.001) at 5% level of significance. The result indicates that, there is significant increase in Weight for Group B.

Comparative Analysis of Groups

Using Mann-Whitney U test, to test the hypothesis –

$H_0$: Increase in Weight for group A and group B are equal (equally distributed).

$H_1$: Increase in Weight for group A and group B are not equal (not equally distributed).

| Group | Mean of difference (abr-aft) | S.D. of difference (abr-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 3 | 0 | 450 | ≈ 1 |
| Group B | 3 | 0 | | |

Distribution of "increase in Weight" for group A and group B isn't significantly different (p–value≈1) at 5%levelofsignificance.Thus Group A and Group B drugs can be considered as equally effective in improving Weight.

**Length**

**Table 12: Length of 60 Patients**

| Length | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 1 | | | |
| Group B | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 1 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis –

$H_0$ : Median increase in Length after treatment is zero.

$H_1$ : Median increase in Length after treatment is greater than zero.

For group A, the median increase in Length after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Length for Group A. For group B, the median increase in Length after treatment is significant (P-value<0.001) at 5% level of significance. The result indicates that, there is significant increase in Length for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0 : Increase in Length for group A and group B are equal (equally distributed).

H1 : Increase in Length for group A and group B are not equal(not equally distributed).

| Group | Mean of difference (abr-aft) | S.D. of difference (abr-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| **Group A** | 1 | 0 | 450 | ≈ 1 |
| **Group B** | 1 | 0 | | |

Distribution of "increase in Length" for group A and group B isn't significantly different (p–value≈1)at5%levelofsignificance.Thus Group A and Group B drugs can be considered as equally effective in improving Length.

**Head circumference**

**Table 13: Head circumference of 60 Patients**

| Head circumference | | Mean Score | Sample size | Wicoxon signed rank test ($T^+$) | P-Value |
|---|---|---|---|---|---|
| Group A | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |
| Group B | After Birth | 0 | 30 | 0 | < 0.001 |
| | After treatment | 3 | | | |

Using one tailed Wilcoxon signed rank test, to test the hypothesis – H0 : Median increase in Head circumference after treatment is zero.

H1: Median increase in Head circumference after treatment is greater than zero.

For group A, the median increase in Head circumference after treatment is significant (P-value<0.001) at 5% level of significance. The result indicates that, there is significant increase in Head circumference for Group A. For group B, the median increase in Head circumference after treatment is significant (P-value < 0.001) at 5% level of significance. The result indicates that, there is significant increase in Head circumference for Group B.

*Comparative Analysis of Groups*

Using Mann-Whitney U test, to test the hypothesis –

H0: Increase in Head circumference for group A and group B are equal (equally distributed).

H1: Increase in Head circumference for group A and group B are not equal (not equally distributed).

| Group | Mean of difference (bef-aft) | S.D. of difference (bef-aft) | Mann- Whitney U statistic | P-Value |
|---|---|---|---|---|
| Group A | 3 | 0 | 450 | ≈ 1 |
| Group B | 3 | 0 | | |

Distribution of "increase in Head circumference" for group A and group B isn't significantly different (p –value ≈ 1) at 5% level of significance. Thus Group A and Group B drugs can be considered as equally effective in improving Head circumference.

## Conclusion

Abhyanga, one of the procedures in neonatal care, which is described in all brihatrayes. It has 'vata-shaman' and nourishing properties. There was minimal initial weight loss and early weight regaining both groups. Gain in weight, height or length, Head circumference in both groups are significantly equal. Group A receiving Tila Taila Abhyanga and Group B receiving Bala Taila Abhanga showed equal gain in weight, height, head circumference. Bala Taila Abhyanga was associated with earlier organizationof behavioral pattern than Til Taila Abhyanga. Group A neonates shows more number of events of illness than controlgroup. In both group of patients who are taking Tila Taila Abhyangaor Bala Taila Abhyanga shows equal results in different parameters. Oil application conserves internal body heat probably by reducing insensible water loss.

**Conflict of interest**

The authors declare no conflict of interest.

**References**


1. Acharya, Y.T. (2009). Edite- Sushruta Samhita with Nibandhasangraha commentary of Shri Dalhanacharya , Choukhamba Sanskrit Sansthan, Varanasi, Reprint. 15-35.
2. Agerwal, K.N. and Gupta, A. (2000). Effects of Massage and use of oil on growth, blood flow and sleep pattern in infants. *Indian J Med Res.*, 12.112, 212-217.
3. Darmstadt, G.L. and Saha, S.K. (2002). Traditional practice of oil massage of neonates in Bangladesh. *J Health Popul Nutr*, 20 (2), 184-188.
4. Datta, D.C. (2004). Text book of Obstetric, 6th ed., Central Book Agency, Kolkatta. 42-44.
5. Deshpande and Javalgekar. (2010). Dravyaguna Vidyana,
6. Elizabeth, K.E. (2010). Nutrition and Child Development, 4th ed., Paras Medical Publisher, Hyderabad. 1-81.
7. Ghai, O.P., Gupta, P. and Paul, V.K. (2007). Essential Pediatrics, 6th ed., CBS publishers and distributors, New Delhi. 135-152.
8. Gogate, V. (2008). Dravyaguna Vidyana, 1st ed., Vaidyamitra Prakashan, Pune, 522-524.
9. Kasture, H. (1999). Ayurvediya Panchkarma Vidnyan, 6th ed., Baidyanath Ayurved Bhavan, Nagpur. 82-83.
10. Kliegman, R.M., Behrman, R.E., Jenson, H.B. and Stanton, B.F. (2008). Nelson Textbook of Pediatrics, 18th ed., Vol. – I and II, Elsevier, New Delhi. 532-538.
11. Kulkarni, K. and Kaushik, J.S. (2010). Massage and touch therapy in neonates. *Indian Pediatrics*, 47(9), 771-776.
12. Kumar, A.K. (2011): Pediatric Clinical examination, 3rd ed., Paras Medical Publisher, Hyderabad. 1-19.
13. Kunte, A. and Shastri, K.R. (2010) Ashtanga Hridaya, 1st ed., Reprint, Chaukhamba Sanskrit Sansthan, Varanasi, 3-12, 357-379.
14. Mahajan, B.K. (2010). Methods in Biostatistics, 7th ed., Jaypee Publications. 168-185.
15. Murthy, K.R.S. (2001). Edited-Sharangadhara Samhita of Sharangadhara, 4th ed., Choukhamba Orientalia, Varanasi. 115-135.
16. Pandeya,G. (1998) Edited-Charak Samhita of Agnivesh, With Ayurved Dipika commentary of Chakrapanidatt.
17. Rao, A. and Sharma, R. D. (2009). Clinical study of the immunoglobulin enhancing effect of bala compound on infants. *Ancient science of life*, 28, 18-22.
18. Sarkar, R. and Basu, S. (2010). Skin care of the newborn. *Indian Pediatrics*, 47(7), 593-598.
19. Shakarnarayanan, K. and Mondkar, J.A. (2005). Oil massage in neonates open randomized controlled study of coconut versus mineral oil. *Indian paediatrics*, 42(5), 877-884.
20. Sharma, P.V. (2002). Dravyaguna Vidyana, Reprint. PA Choukhamba, 734.
21. Shastri, L.C. and Trivedi. (YEAR???) Ashtang Sangraha, 1st ed., Reprint, Shree Baidyanatha Ayurveda Bhavan PVT LTD, Nagpur. U:1-15.
22. Shastri, Y.S. (2002).Choukhamba Sanskrit Sansthan, 7th ed., Varanasi, 2002.
23. Shukla, G.D. (1999). Edited-Bhela Samhita of Bhela, edited by, Choukhamba Bharati Academy, Varanasi, Reprint. 48,49,75-88.
24. Solanki, K. Matnani, M. and Kale, M. (2005). Transcutaneous absorption of topically massaged oil in neonates. *Indian Pediatrics*, 42(10), 0998 – 1005.
25. Tevari, P.V. and Chaukhambavisva, B. (2008). Edited-Kashyapa Samhita of Maharshi Kashyapa, Varanasi, Reprint. 614-636.
26. Underdown, A., Barlow, J., Chung, V., Stewart – Brown, S. (2006). Massage intervention for promoting mental and physical health in infants aged under six months. Cochrane Data base of systemic reviews, (4), Art.No:CD005038DOI:10.1002/14651858CD 005038.Pub2.