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Effect of Yakson Touch Technique on Selected Health Outcomes among Preterm Neonates in the Neonatal Intensive Care Units

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Abstract: Background: Multiple sources of stress can affect premature neonates hospitalized in the NICU. Therapeutic touch is thought to be a beneficial strategy to reduce stress in newborns. **Purpose:** To evaluate the effect of Yakson touch technique on selected health outcomes among preterm neonates in the NICUs. **Design:** A quasi-experimental two-group (study and control) pre and post-test design was used. **Setting:** NICUs at Shebin El-Koom Teaching Hospital and El Gamea El Sharea for neonates at Shebin El-Koom city, Menoufia Governorate, Egypt. **Sampling:** A purposive sample of 60 preterm neonates. Instruments: Three instruments were utilized (preterm neonate's baseline data assessment sheet, preterm neonates' physiological and physical measurements record and Anderson behavioral state scale (ABSS)). **Results**: There was a significant improvement in mean scores of preterm neonates' vital signs and oxygen saturation in the study group after intervention than on pre intervention in all study days. There was a significant increase in mean scores of preterm neonates' weight in the study group in the last day of intervention than on the 1st day (1599.00 ± 133.94 vs 1464.83 ± 89.48 respectively). Also, mean scores of preterm neonates' behavioral state in the study group decreased after intervention compared to pre intervention in all study days. Furthermore, duration of hospitalization of preterm neonates in the study group was less than duration of hospitalization of neonates in the control group (12.90 ± 6.18 &17.96 ± 9.48 respectively). **Conclusion:** Yakson therapeutic touch significantly positively affected the stability of the preterm neonates' vital signs, the improvement of their weight, and the reduction of their behavioral state score and duration of hospitalization while they are being cared for in the NICU. **Recommendation**: All NICU nurses should receive training on Yakson therapeutic touch modality in order to integrate it into the NICU's care of preterm neonates.

Keywords: *Health Outcomes, Preterm Neonate, Yakson Touch Technique*

Introduction

Preterm birth is the major contributing factor to neonatal mortality within the first month following birth globally. It affects 15 million infants annually globally (over one in ten infants) (Acharya et al., 2021). Complications associated with prematurity are the main direct cause of newborn mortality, representing 3.1 million deaths annually and 35% of all deaths internationally. Moreover, it is the second major cause of mortality following pneumonia among children under 5 years old worldwide (Blencowe et al., 2020). Preterm neonates are much more likely to experience difficulties and complications because their body organs would not have as much time to develop in the womb. Extremely premature infants are more likely to suffer specific health problems. About 16 % of neonatal mortality were attributable to premature birth & low birth weight, neonates who survive may have brain hemorrhage, digestive (intestinal) troubles & respiratory difficulties. Long-term outcomes may involve developmental delays (not meeting age-appropriate developmental milestones) and poor academic attainment (National Center for Chronic Disease Prevention and Health Promotion, 2022).

When neonates are admitted to the neonatal intensive care units (NICU), they are separated from their mothers and subjected to unpleasant stimuli such as lights, sounds, therapeutic & invasive diagnostic procedures. The sensory impact of the NICU causes harm to the neuro-developmental outcomes of premature newborns (Mohamed, et al., 2018). So, attempting to find a new approach to alleviate stress for preterm neonates in NICU is a crucial topic in the nursing care field. Neonatal nurses are in a unique position to promote the health & normal growth of premature neonates by maintaining a positive neuro-developmental atmosphere. They should provide human contact and touch for premature neonates' in order to achieve appropriate growth and development (Dussi & Ferrari, 2021).

Touch is one of the most advanced senses utilized by medical practitioners to comfort preterm newborns, and it is crucial for their proper development & growth (Adamson-Macedo., 2020). Yakson touch is a noninvasive therapeutic approach that does not need specialized technology or equipment; it can be combined effectively with conventional therapy to reduce treatment expenses and adverse effects. Besides that, it affords nurses the opportunity to contact directly with premature neonates' particularly while providing neonatal care (Parashar et al., 2019). Yakson touch for premature neonates enhances the developmental and physical outcomes, involving neuro-motor and neurologic development promotion, reduced stress behavior, weight gain associated with shorter hospital stays, infant-parent attachment enhancement, sleep improvement, and decreased rates of nosocomial infection & mortality. Therefore, it has been advocated as a means of promoting the neonatal growth and development by stimulation of immunity, digestion, blood flow and heart rate. Also, it is useful in reducing complications and deficits associated with premature birth (Eshghi et al., 2015; Field et al., 2020 & Parhi et al., 2021).

Yakson therapeutic touch affords nurses the opportunity to contact directly with premature neonates' particularly while providing neonatal care. Besides that, Yakson touch is a

noninvasive therapeutic approach that does not need specialized technology or equipment; it can be combined effectively with conventional therapy to reduce treatment expenses and adverse effects (Parashar & Samuel., 2018). For these reasons, nurses working in NICUs must apply this magic approach and integrate it in the daily nursing care of the medically stable preterm neonates. So, the current research aims to examine the effect of Yakson touch technique on selected health outcomes of preterm neonates in NICUs.

Significance of the study

According to WHO, an estimated 15 million preterm neonates are delivered annually at a rate ranging from 5 - 18 % newborns (WHO, 2018). In Egypt, 12 - 15.8 % of live neonates had a low birth weight and nearly 1/3 were born prematurely (Hassanein, 2019). Besides that, 8100 neonates died from complications of preterm birth (Blencowe et al., 2020). Admission to the NICU predispose premature neonates to an intense sense of parental separation and a variety of uncomfortable procedures and almost 80% of them do not receive any form of calming and relaxing techniques (Hatfield et al., 2019). Yakson touch technique is one of the simplest and most affordable non-pharmaceutical approaches to help premature neonates adapt to extra-uterine stressors (Gomes Neto et al., 2020). Consequently, this research aimed to assess the effect of Yakson touch technique on selected preterm neonate's health outcomes in NICUs.

Definition of variables

Preterm neonates

A newborn who is born alive prior to 37 wks. of gestational age (WHO, 2018). In the context of this research, it is defined as an infant born between 33 - 37 wks. of gestation.

Yakson therapeutic touch

Yakson is a Korean therapeutic touch administered to infants & neonates by rubbing their belly with a hand while placing the other on their back to relieve discomfort or relax them. (Alinejad-Naeini et al., 2022). While in this research, is defined as an effective, simple and safe non-medical approach that the researcher can provide to preterm neonates by using warmed hands, then approaching the infant from behind and placing the left hand under the neonate's back. Next, the right hand was placed on top of the newborn's abdomen and massaged in a clockwise movement, roughly 1 cm in diameter every 10s, with the goal of calming the newborn and resulting in a physically relaxed and emotionally stable state.

Selected health outcomes of preterm neonates

Selected health outcomes of preterm neonates in this study were defined as the preterm neonates' vital signs (temperature, heart rate and respiratory rate), oxygen saturation, weight, behavioral state and duration of hospitalization in the NICU. It will be assessed using instruments II and III.

Purpose

To evaluate the effect of Yakson touch technique on selected health outcomes of preterm neonates in the neonatal intensive care units.

Hypothesis

1) Preterm neonates who receive Yakson therapeutic touch technique are expected to gain more weight than those who receive only routine hospital care.

2) Preterm neonates who receive Yakson therapeutic touch technique are expected to have more physiological stability (temperature, heart rate, respiratory rate and oxygen saturation) than those who receive only routine hospital care.

3) Preterm neonates who receive Yakson therapeutic touch technique are expected to have fewer behavioral problems than those who receive only routine hospital care.

4) Preterm neonates who receive Yakson therapeutic touch are expected to have shorter length of hospitalization than those who receive only routine hospital care.

Methods

Research design

A quasi-experimental two-group pre-test and post-test design was employed in the research.

Setting

This research was performed at NICUs in Shebin El-Koom Teaching Hospital and El Gamea El Sharea for neonates at Shebin El-Koom city, Menoufia Governorate, Egypt. In Shebin El Kom Teaching Hospital, the NICU was divided into 3 rooms on the 3rd floor, each housing 8 incubators. Two of these rooms are reserved for stable preterm neonates and neonates with hyperbilirubinemia. The other one for neonates with other diagnoses. In El Gamea El Sharea hospital, the NICU involved 4 rooms in the 1st floor. The first 3 rooms featured 6 incubators for all newborns, whereas the 4th room contained 5 incubators for newborns with hyperbilirubinemia. This hospital's one of the most significant educational facilities in Menoufia, serves as the primary teaching facility.

Sampling

From the previously indicated settings, a purposive sample of 60 preterm newborns was selected according to the following inclusion & exclusion criteria:

Inclusion criteria

- Gestational age (GA) ranged from 32 - 37 wks.
- The newborns were medically stable and had birth weights > 1000 grams.
- For physiological stability, postnatal age was > 7 days.

Exclusion criteria

- Preterms with any congenital defects, congenital infections, CNS disorders.
- Preterm neonates connected to mechanical ventilator or medically unstable.

Sample size

The sample size was obtained statistically by counting the number of preterm neonates admitted to NICUs at the above mentioned facilities. Estimation approach for subjects (G power Program, Power= 80% Alpha error=5%, Medium effect size =0.4, the minimum required sample size=52). The sample was randomly assigned into two groups: -

- The control group: - received only routine hospital care (n=30).
- The study group: - received the Yakson therapeutic touch along with routine hospital care (n=30).

Instruments

To accomplish the research's goal, data were collected using three different instruments as follows:

Instrument I: Preterm neonate's baseline data assessment sheet.

The researcher designed this instrument after pertinent literature evaluation (Farag et al., 2022). It

composed of two parts to assess the baseline data of the preterm neonates as the following:

- **Part A:** Characteristics of preterm neonates. It contained data about sex, gestational age/ weeks, post-natal age/ days, mode of delivery, presence of fetal distress and Apgar score at 1st and 5th minutes.
- **Part B:** Medical data of preterm neonates. This part contained information about admission diagnosis, history of previous sepsis, type of feeding and length of stay in NICU.

Instrument II: Preterm neonates' physiological and physical measurements record:

The researcher developed this instrument after evaluating the pertinent literature (Dur et al., 2020; Parashar & Samuel., 2018). It involved 2 parts:

- **Part A:** Preterm neonate's physiological measurements. It involved measuring of preterm vital sings (temperature, heart rate, respiratory rate) and oxygen saturation from day one to last day of intervention.
- **Part B:** Preterm neonate's physical measurement. It involved measuring of preterm neonates' weight on the 1st and last day of intervention.

Instruments III: Anderson behavioral state scale (ABSS).

A standardized instrument adopted from Anderson (1994), to assess the preterm neonate's behavioral condition depending on evaluation opening or closure of the eyes, trunk and limb activity, the crying intensity& respiratory regularity. This scale measures 12 preterm neonate's behavioral states as following: 12; hard crying, 11; crying, 10; fussing, 9; very active awake, 8; active awake, 7; quiet awake, 6; alert inactivity, 5; drowsy, 4; very active sleep, 3; active sleep, 2; irregular quiet sleep & 1; regular quiet sleep. Scores between 1 and 5 suggest that the preterm neonate is sleeping. Scores between 6 and 8 suggest that the preterm neonate is awake and calm. Scores between 9 and 12 suggest that the preterm neonate is in a state of restless activity or fussiness.

Validity

An expert team of 2 professors of pediatrics and three professors of pediatric nursing examined the data gathering tools. In response to their insightful remarks, changes were made, such as changing the meaning of a few terms to give the phrase's unclear meaning its most suitable interpretation.

Reliability

Reliability of the three instruments was tested using Cronbach Co efficiency Alpha. The estimated reliability of instruments one, two, and three was 0.89, 0.97, and 0.96 consequently.

Pilot study

For the instruments' consistency, clarity, applicability, usability & practicability assessment as well as determination of how long it will take to complete, a pilot study was performed on 10% of the entire sample, consisting of 6 preterm neonates, after the instruments were developed and before data collection began. No essential adjustments were made. Consequently, the pilot study was involved in the entire sample.

Ethical considerations

The Scientific Research and Ethical Research Committee of the Faculty of Nursing, Menoufia University granted ethical approval for the research. The study was voluntary, innocuous, and

anonymous, and respondents' confidentiality was honored. All parents had the right to withhold consent for their preterm neonates to participate in the trial and to withdraw at any time. Personal data anonymity was ensured by encoding all data and storing it in a locked cabinet. Before enrolling their preterm neonates in the study, the parents' written consent was obtained for the protection of their human rights, after they were reported about the research nature & objectives.

Procedure

Prior to data collection, written permission to conduct the study was obtained from the head of NICUs by submitting an official letter from the Dean of the Faculty of Nursing at Menoufia University describing the goal of the study and data collection procedures. First, meetings with unit managers were organized to request permission to conduct the research and to describe its objectives and anticipated outcomes. This study's data collection spanned five months, from November 2022 to the end of March 2023, between morning and evening shifts on successive 5 days. The study participants were assigned into study and control groups as illustrated in figure 1.

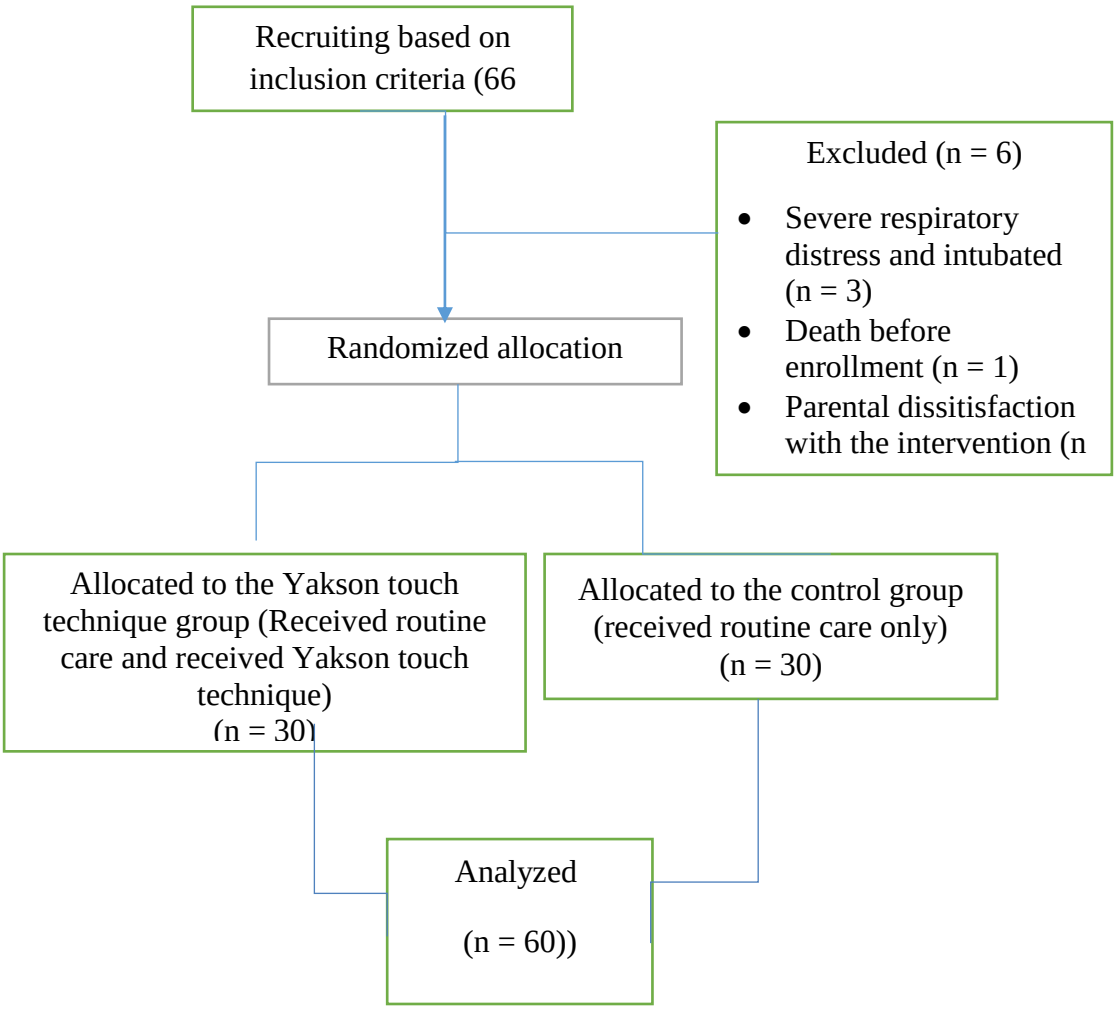


Figure 1. Assignment of participants into study and control groups

For the study group, Yakson therapeutic touch was applied in three phases: **Assessment phase:** after sample selection, the characteristics of preterm newborns were extracted from their medical records and then recorded using instrument I for both groups. In the first day, as a baseline, the researches monitored and documented vital signs and oxygen saturation of all preterm neonates in both groups by using instrument II part A. Their behavioral state was observed and scored by using instrument III. Their weight assessed and documented by using instrument II (part B).

Implementation phase for the study group: the researcher applied Yakson therapeutic touch for 15 min twice daily for 5 consecutive days, during the morning and evening shifts. Before and after Yakson therapeutic touch application, the researcher examined and documented preterm neonates' vital signs & behavioral state score for 2 min. It was applied as follows: Universal precautions were followed to preserve sterile conditions. The researcher carefully scrubbed her hands and arms with antiseptic solution for three minutes then wore a sterile gown. A radiant warmer or rubbing technique was used to warm both hands. The researcher relaxed her shoulders and arms for one minute while inhaling deeply. While the preterm neonates were lying supine, the researcher applied Yakson touch to them. Yakson touch lasted for 15 min: five minutes for hand resting, five minutes for gentle caressing, and repeated five minutes for hand resting again. The researcher kept regular close contact with the preterm while administering the Yakson touch with their palms and all of their fingers, but only to the degree in which the preterm neonates felt no pressure.

To perform hand resting (5 min), the researcher approached the preterm neonates from behind and placed left hand under their back to support it. Then, right hand was placed on their chest and belly. At that time, the researcher maintained a relaxed condition by breathing slowly. Gentle caressing (5 min): The researcher repeatedly caressed and rested in the same hand position for five minutes: caressing (1 min), resting (30 s), caressing (1 min), resting (30 s), and caressing (2 min). Every 5s, the researcher caressed the infant's chest and belly as if drawing a clockwise circle approximately 1 cm in diameter. Hand resting (5 min). The researcher utilized the same hand-resting technique described earlier.

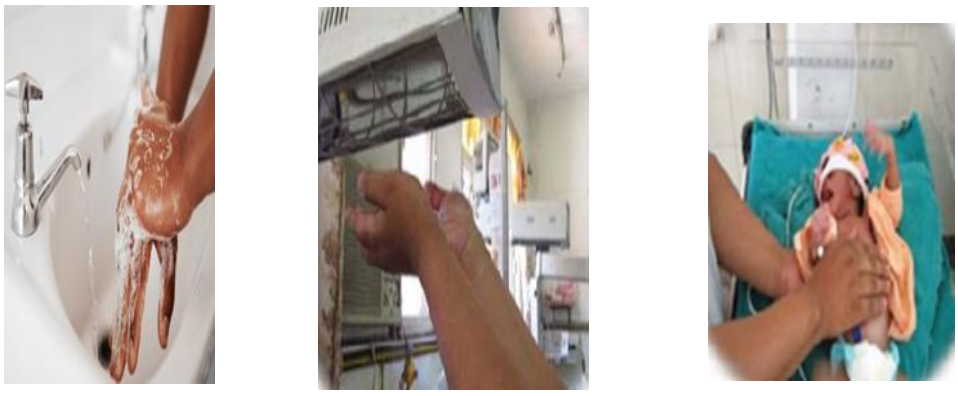


Figure 2. Application of Yakson's touch technique by the researcher

For the control group, the researcher examined vital signs & a behavioral state score 2 min before and 2 min after administering basic nursing care, during the morning and evening shifts. This was carried out twice daily for 5 consecutive days.

Reassessment phase: - the researchers reassessed and documented preterm neonates' weight in both groups in the last day of the study. In addition, length of hospitalization was assessed and recorded at discharge to assess the intervention effect & to compare between the 2 groups.

Statistical analysis

SPSS (Statistical Package for Social Science) version 22 was used for data entry and analysis. Excel program was used for designing figures. For comparisons between the qualitative data supplied as numbers and percentages, chi-square test was used. Mean and standard deviation were used for quantitative data. The data was analyzed using the student t-test to compare means. If the P-value is less than 0.05, the result is considered significant.

Results

Table 1 clarified that half of preterm neonates in the study group were between 34-35 weeks of gestation while more than two thirds (63.3%) in the control group were between 32-33 weeks. In terms of post-natal age, more than half (53.3%) in the study group and less than half (46.7%) in the control group were between 7-14 days. 66.7% of preterm neonates in the study group and 73.3% in the control group were delivered by cesarean section. More than half (56.7%) in the study group and 80% in the control group didn't experience fetal distress. Preterm neonates' characteristics were comparable between both groups.

Figure 3 demonstrated that more than two thirds (66.7%) of preterm neonates in the study group and half in the control group were girls.

Table 2 indicated that majority of preterm neonates (93.3%) in the study and control groups didn't have sepsis. Less than half (43.3%) in the study group and more than half (56.7%) in the control group received formula feeding. Medical data were comparable between both groups.

Figure 4 illustrated that less than half (46.7%) of preterm neonates in the study group had RDS and 40% in the control group had LBW.

Table 3 illustrated that there was an improvement in preterm neonates' temperature in the study group compared to control group post intervention. Also, preterm neonates in the study group had lower mean heart rates on the 5th day compared to the 1st day of intervention (139.06 ± 4.51 vs 149.83 ± 5.47 respectively). They had lower mean respiratory rates compared to control group in all study days post intervention. Moreover, preterm infants in the study group had lower means of respiratory rates on the 5th day compared to the 1st day of intervention (41.93 ± 1.70 vs 49.56 ± 3.87 respectively). They had lower mean respiratory rates compared to control group in all study days post intervention For this reason, there were highly statistical significant differences between preterm neonates' vital signs in the study and control groups across the days at 1% level of statistical significance.

Table 4 clarified that preterm neonates in the study group had higher means of oxygen saturation on the 5th day compared to the 1st day of intervention (98.66 ± .54 vs 94.73 ± 1.14 respectively). Also, study group

showed high mean of oxygen saturation compared to control group in all study days post intervention. On the other hand, preterm neonates in the control group had lower means of oxygen saturation in almost all days after routine care. So, there were highly statistical significant differences between the two groups at 1% level of statistical significance.

Table 5 clarified that mean weights of preterm neonates were 1520.43 ± 60.81 on the last day of intervention compared to 1515.23 ± 67.71on the 1st day in the control group. So, there were no statistical significant differences at 5% level of statistical significance between pre and post intervention in the control group regarding weight. While in the study group, mean weights of preterm neonates were 1599.00 ± 133.94 on the last day of intervention compared to 1464.83 ± 89.48 on the 1st day. Therefore, there were highly statistical significant differences at 1% level of statistical significance between the 1st and last day of intervention in the study group regarding weight. Also, there were statistically significant differences between the study and control groups on the 1st and last day of intervention at 1% level of statistical significance.

Table 6 represented decrease in mean scores of behavioral state in the study group on the last day after intervention than on the 1st day (2.76 ± 1.94 vs 9.93 ± 2.24 respectively). Therefore, there were highly statistical significant differences at 1% level of statistical significance between the 1st and last day of intervention in the study group regarding the behavioral state. On the other hand, there was increase in total mean scores of behavioral state on the last day than on the 1st day (9.96 ± 2.32 vs 8.36 ± 2.56 respectively) in the control group. Therefore, there were highly statistical significant differences at 1% level of statistical significance between the 1st and last day of routine care in the control group regarding the behavioral state. Also, there were statistically significant differences between the study and control groups on the 1st and last day of intervention at 1% level of statistical significance.

Figure 5 illustrated that there was a significant improvement in the behavioral state (sleeping) and significant reduction in restlessness of the preterm neonates in the study group after the intervention compared to pre intervention. While preterm neonates in the control group became more restless after routine care.

Table 7 showed that duration of hospitalization of preterm neonates in the study group (12.90 ± 6.18) was less than duration of hospitalization of neonates in the control group (17.96 ± 9.48). Therefore, there was statistical significant difference between neonates in the study and control groups ($P \leq 0.05$).

Table (1): - Characteristics of studied preterm neonates in the study and control groups.

Items	Study group (n=30)		Control group (n=30)		X^2	P- value
	No.	%	No.	%		
Gestational age/ weeks						
32-33	12	40.0%	19	63.3%	3.28 ns	.194
34 -35	15	50.0%	9	30.0%		
36 - <37	3	10.0%	2	6.7%		
Post-natal age/ days						
7-14	16	53.3%	14	46.7%	1.46 ns	.480
15-21	10	33.3%	14	46.7%		
22-28	4	13.3%	2	6.7%		
Mode of delivery						
Vaginal	10	33.3%	8	26.7%	.31 ns	.573
Cesarean section	20	66.7%	22	73.3%		
Fetal distress						
Yes	13	43.3%	6	20.0%	3.77 ns	.052
No	17	56.7%	24	80.0%		
Apgar score at 1st minute						
>4	5	16.7%	3	10.0%	3.19 ns	.202
4-6	20	66.7%	16	53.3%		
7-10	5	16.7%	11	36.7%		
Apgar score at 5 minute						
>4	1	3.3%	0	0.0%	2.69 ns	.259
4-6	9	30.0%	5	16.7%		
7-10	20	66.7%	25	83.3%		

Note: (ns): not significant (p>0.05)

Figure (3): - Distribution of preterm neonates according to their sex in the study and control groups.

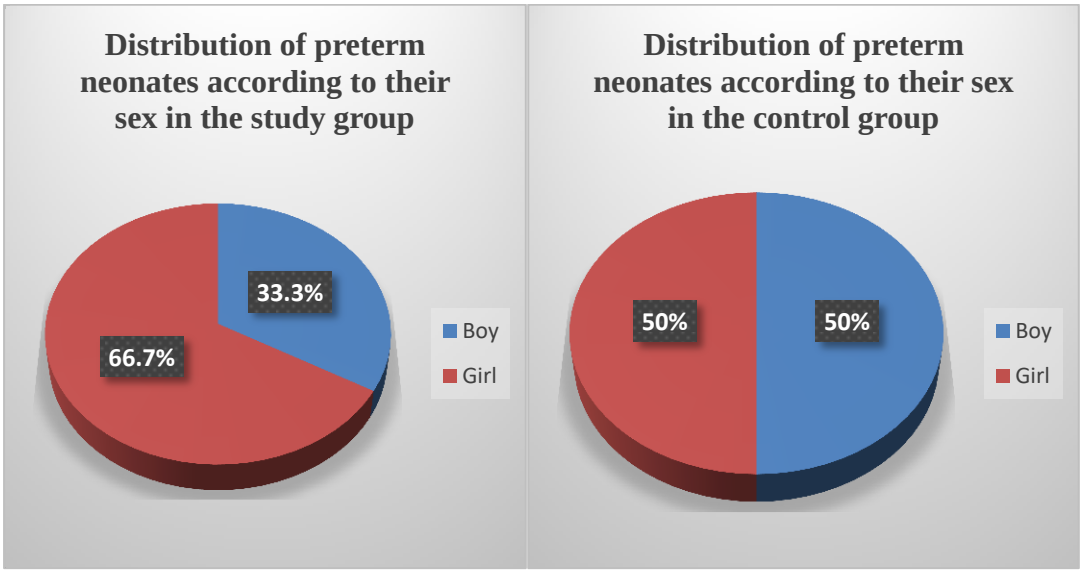
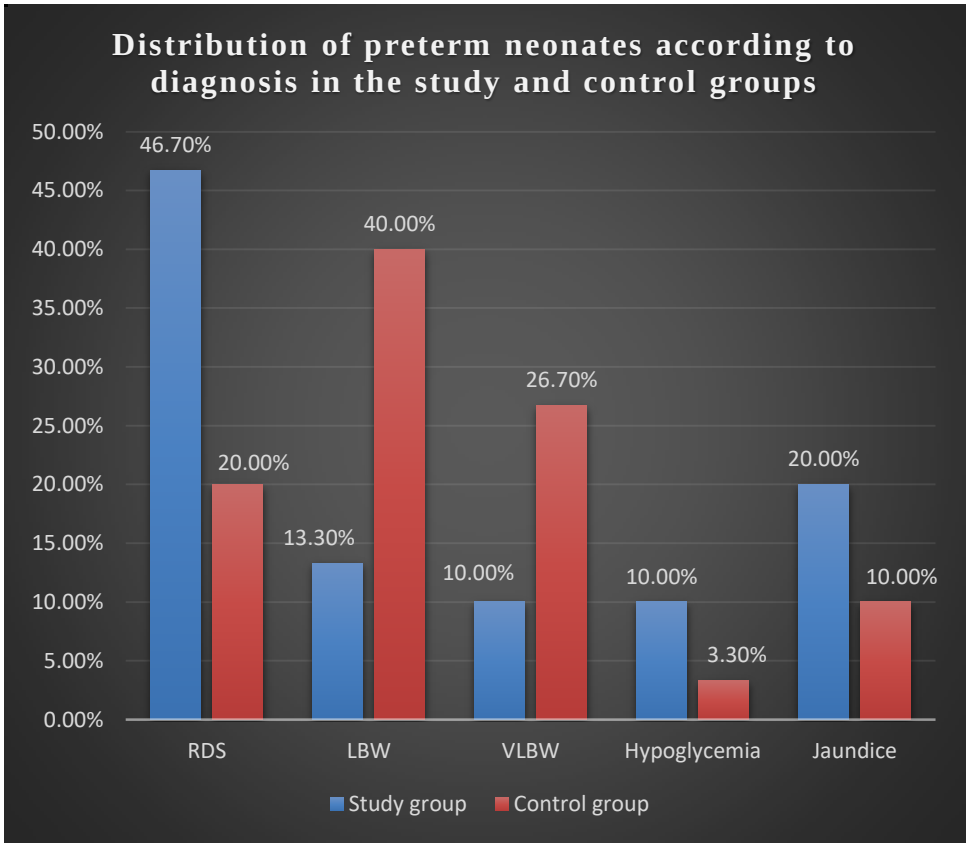


Table (2): - Distribution of studied neonates according to their medical data in the study and control groups.

Medical data	Study group (n=30)		Control group (n=30)		X^2	P- value
	No.	%	No.	%		
Previous sepsis						
Yes	2	6.7%	2	6.7%	.00 ns	1.000
No	28	93.3%	28	93.3%		
Type of feeding						
Expressed breast milk	4	13.3%	5	16.7%	2.44 ns	.485
Formula	13	43.3%	17	56.7%		
Mixed (Expressed breast milk and formula)	1	3.3%	0	0.0%		
Gavage	12	40.0%	8	26.7%		

Note: (ns): not significant (p>0.05)

Figure (4): - Distribution of preterm neonates according to diagnosis in the study and control groups.



N.B: RDS, respiratory distress syndrome; LBW, low birth weight; VLBW, very low birth weight

Table (3): - Mean scores of preterm neonates' vital signs (temperature, heart rate, respiratory rate) in the study and control groups on pre and post intervention across the study days.

Vital signs	Study group (n=30)		Control group (n=30)		Independent t test (P-value)
	Before intervention	After intervention	Before routine care	After routine care	
Temperature					
1st day	36.49 ± 0.46	36.96 ± 0.31	36.13 ± 0.26	37.57 ± 7.27	t =-.464 ns P=.644
Paired t test (P- value)	-4.558 HS (.000)		-1.091 ns (.280)		
3rd day	36.31 ± 0.48	37.04 ± 0.03	36.07 ± 0.17	36.08 ± 0.17	t = 29.653 HS P= .000
Paired t test (P- value)	-8.174 HS (.000)		-.197 ns (.845)		
5th day	36.26 ± 0.37	37.04 ± 0.02	36.34 ± 0.69	36.28 ± 0.49	t = 8.422 HS P= .000
Paired t test (P- value)	-11.329 HS (.000)		.376 ns (.708)		
Heart rate					
1st day	149.83 ± 5.47	149.83 ± 5.47	145.93 ± 3.12	146.23 ± 2.95	**t** = 3.171 S **P**=.002
Paired t test (P- value)	.000 ns (1.000)		-.382 ns (.704)		
3rd day	150.40 ± 5.16	137.96 ± 3.89	146.00 ± 4.00	146.26 ± 3.89	**t** = -8.249 HS **P**=.000
Paired t test (P- value)	10.525 HS (.000)		-.261 ns (.795)		
5th day	149.466 ± 4.16	139.06 ± 4.51	148.13 ± 3.94	148.63 ± 3.47	**t** =-9.199 HS **P**=.000
Paired t test (P- value)	9.277 HS (.000)		-.521 ns (.605)		
Respiratory rate					
1st day	49.56 ± 3.87	41.96 ± 1.82	53.03 ± 2.73	53.53 ± 2.86	**t** = -18.656 HS **P**=.000
Paired t test (P- value)	9.716 HS (.000)		-.692 ns (.492)		
3rd day	48.40 ± 4.58	41.80 ±1.51	51.13 ± 2.95	51.86 ± 2.34	**t** =-19.739 HS **P**=.000
Paired t test (P- value)	7.487 HS (.000)		-1.064 ns (.292)		
5th day	48.66 ± 4.07	41.93 ± 1.70	49.76 ± 2.97	50.80 ± 2.56	**t** = -15.780 HS **P**=.000
Paired t test (P- value)	8.359 HS (.000)		-1.440 ns (.155)		

Note: (HS): High significant (P<.001) S: Significant (P <0.05) ns: not significant (P>0.05)

t comparison between the study and control group after intervention

Table (4): - Mean oxygen saturation of preterm neonates in the study and control groups on pre and post intervention across the study days.

Time	Study group (n=30)		Control group (n=30)		Independent t test (P-value)
	Before intervention	After intervention	Before routine care	After routine care	
1st day	94.73 ± 1.14	98.06 ± 0 .73	94.83 ± 0.83	95.53 ± 0.73	t^a= -.387 ^{ns} P=.700 t^b= 13.349 ^{HS} P=.000
Paired t test (P- value)	-13.413 ^{HS} (.000)		-3.459 ^{S} (.001)		
2nd day	95.16 ± 0.64	97.56 ± 0.62	95.10 ± 0 .75	95.40 ± 0.49	t^a= .366 ^{ns} P=.716 t^b= 14.831 ^{HS} P=.000
Paired t test (P- value)	-14.592 ^{HS} (.000)		-1.810 ^{ns} (.075)		
3rd day	94.90 ± 0 .66	97.63 ± 0.66	94.43 ± 1.04	94.96 ± 0.61	t^a= 2.074 ^{S} P=.043 t^b=16.078 ^{HS} P=.000
Paired t test (P- value)	-15.914 ^{HS} (.000)		-2.418 ^{S} (.019)		
4th day	95.60 ± 0.563	97.96 ± 0 .80	90.10 ± 12.42	95.50 ± 0 .73	t^a=4.412 ^{HS} P=.000 t^b= 12.393 ^{HS} P=.000
Paired t test (P- value)	-13.153 ^{HS} (.000)		-3.333 ^{S} (.002)		
5th day	95.53 ± 0.57	98.66 ± 0.54	94.30 ± 0.65	95.26 ± 0.63	t^a= 7.797 ^{HS} P=.000 t^b= 22.131 ^{HS} P=.000
Paired t test (P- value)	-21.703 ^{HS} (.000)		-5.800 ^{HS} (.000)		

Note: (HS): High significant (P <.001) S: Significant (P <0.05) ^{ns}: not significant (P >0.05)

t^a comparison between the study and control group before intervention

t^b comparison between the study and control group after intervention

Table (5): - Mean weights of preterm neonates in the study and control groups on the first and last day of intervention.

Weight (M ± SD)	Study group	Control group	Independent t- test	P-value
Weight				
1st day	1464.83 ± 89.48	1515.23 ± 67.71	-2.460 ^{S}	.017
Last day	1599.00 ± 133.94	1520.43 ± 60.81	2.925 ^{S}	.005
Paired t- test	-4.562 ^{HS}	-.313 ^{ns}		
P-value	.000	.755		

Note: (HS): High significant (P<.001) S: Significant (P <0.05) ^{ns}: not significant (P>0.05)

Table (6): - Mean behavioral state of preterm neonates in study and control groups before and after the intervention of 5 days.

Time	Study group		Control group		Test of significance
	Before intervention	After intervention	Before routine care	After routine care	
1st day	9.93 ± 0.24	3.83 ± 0.29	8.36 ± 0.56	10.26 ± 0.96	t^a= 2.518 S P=.015 t^b= -11.678 HS P=.000
Paired t test (P- value)	10.422 HS (.000)		-3.220 S (.002)		
2nd day	11.26 ± 0.69	3.33 ± 0.12	8.76 ± 0.40	10.30 ± 0.84	t^a= 5.477 HS P=.000 t^b= -13.580 HS P=.000
Paired t test (P- value)	19.464 HS (.000)		-2.775 ns (.007)		
3rd day	11.00 ± 0.74	3.10 ± 0.21	8.60 ± 0.31	9.43 ± 0.41	t^a= 5.410 HS P=.000 t^b= -10.575 HS P=.000
Paired t test (P- value)	18.497 HS (.000)		-1.364 ns (.178)		
4th day	6.36 ± 0.07	3.00 ± 0.13	8.20 ± 0.45	9.20 ± 0.55	t^a= -3.123 S P=.003 t^b= -10.210 HS P=.000
Paired t test (P- value)	6.195 HS (.000)		-1.547 ns (.127)		
5th day	8.10 ± 0.42	2.76 ± 0.94	7.76 ± 0.63	9.96 ± 0.32	t^a= .510 ns P=.612 t^b= -13.013 HS P=.000
Paired t test (P- value)	9.400 HS (.000)		-3.428 S (.001)		

Note: (HS): High significant (P <.001) S: Significant (P <0.05) ns: not significant (P >0.05)

t^a comparison between the study and control group before intervention

t^b comparison between the study and control group after intervention

Figure (5): Level of preterm neonates' behavioral state in the study and control groups on pre and post intervention of 5 days.

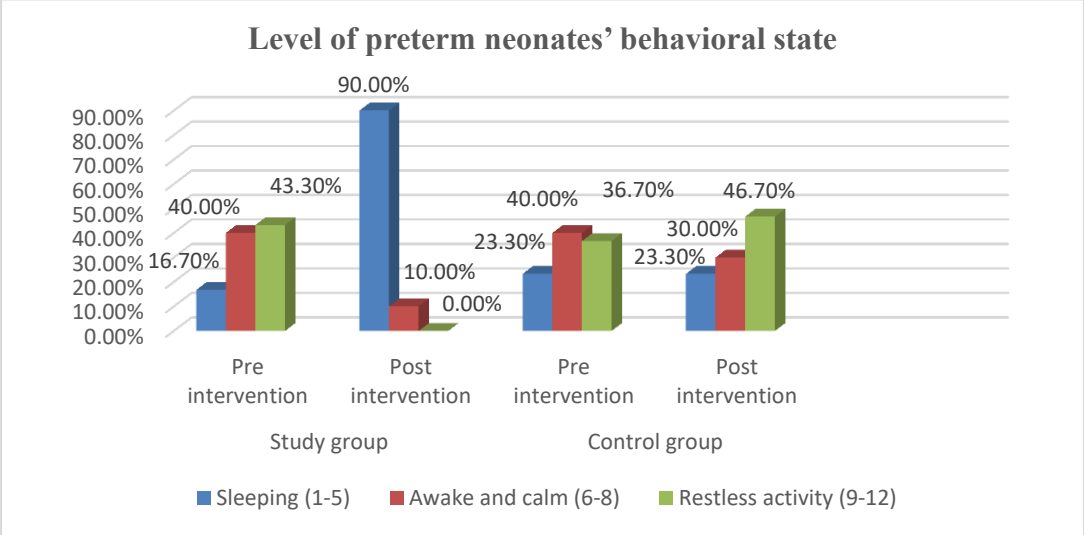


Table (7): - Duration of hospitalization of preterm neonates in the study and control groups.

Duration of hospitalization	Study group	Control group	t- test	P-value
Mean ± SD	12.90 ± 0.18	17.96 ± 1.48	-2.450 S	.017

Note: (S): Significant (P <0.05)

Discussion

Touch plays a crucial part in the growth and development of preterm infants. As a result, therapeutic touch has gained recognition as a significant complementary therapy. Yakson touch has been shown to be a stress-relieving or pain-relieving therapy for newborns (Can & Kaya, 2022 & Efe et al., 2022). Therapeutic touch is said to have a number of immediate advantages in medically sound, developing preterm children, including increased weight gain, a shorter hospital stay, a lower incidence of problems, etc. (Hernandez-Reif et al., 2017; Field & Schanberg, 2018). Unfortunately, very few research have looked into how premature infants respond to Yakson therapeutic touch. Therefore, it was necessary to research how Yakson therapeutic touch affected the preterm newborns' growth measurements, vital signs, & behavioral status.

In relation to hypothesis one; the present research clarified that preterm neonates in the study group had higher means of temperature post intervention. It was probably because they were receiving heat from the researcher's hands, or perhaps it was because Yakson touch helped the nervous system to regulate temperature. They also had lower means of heart rate post intervention. This might be explained by the fact that Yakson touch enhances the autonomic nervous system's response and lowers stress hormones like cortisol and adrenaline, which lowers heart rate. Furthermore, they had lower means of respiratory rate post intervention. This could be related to Yakson touch 's beneficial effect on physiological indicators that regulate respiratory rate. In addition, they had higher means of oxygen saturation post intervention. This could be linked to the fact that Yakson touch is a type of sensory stimulation that increases blood flow to the bodily tissues and brain, hence improving oxygen saturation.

Similarly, Farag et al., (2022) discovered that in the study group, following the intervention, preterm neonates' mean total morning & total evening respiratory & heart rates decreased, but their temperatures & oxygen saturation increased. In the same context, a study by Parhi et al., (2021) found that the Yakson touch technique, when used with routine care, had a significant impact on stabilizing vitals (heart rate, respiratory rate and oxygen saturation) than the other group who received only basic care. On contrary, Im, H., (2006) did a quasi-experimental investigation on the impact of Yakson vs. GHT therapy on preterm neonates' physical response, growth and bonding to their mothers. The results showed that oxygen

saturation or maternal bonding were insignificantly different between the studied groups. According to the researcher, this might be due to use of a small sample size in the study. Also, the Yakson touch technique was utilized only once per day.

In relation to hypothesis two; the recent study's findings made clear that in the study group after intervention, there was a substantial increase in mean scores of preterm neonates' weight compared to pre intervention. This could be connected to the Yakson touch, which may stimulate vagal activity, cause the release of digestive hormones, increase stomach movement and ultimately cause weight gain. Also, before and after the intervention, there were significant differences between the study group and the control group ($p < 0.05$). This was consistent with Im, H., (2006) who discovered that when Yakson therapy was given to preterm neonates, Yakson group had significantly increased weight than the gentle human touch (GHT) group. This outcome was consistent with a study by Farag et al. (2022). According to their findings, the study group's weight increased over the course of the study ($p=0.047$), and this growth was somewhat higher than that of the control group. Additionally, Can & Kaya, (2022) concluded that the Yakson & GHT practices performed on preterm neonates by their moms improved mother-child bonding and aided infant weight gain.

On the other hand, a clinical trial study conducted by Mahdieh et al., (2021) on 64 preterm neonates admitted to NICU. The preterm neonates's weight was recorded 5 days later by 3 control nurses. Prior to the intervention, the weights of the control group did not differ significantly according to an independent t-test ($P = 3.6$). After the intervention, there was no detectable change in the newborn weight between the experimental and control groups at any of the examined times ($P = 3.29$). This could be a result of delayed measurement (5 days after intervention). At this time, premature newborns could experience issues that affected their weight.

In relation to hypothesis three; the current research study showed that across all study phases, in the study group, the mean behavioral state scores of preterm neonates were reduced after intervention than on pre intervention. While in the control group, preterm newborns' behavioral state mean scores were increased following usual care. This might be related to the good benefits of Yakson touch on enhancing sleep status as well as soothing and relaxing behavior in preterm neonates in the study group. This outcome was consistent with a study done by Bahman Bijari et al., (2012). They found that following the Yakson and GHT intervention, there was an improvement in the sleep state scores in the interventional group. This result was in line with Im & Kim (2012) who discovered that stress hormone levels were much lower in the Yakson and GHT groups when compared to preterm newborns in the control group. Also, after Yakson or GHT, the infants showed a higher percentage of sleep states and a lower percentage of awake and fussing states.

Furthermore, a quasi-experimental study done by Eshghi et al., (2015) discovered that there was a significant difference between the groups in the behavioral response ratings following the intervention (p=0.001). Along this line, a study by Farag et al., (2022). They reported that following the intervention, the preterm neonates in the study group's overall morning and overall evening behavioral state mean scores reduced (4.2801.11 & 3.8661.09, respectively). In contrast, the scores of preterm neonates in the control group increased following standard care (10.170.686 & 10.410.897, respectively), with statistically significant differences between the two groups. Additionally, Can & Kaya, (2022) concluded as a result that the Yakson technique used on the preterm neonates by their moms contributed to the neonates' states of calmness and sleep.

In relation to hypothesis four; the present study illustrated that duration of hospitalization of preterm neonates in the study group was less than duration of hospitalization of neonates in the control group. It might be because massage therapy improved immune function and caused less sepsis, which resulted in a shorter hospital stay. This result was consistent with Can & Kaya, (2022), who found that the Yakson practices performed on premature neonates by their moms, decreased their hospital stays.

To capitulate, Yakson therapeutic touch of preterm neonates was effective in maintaining more stability in vital signs and weight improvement. As well as had a significant decline in behavioral state score and length of hospitalization.

Conclusion

The findings of this study led to the conclusion that Yakson therapeutic touch significantly improved the stability of the preterm neonates' vital signs, weight, and their behavioral state score and their length of hospitalization while they are being cared for in the NICU.

Recommendations

All NICU nurses should receive training on Yakson therapeutic touch modality in order to integrate it into the NICU's care of preterm neonates. Nurses working in NICUs must to have access to advanced booklets and electronic media on Yakson therapeutic touch and its application technique. The study must be repeatable on a bigger sample size to verify that the findings are generalizable.

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