Effect of Yakson's Therapeutic Touch on Vital Signs, Growth Measurements and Behavioral State of Preterm Neonates

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Abstract

Background: *Yakson's is a Korean therapeutic touch given to neonates and infants in which one hand caresses their tummy while the other rests on their back to reduce pain and quiet them down. It could significantly decrease the level of stress hormones and increase sleep efficiency during and after the intervention which improve preterm neonate's health and relaxation.* ***Objective****: was to investigate the effect of Yakson's therapeutic touch on vital signs, growth measurements and behavioral state of preterm neonates.* ***Setting****: This study was conducted at the Neonatal Intensive Care Unit (NICU) of Alexandria University Maternity Hospital (AUMH) -El Shatby and Smouha Children's University Hospital (SCUH).* ***Subjects:*** *A convenient sample of 60 preterm neonates who were randomly allocated to two equal groups (control and study).* ***Tools****: Three tools were used; preterm neonate's perinatal and admission data assessment sheet, preterm neonates' vital signs and growth measurements record and Anderson behavioral state scale (ABSS).* ***Results****: Very large effect size of Yakson therapeutic touch was found regarding preterm neonates' behavioral state (Cohen's D=3.58), mid arm circumference (Cohen's D=1.52) and the vital signs. Moreover, large effect size of Yakson's therapeutic touch was found on preterm neonates' length, chest and head circumference throughout the study phases (Cohen's D=0.88, Cohen's D=1.13, Cohen's D=1.02 respectively).* ***Conclusion:*** *Yakson's therapeutic touch has a significant effect on preterm neonates' vital signs stability, growth measurements increase and behavioral state score decrease.*

Key words: - Yakson's Therapeutic Touch, Vital Signs, Growth Measurements, Behavioral State, Preterm Neonates.

Introduction

Prematurity is the main cause of infant's death around the world. Preterm birth is defined by the World Health Organization (WHO) as any birth before 37 weeks of pregnancy or 259 days after the onset of last woman's menstrual period (De Costa et al., 2021). Preterm births are expected to affect 15 million people worldwide each year (more than 1 in 10 infants) (Acharya et al., 2021). Nationally, preterm delivery problems were the primary causes of infant fatalities in Egypt in 2018, with a rate of 38 % (WHO and Maternal and Child Epidemiology Estimation Group, 2018).

Preterm births are becoming more common as a result of complex and multiple risk factors. Premature rupture of membranes causes 30% of all preterm births, and idiopathic preterm births account for 45–50% of all preterm cases. While, medically indicated or elective factors account for 15–20% of premature births, and congenital abnormalities account for 28% of all neonatal

fatalities (Murad et al., 2017; Bello, Pius & Ibrahim, 2019).

Many neurobehavioral disorders are caused by prematurity, including Cerebral Palsy (CP), Attention Deficit Hyperactivity Disorder (ADHD), Autism, deafness and blindness, which affect up to 15% of premature infants (Mohamed et al., 2018). Although, preterm birth cannot be totally avoided, a mother can advocate for a healthier pregnancy. Universal coverage of high-impact newborn health interventions packaged as care bundles, including special and intensive newborn care, might result in 86% fewer fatalities owing to direct preterm delivery problems (Kinney & Rhoda, 2019).

Vital signs monitoring is an important aspect of newborn care. Cumulative study of continuous vital signs trends collected by monitors might indicate impending clinical deterioration or disease (Sun et al., 2019). Moreover, assessment and monitoring the physical growth of preterm infants is required in the Neonatal Intensive Care Unit (NICU) to approximate the growth and body composition of preterm neonates. It also support optimal brain development while avoiding future cardiometabolic risk and longer-term developmental effects (Cordova & Belfort, 2020).

The behavioral condition of preterm neonates is particularly significant, as it is required in addition to craniofacial completeness, muscle contraction ability, posture, global flexion, and alertness (Fujinaga et al., 2018). Touch therapy has been shown to improve the physical and developmental outcomes of premature infants. Yakson is a Korean therapeutic touch given to neonates and infants to reduce pain and quiet them down (Dehghani et al., 2019). Preterm newborns' cortisol and norepinephrine levels can be reduced by Yakson’s therapeutic touch. It can aid in the promotion of preterm neonates’ growth and reduction of hospital stay (Dur et al., 2020).

Neonatal nurses are in a unique position to promote normal and healthy growth of preterm neonates by creating a positive neurodevelopmental atmosphere. They should provide the contact and human touch that are necessary for premature newborns' proper growth and development (Dussi & Ferrari, 2021). Yakson’s therapeutic touch has been shown to have beneficial effects on neonatal behaviors such as motor development, self-regulated behaviors, daily weight gain and reduced hospital stay (Parashar & Samuel, 2018).

Aim of study

This study aimed to investigate the effect of Yakson’s therapeutic touch on vital signs, growth measurements and behavioral state of preterm neonates.

Research Hypotheses:

1. Preterm neonates who receive Yakson’s therapeutic touch exhibit stable vital signs than those who do not.
2. Preterm neonates who receive Yakson’s therapeutic touch exhibit increase in growth measurements than those who do not.
3. Preterm neonates who receive Yakson’s therapeutic touch exhibit lower behavioral state score than those who do not.

Materials and Methods

Materials

Design: A quasi-experimental research design was used.

Settings: This study was conducted at the NICU of Alexandria University Maternity Hospital (AUMH) -El Shatby and Smouha Children's University Hospital (SCUH).

Subjects: A convenient sample of 60 preterm neonates who fulfilling the following criteria comprised the study subjects:

***Inclusion criteria*:**

- Gestational age (GA) was between 32 < 37 weeks.
- Birth weight was more than 1000 gram.
- Apgar score was more than 6 at 5 min.
- Postnatal age was more than 7 days for physiological stabilization.

***Exclusion criteria*:**

Preterm neonates with the following criteria were excluded:

- On mechanical ventilator .
- Treated with any sedatives.
- Suffered from intraventricular hemorhage.
- With neonatal sepsis, neurological problems and congenital heart disease.

The subjects of the study were randomly allocated to two equal groups as follows:

a. **The control group** who comprised 30 preterm neonates those were only subjected to the hospital routine care of neurodevelopmental protective measures.
b. **The study group** who comprised 30 preterm neonates. They were subjected to the Yakson's therapeutic touch modality in addition to the hospital routine care, regarding neurodevelopmental protective measures.

Tools: Three tools were used for data collection.

Tool I: Preterm Neonate's Perinatal and Admission Data Assessment Sheet.

This tool was developed by the researcher. It included two parts as follows:

Part A: Preterm Neonate's Perinatal Data

This part included data about prenatal, natal and postnatal history such as presence of fetal distress, resucitative data, gender, method of delivery, APGAR score, estimated gestational age and postnatal age.

Part B: Preterm Neonate's Admission Data

This part included data about date of neonate's admission, diaganosis, admission physiological and physical measurements.

Tool II: Preterm Neonates' Vital Signs and Growth Measurements Record

This tool was developed by the researcher after reviewing the relevant literatures (Dur et al., 2020; Parashar & Samuel., 2018; Abed Elataief et al., 2017). It included two parts as follows:

Part A: Preterm Neonate's Vital Signs

This part included the measured values of temperature, heart rate, respiratory rate, blood pressure and oxygen saturation

Part B: Preterm Neonate's Growth Measurements

It included the measured values of weight, length, head, chest and mid-arm circumferences.

Tool III: Anderson Behavioral State Scale (ABSS).

This is standardized tool adopted from Anderson (1996). The aim of this tool was to assess the behavioral state of preterm neonates based on observations of the intensity of crying, respiratory regularity, opening or closing of the eyes, as well as limb and trunk activity. It was designed to measure the sleep-wake state of preterm neonates' using behavioral sleep descriptors. This scale measures 12 preterm neonates' behavioral states including 1; regular quiet sleep, 2; irregular quiet sleep, 3; active sleep, 4; very active sleep, 5; drowsy, 6; alert inactivity, 7; quiet awake, 8; active awake, 9; very active awake, 10; fussing, 11; crying and 12; hard crying.

The total score was classified as following:

- Scores from 1 to 5 indicated that the neonate is sleeping.
- Scores 6–8 indicated that the neonate is awake and calm and in the most suitable state for nursing activity.
- Scores from 9 to 12 indicated that the neonate is in a state of restless activity or fussiness, which take substantial energy (Yang et al., 2014; Anderson., 1996)

Methods

1. Approval from the Faculty of Nursing, Alexandria University Research Ethics Committee was obtained before starting the study.
2. An official letter from the postgraduate affairs department was sent to previously mentioned setting to conduct the study.
3. The researcher attended an extensive training program about Yakson's therapeutic touch for preterm neonates at Faculty of Nursing Cairo University.
4. Tool I & II were developed by the researcher after thorough review of the recent and relevant literature.
5. Tool I & II were tested for their content validity by five experts in the pediatric nursing field.
6. Tool III was adopted from the standardized tool of Anderson Behavioral State Scale (ABSS).
7. A pilot study was carried out on 10% of preterm neonates (6 preterm neonates) to test feasibility & clarity of tools. The necessary modifications was done accordingly. Those preterm neonates were excluded from the total study subjects.
8. The reliability of the tools was done by measuring the internal consistency of its items using Cronbach Coefficient Alpha Test. The tools were reliable for preterm neonates as r = 0.94
9. Perinatal and admission data were obtained from medical records for all preterm neonates in both groups using Tool I.
10. Baseline vital signs and growth parameters were measured and recorded for all neonates in both groups using Tool II.
11. Baseline behavioral state were measured & scored for all preterm neonates in both groups using Tool III.
12. Vital signs were measured and recorded for all preterm neonates in both groups two times per day over 5 consecutive days using part A in Tool II.
13. Growth parameters were measured and recorded for all preterm neonates in both groups. This was done once daily over 5 consecutive days using part B in Tool II.
14. **For the control group:** The researcher assessed vital signs using part A Tool II and behavioral state score using Tool III, two minutes before initiation of routine nursing care and two minutes after finishing it. This were performed twice a day for five consecutive days.
15. **For the study group:** The researcher applied Yakson's therapeutic touch twice a day for 15 minutes in the morning (9-11Am) and evening shifts (3-5Pm) for 5 consecutive days. The researcher assessed vital signs using part A Tool II and behavioral state score using Tool III two minutes before and two minutes after applying Yakson's therapeutic touch.
16. **Yakson's therapeutic touch procedure was applied by researcher as follow:**
    a. Researchers' hands and arms were washed thoroughly with an antimicrobial agent for 3 min.
    b. A clean gown was worn.
    c. Both hands were warmed using a radiant warmer/or rubbing technique.
    d. The researchers' both arms and the muscles of both shoulders were relaxed for 1 min and breathed deeply to concentrate Ki energy on their palms.
    e. Yakson's therapeutic touch steps were done as follows:

- **Hand Resting (5 min):** Resting one hand on the chest and abdomen of the preterm neonate while supporting the back of the preterm infant with the other hand. The researcher concentrated on the resting hands and breath slowly to maintain a relaxed state.
- **Gentle Caressing (5 min).** In the same hand position, the researcher alternated caressing and resting for 5 min: caressing (1 min), resting (30 s), caressing (1 min), resting (30 s) and caressing (2 min). The researcher

caressed the neonate's chest and abdomen in clockwise direction in a 1 cm diameter circular motion every 10 s.

- **Hand Resting (5 min).** The researcher followed the same hand resting procedure as mentioned previously.

17. Data was collected over a period of five months starting from the beginning of August to the end of December, 2021.
18. **Ethical considerations:**

❖ Written informed consent were obtained from parents of preterm neonates for their neonates' participation after explaining the aim of the study.
❖ Parents had the right to refuse the participation of their neonates and the right to withdraw their neonates from the study at any time.
❖ Privacy of preterm neonates was maintained.
❖ Confidentiality of preterm neonates' data was ascertained through the application of the study.

Ethical considerations:

- Written consent from mothers for participation in the study was obtained and witnesses wrote consent from the head nurse for observation after explaining the aim of the study.
- Participants' privacy through closing the room doors, respect for dignity, and anonymity were considered.
- The confidentiality of data was assured.
- Participation was done voluntarily.

Statistical analysis:

- The collected data were coded and entered in special format to be suitable for computer feeding.
- Following data entry, checking and verification process were carried out in order to avoid any errors.
- Data were analyzed using the statistical package for social science SPSS (version 20).
- The following statistical analysis measures were used:

- **Descriptive statistical measures,** which included: numbers, percentages, and averages, Minimum, Maximum, Arithmetic mean ($\overline{X}$), Standard deviation (SD).
- **Statistical analysis tests,** which included**:** Chi square, student T test and paired T test.
- **Graphical presentation** included: Bar graphs were done for data visualization.
- **Significance** of the obtained results was judged at the 5% level.

***Results*:**

Table (1) illustrates the perinatal data of preterm neonates. It is clear from this table that no statistically significant differences were found in perinatal data of preterm neonates between study and control groups. The highest percentage of preterm neonates in the study and control group (93.3% and 100% respectively) had 4-6 Apgar score at 1 min. As well as, 100% and 90% of study and control group respectively had 7-10 Apgar score at 5 min. Moreover, 63.3% of preterm neonates in the study group required initial steps of resuscitation, relative to 46.7% of those in the control group. Regarding gestational weeks, 53.3% of preterm neonates in the study group ranged from 34-36 wks, whereas 60% of preterm neonates in control group had 32 to 33 gestational weeks.

Medical data of preterm neonates is shown in **Table (2)**. It is noted from this table that the majority of preterm neonates in both study and control group (90% and 93.3% respectively) had RDS and VLBW as the final diagnosis. Concerning method of feeding and previous sepsis, all preterm neonates in the study and control group (100% for each) were on gavage feeding and had no previous sepsis. A statistically significant differences was not found in medical data between the study and control groups.

The effect of Yakson's therapeutic touch on preterm neonates' mean scores of weights across the study phases is highlighted in **Table (3)**. There were no statistically significant differences in the mean scores of weights between the study and control group. But a statistically significant difference was found in the means scores of weights among preterm neonates in the study group throughout the study period (p=0.047) other than in the control group (p=0.861). Despite, the total mean score of weight among preterm neonates in the study group is lower than those in the control group (1528.54±167.51 and 1535.52±190.04 respectively), the increase in weight in the study group throughout the study period was somewhat higher than those in the control group.

Table (4) clarifies the total morning and the total evening vital signs and behavioral state mean scores of preterm neonates across the study phases. It is noted from this table that the total morning and the total evening heart and respiratory rates' mean scores of preterm neonates in the study group decreased after intervention. On the other hand, preterm neonates in the control group had increased heart and respiratory rate mean scores after the routine care. There were statistically significant differences between both groups before and after intervention (p=0.000). The total morning and the total evening oxygen saturation mean scores of preterm neonates raised after intervention in the study group. On the contrary, preterm neonates in the control group showed reduction in oxygen saturation. There were statistically significant differences between both groups after intervention only (p=0.000). Furthermore, the total morning and the total evening behavioral state mean scores of preterm neonates in the study group decreased after intervention (4.280±1.11 and 3.866±1.09 respectively). Oppositely, preterm neonates in the control group which increased scores after the routine care (10.17±0.686 and 10.41±0.897 respectively) with statistically significant differences between two groups.

Table (5) portrays effect size of Yakson's therapeutic touch on preterm neonates' vital signs; growth measurements and behavioral state mean scores. There was very large effect size of Yakson's therapeutic touch on preterm neonates' behavioral state (Cohen's D=3.58), mid arm circumference (Cohen's D=1.52) and the vital signs (temperature, heart rate, respiratory rate, oxygen saturation, systolic and diastolic blood pressure). There was statistically significant differences within the study group before and after intervention throughout the study period (p=0.000). In addition, large effect size of Yakson's therapeutic touch was shown on preterm neonates' length, chest and head circumference throughout the study phases (Cohen's D=0.88, Cohen's D=1.13, Cohen's D=1.02 respectively) with statistically significant differences before and after intervention.

Discussion

Yakson's therapeutic touch is a developmental supportive care strategy that has been linked to enhanced preterm neonatal neurodevelopmental outcomes in both the short- and long-term run. It has been shown to reduce the stressful NICU environment, which modulates the sleep-wakefulness pattern by calming newborns and encouraging positive behaviors. Furthermore, it has been shown to be more helpful in facilitating preterm neonates' physiological stability, growth measurements, and behavioral state (Dur et al., 2020). Few studies have investigated the effect of Yakson's therapeutic touch on preterm neonates. Therefore, it was essential to study the effect of Yakson's therapeutic touch on vital signs, growth measurements and behavioral state of preterm neonates.

Respiratory distress syndrome (RDS)/ Hyaline membrane disease is one of the most common reasons for neonatal NICU

hospitalization. It is more common in preterm neonates, especially those delivered before 34 weeks of pregnancy. This occurs because preterm neonates have immature lung development and surfactant deficiency due to prematurity itself (Aynalem et al., 2020). In the current study, the diagnosis of the majority of preterm neonates in both the study and the control group was RDS (Table 2). This could be justified that about half of neonates in both study and control groups were delivered before 34 weeks of pregnancy. This finding is coincided with Abdel Baseer et al., (2020) who reported that the majority of neonates were diagnosed with RDS in the studied groups. However, this result is contradicted with Rasalan-Fermin, Imperial, and de Ocampo, (2021) whose results revealed that half of the studied preterm neonates diagnosed with congenital pneumonia.

Worldwide, preterm neonates' anthropometric measurements are considered an important indicator for growth as well as a major risk factor for neonatal mortality (Ayed, et al., 2021). The current study revealed that there was an increase in weight in the study group throughout the study period that was somewhat higher than in the control group (Table 3). It could be attributed that Yakson touch increased vagal activity which in turn may lead to increased gastric mobility as a result of the release of digestive hormones and thereby leads to weight gain (Hassan et al., 2014**).** This result agrees with Sridharaswari et al., (2019) results who revealed that the mean increase in body weight after touch stimulation in the treatment group was 252.2 grams greater than those in the control group of 137.9 grams. On the contrary, Garbi et al., (2020) results showed that a massage provided to neonates of 33–36 corrected gestational age, for five consecutive days, 10 min twice a day did not result in a higher growth rate of preterm neonates.

The preterm neonates' respiratory and cardiovascular systems are the primary affected organs from stress reaction to noise. Since an increase in heart rate and secondary oxygen consumption due to stress, it can minimize the quantity of calories required for growth. (Başaranoğlu et al., 2020). In the current study, the mean oxygen saturation for the preterm neonates in the study group throughout the study period were higher after applying the intervention. Whereas, in the control group, oxygen saturation decreased after the routine care with statistically significant difference between study and control group after intervention (Table 4). This could be attributed to the secretion of catecholamine that increased after massaging the skin. In addition, epinephrine affects beta-adrenergic receptors in the airways and increases their diameter which in turn leads to increased alveolar ventilation. This process finally leads to an improvement in mean oxygen saturation (Ramezani, Baniasadi & Banesh, 2017). This finding is congruent with Parhi, Das, & Sahoo, (2021) whose results revealed that the post-test oxygen saturation for control group was lower than those in experimental group with statistically significant differences. Unlike the results of the present study, Bostani-Khalesi, Abedinzadeh & Yaghoubi, (2011) reported that no significant differences in oxygen saturation during intervention.

The Yakson's touch method has been proven to control the sleep-wakefulness pattern by calming newborns, encouraging positive behaviors, and lowering behavioral stress, energy consumption, and motor activities (Dur et al., 2020). The current study findings revealed that the behavioral mean scores of preterm neonates in the study group decreased after intervention, contrast to what happened in the control group (Table 4). This could be attributed to the explanation by Im and Kim (2009) who studied the use of Yakson's touch on preterm infants, finding that the cortisol and norepinephrine levels of infants who received Yakson decreased significantly compared with infants who received no

touch therapy. Additionally, it was found that the infants’ sleep time increased and they remained calmer than those who did not receive touch therapy.

The current study findings revealed that very large effect size of Yakson's therapeutic touch was presented regarding preterm neonates’ behavioral state (Cohen’s D=3.58) as shown in Table 5. This finding is congruent with Parashar & Samuel (2018) who reported that Yakson touch might have positive effect on improving sleep status and have soothing and calming behavior on neonates. The effect size index calculation revealed very large effect size in study group (Cohen’s d >1.3).

Based on the current study findings, Yakson could be considered a safe touch intervention which helps to alleviate the stress level, improve vital signs, growth measurements and behavioral state of preterm neonates. This consequently enhance their recovery and reduced hospital stay.

Conclusion:

Based upon the findings of the current study, premature neonates who received Yakson's therapeutic touch had more stable vital signs and increased growth measurements across study phases compared to those in the control group. On the other hand, preterm neonates who received Yakson's therapeutic touch exhibited lower behavioral state score across the study period than those who do not.

Recommendations:

- Training program should be provided for all NICU nurses as regards Yakson's therapeutic touch modality and its benefits to be merged in the care of preterm neonates in the NICU.
- Simplified booklet or CD about Yakson's therapeutic touch and its application technique should be available for nurses working in NICU

Table (1) Distribution of the Studied Groups according to Perinatal Data

Perinatal data	Groups				Test of Significance
	Study group (n=30)		Control group (n=30)		
	No.	%	No.	%	
Fetal distress					
No	16	53.3	17	56.7	X^2= 1.919 P= 0.383
Yes	11	36.7	7	23.3	
Un known	3	10.0	6	20.0	
Signs of fetal distress #	**N= 11**		**N= 7**		
Decrease fetal movement	8	72.7	4	57.1	X^2= 0.172 P= 0.678
Dysrhythmia	3	27.3	3	42.9	
Mode of delivery	**N= 30**		**N= 30**		
Normal	12	40.0	6	20.0	X^2= 2.857 P= 0.091
Cesarean section	18	60.0	24	80.0	
Apgar score at 1st minute					
4-6	28	93.3	30	100.0	X^2= 2.069 P= 0.150
7-10	2	6.7	0	0.0	
Mean ± SD	5.17±0.531		5.00±0.000		t= 2.959 P= 0.091
Apgar score at 5th minute					
4-6	0	0.0	3	10.0	X^2= 3.158 P= 0.076
7-10	30	100.0	27	90.0	
Mean ± SD	8.07±0.944		7.80±1.031		t= 1.092 P= 0.300
Resuscitative data					
Initial steps	19	63.3	14	46.7	X^2= 3.924 P= 0.141
Positive pressure vent.	11	36.7	13	43.3	
Cardiac massage	0	0.0	3	10.0	
Weeks of gestation					
32-	14	46.7	18	60.0	X^2= 1.071 P= 0.301
34-36	16	53.3	12	40.0	
Mean ± SD	33.63±1.159		33.40±1.248		t= 0.563 P= 0.456
Chronological age at the beginning of study (days)					
<10	6	20.0	8	26.7	X^2= 0.672 P= 0.715
10-	15	50.0	12	40.0	
20-30	9	30.0	10	33.3	
Mean ± SD	15.07±6.685		15.50±7.833		t= 0.053 P= 0.819

X^2= Chi Square test t= Student T test * Significant p at ≤0.05 # Multiple responses were allowed

Table (2) Distribution of the Studied Groups according to Medical Data

Medical data	Groups				Test of Significance
	Study group (n=30)		Control group (n=30)		
	No.	%	No.	%	
Final diagnosis					
R.D.S & V.L.B. W	27	90.0	28	93.3	X^2= 0.218 P= 0.640
R.D.S, V.L.B.W & Hypoglycemia	3	10.0	2	6.7	
Previous mechanical ventilation					
No	27	90.0	24	80.0	X^2= 0.624 P= 0.891
Yes	3	10.0	6	20.0	
Previous sepsis					
No	30	100.0	30	100.0	X^2= NA
Yes	0	0.0	0	0.0	
Method of feeding					
Gavage feeding	30	100.0	30	100.0	X^2= NA

X^2= Chi Square test t= Student T test * Significant p at ≤0.05 # Multiple responses were allowed
NA= not applicable

Table (3): Effect of Yakson's Therapeutic Touch on Preterm Neonates' Weight Mean Scores across the Study Phases.

Time	Study group (n=30)	Control group (n=30)	Test of Significance
	Mean ±SD	Mean ±SD	
Baseline	1502.00±167.89	1511.90±191.29	t= 0.045 P= 0.832
1st day	1502.67±167.09	1511.90±191.28	t= 0.040 P= 0.843
2nd day	1514.93±167.84	1522.50±191.07	t= 0.027 P= 0.871
3rd day	1527.63±166.76	1534.50±190.26	t= 0.022 P= 0.882
4th day	1540.33±167.85	1546.33±189.15	t= 0.017 P= 0.897
5th day	1557.13±167.99	1562.37±188.45	t= 0.013 P= 0.910
Total mean score	1528.54±167.51	1535.52±190.04	t= 0.151 P= 0.881
Test of Significance	F= 4.862 P= 0.047*	F= 0.325 P= 0.861	

t= t test F= ANOVA test t comparison between the study and control group
F comparison in the same group across the days * Significant at p ≤0.0

Table (4): The Total Morning and the Total Evening Mean Scores of Preterm Neonates' Vital Signs and Behavioral State across the Study Phases.

	Items	Study group (n=40)		Control group (n=40)		Test of Significance
		Before Intervention	After Intervention	Before routine care	After routine care	
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
Body temperature	Total Morning	37.03±0.224	37.05±0.239	36.96±0.051	36.98±0.037	t^a= 2.618 P= 0.111 t^b= 2.407 P= 0.126
	Total Evening	37.05±0.112	37.12±0.067	36.98±0.026	37.00±0.059	t^a= 13.02 P= 0.001* t^b= 50.40 P= 0.000*
Heart rate	Total Morning	144.18±4.889	141.61±4.936	149.76±3.956	154.19±3.739	t^a= 23.61 P= 0.000* t^b= 123.93 P= 0.000*
	Total Evening	142.57±5.710	139.98±5.792	150.73±4.464	155.31±3.736	t^a= 38.03 P= 0.000* t^b= 148.21 P= 0.000*
Respiratory rate	Total Morning	44.35±4.441	42.25±4.416	50.25±4.877	53.31±4.782	t^a= 24.01 P= 0.000* t^b= 86.51 P= 0.000*
	Total Evening	43.44±4.270	41.33±4.236	50.71±4.979	54.42±4.875	t^a= 36.81 P= 0.000* t^b= 25.91 P= 0.000*
Systolic BL.P	Total Morning	56.04±2.524	58.17±2.749	54.55±1.877	56.43±1.945	t^a= 6.758 P= 0.012* t^b= 8.070 P= 0.006*
	Total Evening	57.71±2.853	59.93±3.049	55.83±2.019	57.98±2.530	t^a= 8.619 P= 0.005* t^b= 7.242 P= 0.009*
Diastolic BL.P	Total Morning	30.45±1.764	31.57±2.003	29.42±1.184	30.02±1.060	t^a= 7.092 P= 0.010* t^b= 13.97 P= 0.000*
	Total Evening	31.35±1.707	32.47±1.867	29.89±0.978	30.63±1.040	t^a= 16.36 P= 0.000* t^b= 22.07 P= 0.000*
Oxygen saturation	Total Morning	96.67±1.125	98.03±1.063	96.59±1.382	95.65±1.441	t^a= 0.060 P= 0.807 t^b= 52.68 P= 0.000*
	Total Evening	97.12±1.086	98.52±0.984	96.81±1.464	95.85±1.558	t^a= 0.848 P= 0.361 t^b= 62.79 P= 0.000*
Behavioral score	Total Morning	7.673±1.488	4.280±1.115	6.240±1.404	10.17±0.686	t^a= 14.72 P= 0.000* t^b= 60.89 P= 0.000*
	Total Evening	7.546±1.696	3.866±1.094	6.546±1.971	10.41±0.897	t^a= 4.437 P= 0.040* t^b= 64.85 P= 0.000*

t= t test F= ANOVA test t^a comparison between the study and control group before intervention
t^b comparison between the study and control group after intervention * Significant at p ≤0.05

Table (5): Yakson's Therapeutic Touch Effect Size Regarding Preterm Neonates' Vital Signs, Growth Measurements and Behavioral State Mean Scores

Items	Study Group (n=30)		Mean Change	Effect size Cohen's D	Test of Significance	
	Before Intervention (Baseline)	After Intervention (5th session)				
	Mean ±SD	Mean ±SD				
Body temperature	36.90±0.119	37.21±0.094	0.31	2.98	t= 11.19	P= 0.000*
Heart rate	149.27±6.991	133.73±5.119	-15.54	2.54	t= 9.823	P= 0.000*
Respiratory rate	48.50±4.470	36.70±4.364	-11.80	2.67	t= 10.34	P= 0.000*
Systolic BP	49.13±1.776	69.17±4.202	20.04	6.21	t= 24.06	P= 0.000*
Diastolic BP	26.70±2.003	36.03±2.297	9.33	4.33	t= 16.76	P= 0.000*
O_2 saturation	94.70±1.664	99.63±0.615	4.93	4.33	t= 15.22	P= 0.000*
Weight	1502.00±167.89	1557.13±167.99	55.13	0.33	t= 1.271	P= 0.209
Length	40.50±1.603	41.97±1.742	1.47	0.88	t= 3.401	P= 0.001*
Head circum.	29.68±1.310	31.15±1.481	1.47	1.02	t= 4.072	P= 0.000*
Chest circum.	27.27±1.158	28.62±1.237	1.35	1.13	t= 4.364	P= 0.000*
Mid arm circum.	6.85±0.658	7.87±0.681	1.02	1.52	t= 5.899	P= 0.000*
ABSS	8.57±2.239	2.30±1.055	-6.27	3.58	t= 13.87	P= 0.000*

Effect size 0.0-0.2 Small effect 0.3 -0.7 Medium effect 0.8-1.2 Large effect ≥ 1.3 Very large effect **T = Paired t test** * Significant p at ≤0.05

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