REVIEW ARTICLE

The effects of Yakson touch and gentle human touch on preterm infants: A systematic review and meta-analysis

DOI: 10.29063/ajrh2023/v27i7.10

Hammad A. Fadlalmola[1], Amal M. Elhusein[2], Huda H. Abedelwahed[3], Salwa A. Mohmed[3], Soad M. A. Alnassry[3], Fathia H. Mohammed[4], Nagat S. Eltaher[3], Elturabi E. Ebrahim[6], Maha A. Abdelsadig[3], Sitelbanat O. M. Ahmed[3], Somia J. Farg[3], Asia S. M. Ahmed[3], Suhair S. Mohmmed[5], Amna M. Ali[3], Amel E. Banaga[3], Insaf H. Mohammed[3], Ehab I. El-Amin[8], Hassan N. Moafa[8], Amal H. Mohamed[9], Hamza H. A. Balola[7], Eltayeb A. Idress[2], Nisha Abraham[2], Elwaleed I. A. Sagiron[10], Ahmed A. Jarelnape[11], Sabha T. Alhajeri[12], Azhar A. Alazhary[13], Awatif O. Alhawsawi[14], Amna M. Idris[10]*

Nursing college, Department of Community health nursing, Taibah University, Saudi Arabia[1]; Nursing department, College of Applied Medical Sciences, University of Bisha, Bisha, Saudi Arabia[2]; Nursing College, Jazan university, Jazan, Saudi Arabia[3]; Department of Nursing, Collage of Applied Medical Science, Buraydah Private Collages, Qassim, Saudi Arabia[4]; College of applied medical science, Univirsity of Hafr Al Batin, Saudi Arbia[5]; Nursing science department, College of Applied Medical Sciences, Prince sattam Bin Abdulaziz University, Saudi Arabia[6]; Department of Community health nursing, Batterjee Medical College for Sciences and Technology, Khamis mushait, Saudi Arabia[7]; Department of Epidemiology, Faculty of Public Health and Tropical Medicine, Jazan University, Jazan, Saudi Arabia[8]; Internal medicine department, Faculty of medicine, Jazan University, Jazan, Saudi Arabia[9]; Department of Community and Mental Health, College of Nursing, Najran University, Najran, Saudi Arabia[10]; Department of Nursing, Al Baha University, Al Baha, Saudi Arabia[11]; King Fahed Hospital, Al Madina Almnwarah, Ministry of Health, Saudi Arabia[12]; King Fahad Medical City, Ministry of Health, Riyadh, Saudi Arabia[13]; King Abdulaziz Hospital, Jeddah, Ministry of Health, Saudi Arabia[14]

***For Correspondence:** Email: *hazzminno345@gmail.com*

Abstract

We aim to collect the evidence of efficacy of Gentle Guman Touch (GHT) and Yakson Touch in preterm neonates as pain relief, heart rate, oxygen saturation, and urine cortisol level. We made our search through PubMed, Web of Science, Scopus, and Cochrane by the mid of March 2023. Randomized control trials (RCTs) were included, and the Cochrane risk of bias tool was utilized to assess their quality. Using Review Manager software, a meta-analysis was conducted. We computed the mean difference (MD) with a 95% confidence interval (CI) for the continuous data. During the examination, the Neonatal Infant Pain Scale (NIPS) was significantly reduced in the touch group compared to the control group (MD = -3.40, 95% CI [-4.15 to -2.64], P-value= 0.00001). After the examination, the NIPS score was also reduced by both Yakson touch and GHT compared to the control (MD = -2.14, 95% CI [-3.42 to -0.85], *P-value* <0.00001). Yakson touch and GHT are non-pharmacological, easy, and safe methods that can be used for painful interventions to reduce the pain experience of preterm infants from variable interventions. Both methods improved infant sleep and behavior. Preterm infants' heart rates and oxygen saturation were unaffected by Yakson touch or GHT. *(Afr J Reprod Health 2023; 27 [7]: 99-108).*

Keywords: Yakson touch; preterm infants; gentle human tough; meta-analysis

Résumé

Nous visons à recueillir les preuves de l'efficacité de la touche gluman douce (GHT) et du toucher des yakson chez les nouveau-nés prématurés comme soulagement de la douleur, fréquence cardiaque, saturation en oxygène et niveau de cortisol d'urine. Nous avons effectué notre recherche via PubMed, Web of Science, Scopus et Cochrane d'ici la mi-mars 2023. Des essais de contrôle randomisés (ECR) ont été inclus, et l'outil de risque de biais Cochrane a été utilisé pour évaluer leur qualité. À l'aide du logiciel Review Manager, une méta-analyse a été réalisée. Nous avons calculé la différence moyenne (MD) avec un intervalle de confiance (IC) à 95% pour les données continues. Au cours de l'examen, l'échelle de douleur infantile néonatale (NIPS) a été significativement réduite dans le groupe tactile par rapport au groupe témoin (MD = -3,40, IC à 95% [-4,15 à -2,64], valeur de p = 0,00001). Après l'examen, le score

NIPS a également été réduit à la fois par Yakson Touch et GHT par rapport au contrôle (MD = -2,14, IC à 95% [-3,42 à -0,85], valeur p <0,00001). Yakson Touch et GHT sont des méthodes non pharmacologiques, faciles et sûres qui peuvent être utilisées pour des interventions douloureuses afin de réduire l'expérience de la douleur des nourrissons prématurés à partir d'interventions variables. Les deux méthodes ont amélioré le sommeil et le comportement du nourrisson. Les fréquences cardiaques prématurées et la saturation en oxygène n'ont pas été affectées par Yakson Touch ou GHT. *(Afr J Reprod Health 2023; 27 [7]: 99-108).*

Mots-clés: Yakson touch; les nourrissons prématurés; gentel humain dur; méta-analyse

Introduction

Each year, more than 15 million babies are born prematurely, with a percentage of 10% globally[1]. A premature infant is an infant that is born before 37 completed weeks of gestation[2,3]. Premature babies have a higher risk of death, developmental delays, mental and physical disabilities, and permanent disabilities like learning disabilities and visual and hearing impairments [4]. Premature neonates may experience various types of painful or hazardous stimulations during hospitalization due to various procedures, noises, or even lights that affect their comfort. Previous studies showed that neonates would have painful stimulation an average of 7 times to 17 times every day in the neonatal intensive care unit[5], and neonates are hypersensitive to pain due to the incomplete nervous system they have[6]. The recurrence of painful stimulations and interventions in the intensive care units was proved to cause behavioral changes in the future in addition to, physiologic and neurologic imbalances in the infants[7,8]. Recently prenatal and neonatal care improved which led to an increase in survival rates worldwide[9]; therefore exploring new methods to give comfort and reduce stress in preterm infants is required to improve the physical and psychological aspects along with the improvement in the mortality rate.

Yakson touch is a method derived from the Korean culture based on the relationship between the mother and the infant as touching is one of the strongest emotional sensations in the neonate. Yakson is the act of a mother's gentle, nurturing, and soothing touch on her infant, which promotes the infant's physical and emotional well-being, the mother's sense of contentment and self-assurance, and a more secure bond between both[4,10]. Key elements of traditional Yakson that were adapted for preterm infants in the Yakson protocol include using warm hands, touching without pressure, and moving hands slowly[11]. Caressing the infant's abdomen with one hand while placing the other hand under the baby's back is a common practice in the Yakson tradition. It has been said that Yakson promotes expansion. The Koreans used to do the Yakson touch to the infants as they believed that would relieve the pain and decrease the stress for their newborn[12].

GHT is also based mainly on the sensation of the skin, the largest sensory organ that transmits signals to the brain which makes it responsible for a part of mood and relaxation[13]. Complementary and alternative medicine often includes therapeutic touch. The holistic nature of complementary therapies is appealing to nurses, and nurses are free to use them in their daily practice without a referral from a doctor[14]. In GHT, a preterm infant is calmed by placing one hand on his or her head and the other on his or her abdomen[15,16]. Lower levels of motor activity or the maintenance of a sleeping state were cited as evidence that GHT reduced energy expenditure during and after the intervention compared to baseline[17].

The purpose of this systematic review and meta-analysis is to provide comprehensive evidence on the effects of Yakson touch and gentle human touch in improving physiological and behavioural outcomes in preterm infants. This study aims to provide valuable insights to healthcare providers in neonatal care regarding the potential benefits of these non-pharmacological interventions.

Methods

Our article is designed as a systematic review and meta-analysis, following PRISMA checklist updates and Cochrane guidelines reported in their handbook[18,19]. The overarching research question guiding this systematic review and meta-analysis is: What are the comparative effects of Yakson touch and gentle human touch on physiological and behavioral outcomes in preterm infants?

Literature search and data collection

We performed our search on the 15th of March 2023 using the following searching terms. The search strategy was constructed using a combination of MeSH terms and free-text words, in relation to

"Yakson touch," "gentle human touch," and "preterm infants". Boolean operators (AND, OR) were used to combine the search terms: [(Yakson OR "Gentle human touch") AND (Premature OR Preterm OR Prematurity) AND (Infant OR Neonat*)]. We searched these previous terms in four different databases: PubMed, Cochrane Library, Scopus, and Web of Science

Studies selection and eligibility criteria

All studies that met our criteria were considered; 1) Population: preterm (premature) infants; 2) Intervention: Yakson touch or GHT; 3) Comparator: Any other method; 4) Outcomes: change in Anderson pain scale score, heart, change in the Neonatal Infant Pain Scale (NIPS), oxygen saturation, and urine cortisol level. After finishing the search, we removed the duplicates using the EndNote software. Two authors independently screened the titles, abstracts, and full texts for relevance. In addition, we double-checked the references of the studies we included to make sure we hadn't missed any important literature. The third author then arbitrated any disagreements that arose between the other two.

Quality assessment

The Cochrane Risk of Bias tool (version 1) has been used to evaluate the included RCTs[20]. This process involved a detailed consideration of several domains:

Sequence generation: We assessed the methods used to generate the allocation sequence in each trial to categorize them as high, low, or unclear risk of bias.

Allocation concealment: We evaluated the methods used to conceal the allocation sequence, assigning a rating of high, low, or unclear risk.

Blinding of participants and personnel: We assessed the methods used to implement blinding of study participants and personnel, assigning a rating of high, low, or unclear risk.

Blinding of outcome assessment: We reviewed the methods used to ensure the blinding of outcome assessors, assigning a rating of high, low, or unclear risk.

Incomplete outcome data: We reviewed the completeness of the outcome data for each study, assigning a rating of high, low, or unclear risk based on the amount, nature, and handling of incomplete data.

Selective outcome reporting: We assessed the possibility of selective outcome reporting, assigning a rating of high, low, or unclear risk.

Other sources of bias: We reviewed each study for other potential sources of bias, assigning a rating of high, low, or unclear risk.

Data extraction

We employed two primary tools for our assessment: the Anderson Pain Scale and the Anderson Behavioral Scale. The Anderson Pain Scale was used to measure pain levels in the preterm infants during and after the interventions. The Anderson Behavioral Scale was utilized to observe and score behavioral responses, providing a more comprehensive view of the infants' reactions to the Yakson touch and gentle human touch.

We extracted our data into Excel sheets. The extracted data contained the following items: 1) Summary and baseline characteristics of the including studies including study ID, study arms, site, trial registration, gender, birth weight in kg, mother's age, gestational age in weeks, 5-min Apgar score, and Neonatal Infant Pain Scale, inclusion criteria, primary outcomes, and conclusion, and 3) Outcomes were divided into the that measured during the examination (touch) including the change in heart rate, NIPS, and oxygen saturation, and the outcomes after the examination which includes a change in Anderson pain scale score, heart rate, change in the NIPS, oxygen saturation, and urine cortisol level.

Data analysis

Review Manager (RevMan) v5.4 was used to conduct the statistical analysis. We considered the significance level at a p-value value < 0.5 level. Data were pooled as mean difference (MD) and 95% confidence interval (95% CI). The heterogeneity was assessed by the I-square test (I^2) and the chi-square test. We considered the data heterogeneous if the p-value of chi-square < 0.1 and the I^2 value was above 50%. The fixed effect model was used for the analysis of the homogeneous data, while the random effects model was employed for the analysis of the heterogeneous data.

Results

Literature search and study characteristics

After data collection, we were able to obtain 106 studies, after title and abstract screening, 22 studies were eligible for full-text screening. Finally, we included 11 RCTs, nine of them[4,11,16,21-26] were utilized in the quantitative evidence, and two [27,28] in the qualitative evidence. Figure 1. The total included population was 782 infants from Turkey, India, China, Iran, and the USA. Supplementary Table 1. Our included RCTs have a low risk of bias except for a few studies that were high bias, so we can say that the overall risk of bias is moderate. Figure 2

Quantitative analysis

A) Outcomes during the touch

1-NIPS scores:
Two studies reported this outcome for GHT, with a total sample size of 110 preterm infants. The NIPS score was reduced significantly in the GHT group compared to the control group (MD = -3.1, 95% CI [-3.62 to -2.58], *P-value* <0.00001). Moreover, two studies reported this outcome for Yakson touch, with a total sample of 122 preterm infants, the NIPS score were reduced significantly compared to the control (MD = -3.54, 95% CI [-4.67 to -2.40], *P-value* <0.00001). The pooled results were heterogenous and the heterogeneity could not be resolved. The overall NIPS score in the intervention groups was significantly reduced compared to the control (MD = -3.40, 95% CI [-4.15 to -2.64], *P-value* <0.00001). the overall results were heterogenous (p value=0.002, I2=85%), and the heterogeneity could be resolved using the subgroup analysis method (p value=0.49, I2=0%). Figure 3

2-Oxygen saturation:
Two studies involving 116 premature infants reported the outcome of oxygen saturation for the GHT. The results were not statistically significant compared to the control group (MD = 3.80, 95% CI [-0.83 to 8.44], P-value =0.11), and the results were homogenous (p value=0.06, I2=72%). Figure 4

3-Heart rate:
Three studies involving 176 premature infants reported this outcome for GHT. The results were not statistically significant compared to the control group (MD = -1.94, 95% CI [-19.25 to 15.38], P-value =0.83), the results were heterogeneous (p value=0.0001, I2=89%), heterogeneity could not be resolved. Figure 5

B) Outcomes after the touch:

1-NIPS score:
Two studies reported this outcome for GHT, with a total sample size of 110 preterm infants. the results were significant for the infants that went through the GHT method. The NIPS score was reduced significantly compared to the control (MD = -1.61, 95% CI [-2.11 to -1.11], *P-value* <0.00001), and the results were homogenous (P value=0.7, I2=0%). In addition, two studies reported this outcome for Yakson touch, with a total sample of 122 preterm infants, the results were significant for the infants that went through Yakson touch as the NIPS score was reduced significantly compared to the control (MD = -2.67, 95% CI [-5.07 to -0.28], *P-value* <0.00001). The pooled results were heterogenous and the heterogeneity could not be resolved. The overall NIPS score in the intervention groups was significantly reduced compared to the control (MD = -2.14, 95% CI [-3.42 to -0.85], *P-value* <0.00001). The overall results were heterogenous (p value<0.00001, I2=93%), and the heterogeneity could be resolved using the subgroup analysis method (p value=0.49, I2=0%). Figure 6

2- Anderson behavioral scale:
Two studies involving a total of 118 premature infants reported the outcome of the Anderson behavioral scale for the Yakson touch. The results were statistically significant compared to the control group (MD = -6.27, 95% CI [-8.26 to -4.28],(P-value <0.00001), and the results were heterogenous (p value=0.05, I2=75%). Heterogeneity couldn't be resolved and subgroup analysis wasn't applicable. Figure 7

3-Urine cortisol level:
Two studies involving a total of 89 premature infants reported urine cortisol level outcomes for GHT. The results were not statistically significant compared to the control group (MD = -0.58, 95% CI [-1.21 to 0.06], P-value =1.78), and the results were homogenous (p value=0.07, I2=69%). Figure 8

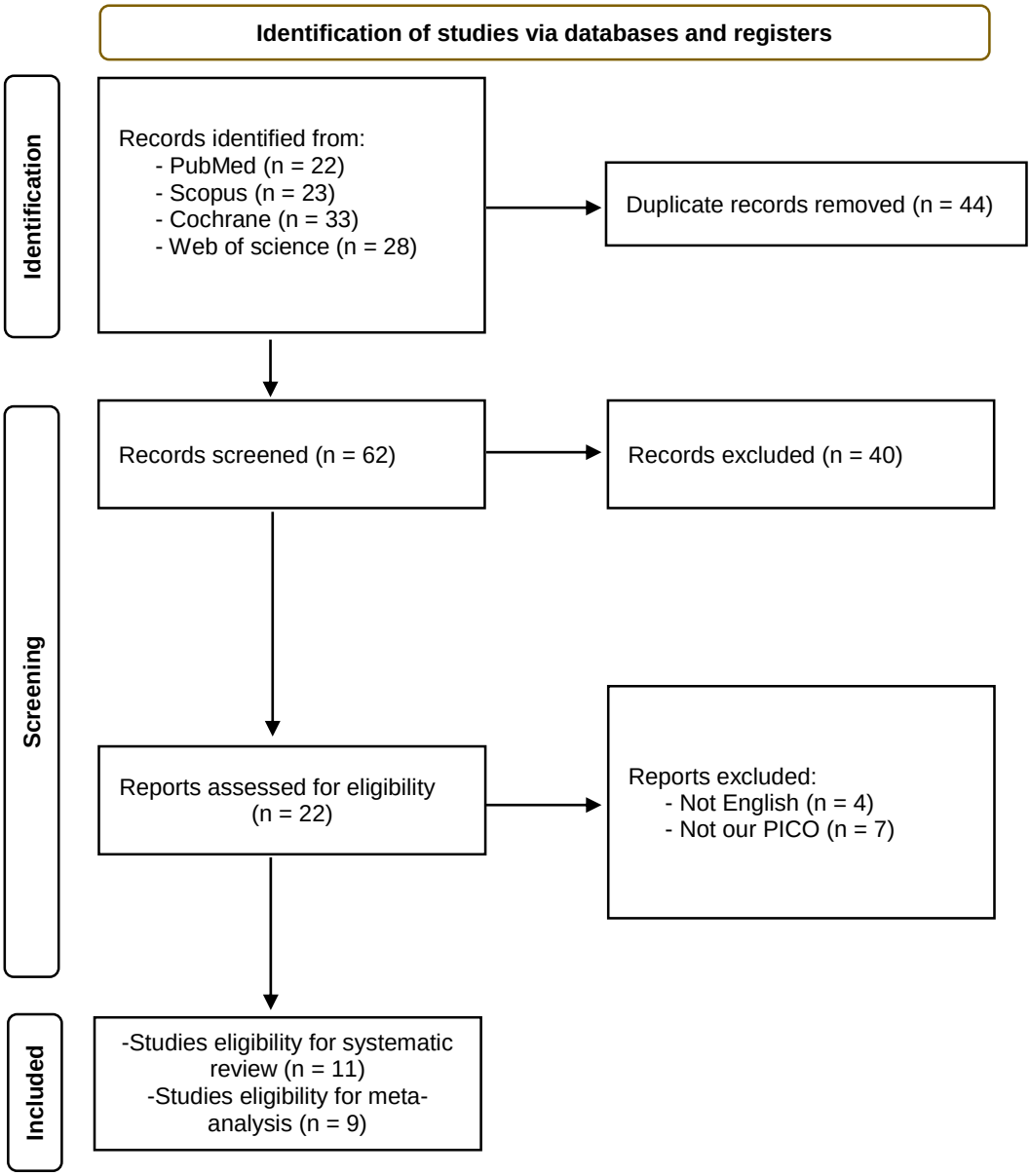

Figure 1: PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

4-Heart rate:

Two studies involving a total of 110 premature infants reported heart rate outcomes for GHT. The results were not statistically significant compared to the control group (MD = -3.82, 95% CI [-11.29 to 3.65], P-value =0.32), and the results were homogenous (p value=0.37, I2=0%). Supplementary Figure 1

5-Oxygen saturation:

Two studies involving a total of 110 premature infants reported oxygen saturation outcomes for GHT. The results were not statistically significant compared to the control group (MD = 1.65, 95% CI [-0.01 to 3.32], P-value =0.05), the results were homogenous (p value=0.91, I2=0%). Supplementary Figure 2.

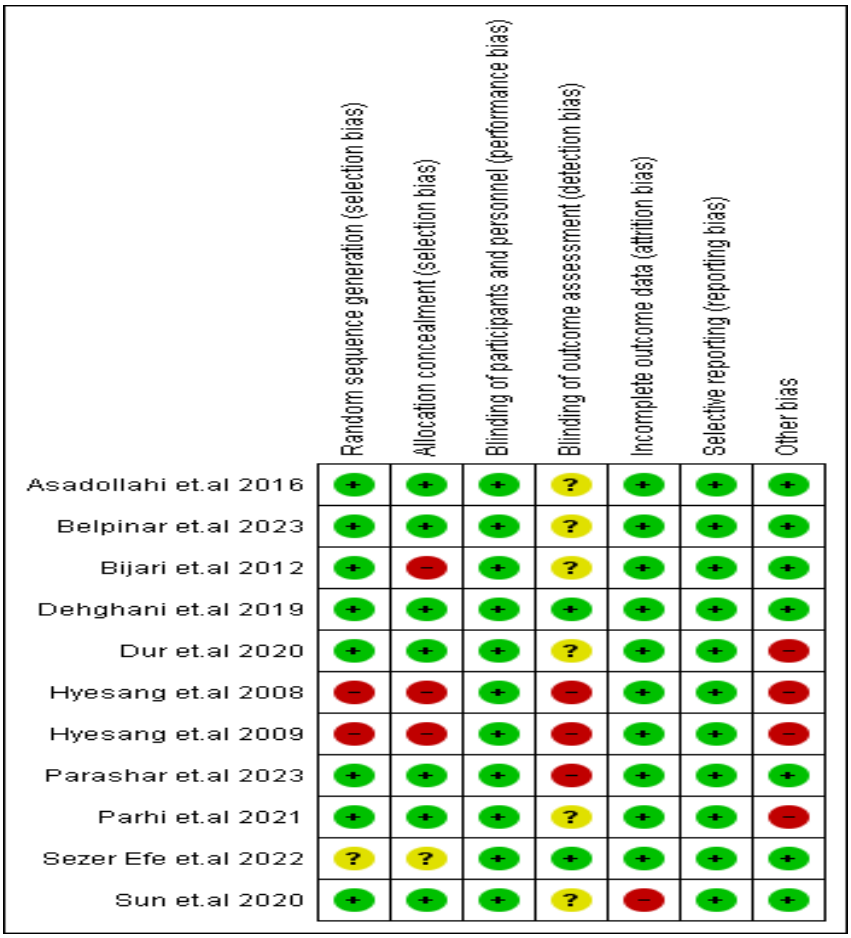

Figure 2: Risk of bias graph summary for RCTs

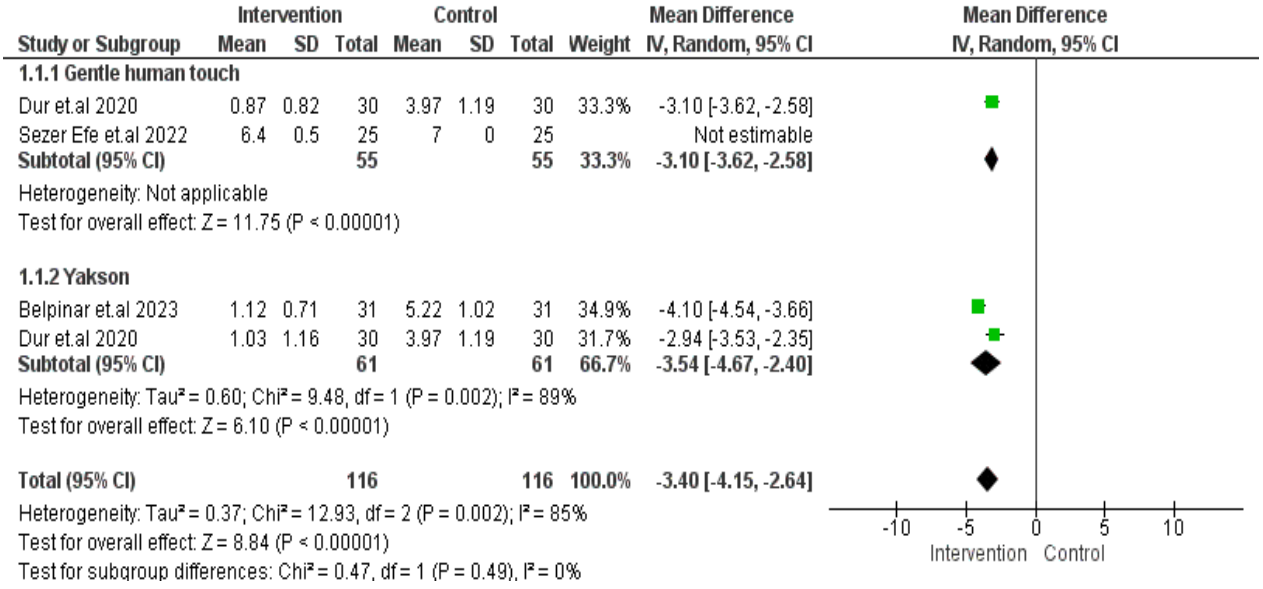

Figure 3: Forest plot of NIPS score during the examination

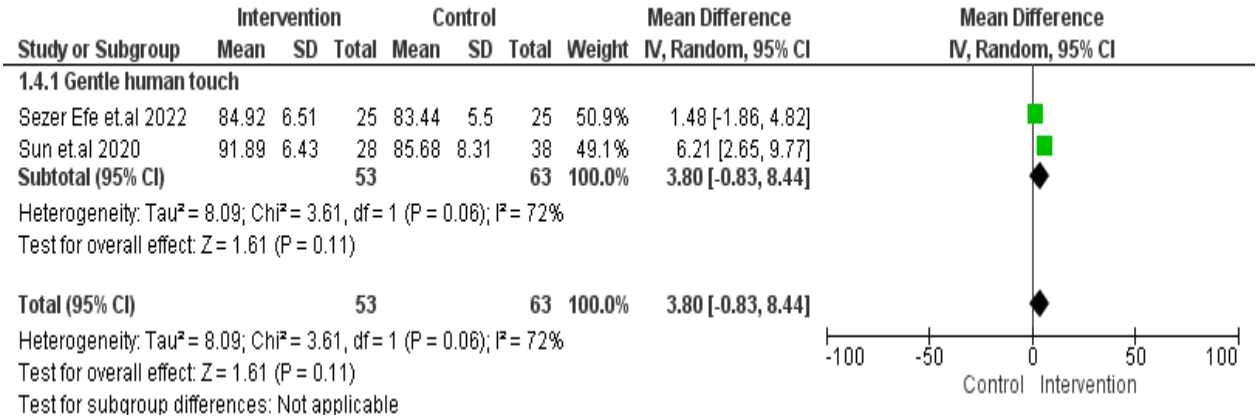

Figure 4: Forest plot of Oxygen saturation during the examination

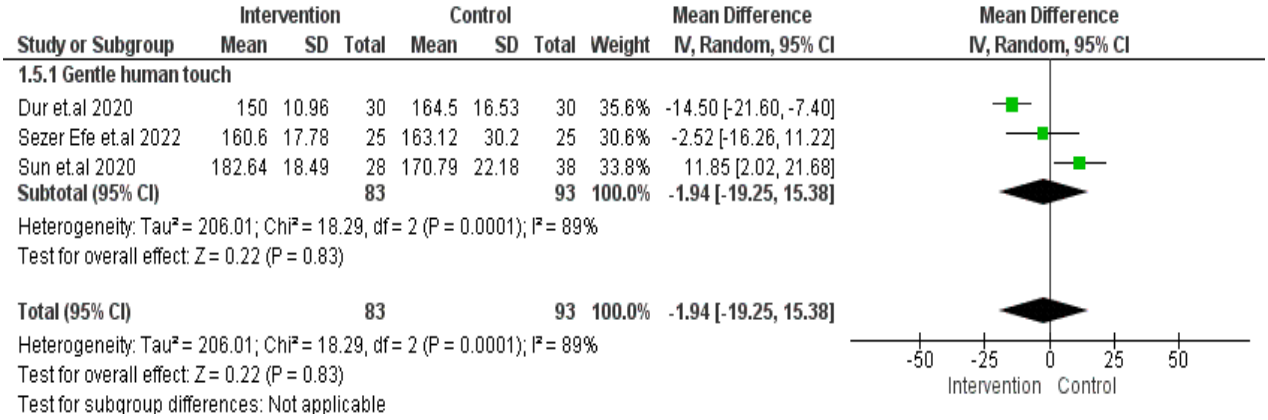

Figure 5: Forest plot of Heart Rate during the examination

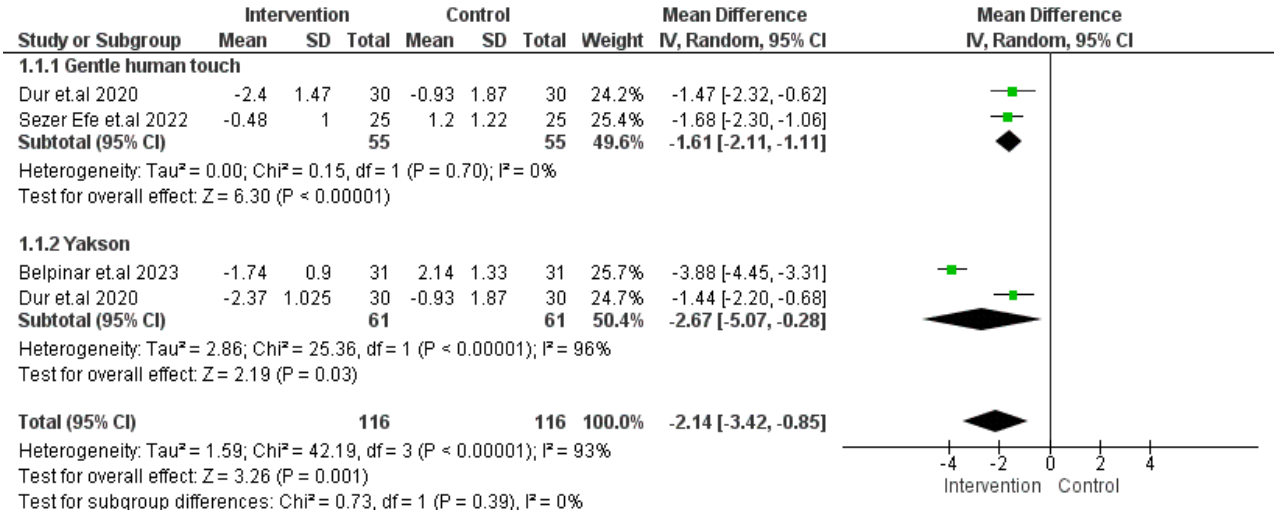

Figure 6: Forest plot of NIPS score after examination

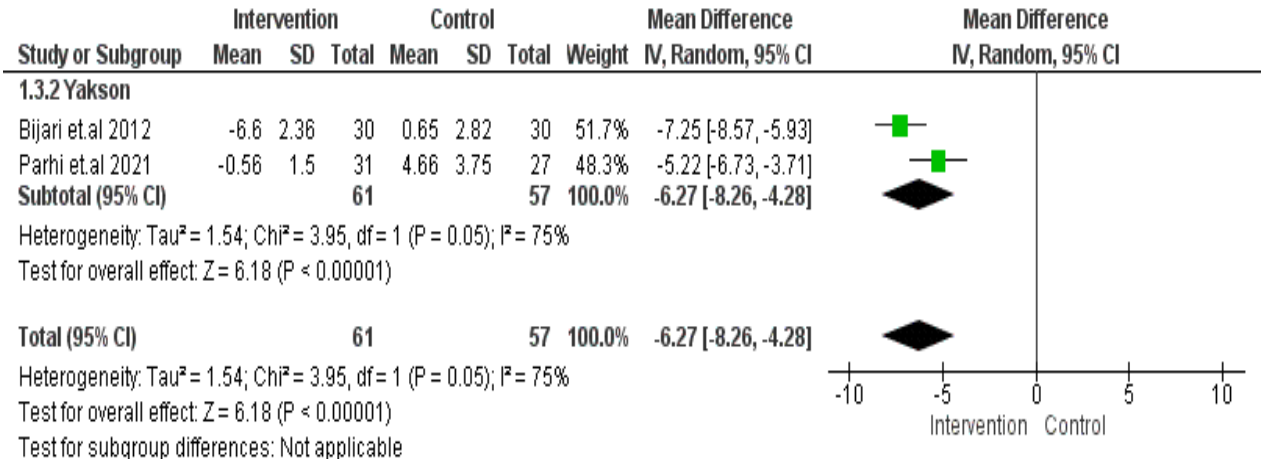

Figure 7: Forest plot of Anderson behavioral scale after examination

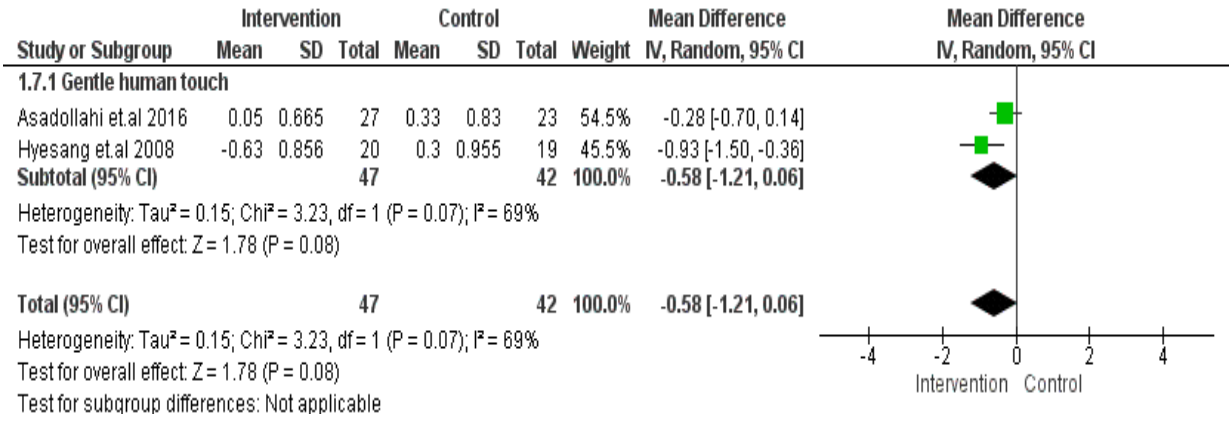

Figure 8: Forest plot of Urine cortisol level after examination

-Discussion

The main aim of our systematic review and meta-analysis was to assess the effects of Yakson touch and Gentle Human Touch (GHT) on preterm infants, specifically focusing on pain relief, physiological responses, and behavioral outcomes. Our findings shed light on the potential benefits and implications of these non-pharmacological interventions in improving the well-being of preterm infants. We assessed the effects on two different time points. The first point was during the examination (touch); in which both interventions showed significant results in NIPS scores reduction. NIPS score was used as the infants are unable to tell the degree of pain they are feeling, hence the NIPS score would be a perfect option for measuring pain as it depends on body language[29]. The NIPS score was developed to evaluate six behavioral responses to painful procedures in newborns, both those born prematurely and those born full-term can benefit from the tool[30]. No other outcomes were found to be significant; oxygen saturation or heart rate. The second time point was after the examination (touch). We found two significant results after examination; NIPS score and Anderson behavioral scale. Anderson behavioral scale is a scale designed to measure the sleep-wake state for preterm infants with 12 different descriptors for the sleep cycle[31].

On the other hand, Oxygen saturation, heart rate, and urine cortisol level were not significant. Urine cortisol levels refer generally to stress hormones as previous studies proved the importance of GHT to decrease stress hormones and their negative effects on preterm infants [21]. The preterm infants' nervous system is not developed, which put some concerns about using any type of physical method; however, recent studies showed that Yakson touch and GHT have positive impacts on preterm infants.

Other studies showed the same results, as Deghani *et al*. found that Yakson touch was effective in reducing NIPS scores among preterm infants during phlebotomy[32]. Our results agreed also with previous studies as sleeping cycles for the infants improved[16]. Moreover, no difference between Yakson touch and GHT was obtained, similar to our results[23]. Our study showed that both Yakson touch and GHT did not affect either heart rate or oxygen saturation whether at the examination or after the examination, which matched with Hyesang *et al.*[23].

Our systematic review and meta-analysis provide evidence supporting the efficacy of Yakson touch and GHT in reducing pain and improving behavioral outcomes in preterm infants. These interventions have the potential to enhance the care provided to preterm infants and should be further explored and incorporated into clinical practice. Future research should focus on addressing the limitations of existing studies, investigating long-term effects, and exploring the underlying mechanisms to optimize the application of these interventions in neonatal care settings.

The findings of our study have implications for healthcare providers, users, and policymakers involved in the care of preterm infants. Yakson touch and GHT offer non-pharmacological, safe, and easily applicable interventions that can be incorporated into routine care to reduce pain, enhance behavioral states, and promote bonding between caregivers and preterm infants. Healthcare professionals should be aware of these techniques and consider their integration into neonatal care protocols to improve the overall well-being of preterm infants.

Limitations

On the other hand, our study had some limitations as we had three included studies with a high risk of bias. Also, the pooled outcomes included few studies which limit the results' certainty. We recommend more future RCTs with a large sample size to produce more valid results.

Conclusion

Yakson touch and GHT are non-pharmacological, easy, and safe methods that can be used for painful interventions to decrease their pain. Both methods can decrease pain and improve the sleeping cycle and behavioral changes in preterm infants. Moreover, Yakson touch and GHT have no significant effects on heart rate or oxygen saturation. Nursing staff that deals with preterm infants should be aware of at least one of the two methods to help preterm infants and decrease their stress and pain.

Authors contribution

HAF, AME, designed and supervised the review process, HHA, SAM, SMA, FHM, NSE, EEE, MAA, SMA, SJF, ASM, SSM, AMA, contributed to the literature search, data extraction, and analysis, and wrote the initial draft of the manuscript. AEB, IHM, EIE, HNM, AHM, HHB, EAI, NA, contributed to the literature search, data extraction, and analysis, and critically reviewed and revised the manuscript. EIS, AAJ, STA, AAA, AOA, AMI, contributed to the data extraction and analysis, and critically reviewed and revised the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest in relation to this research.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

The data used in this systematic review and meta-analysis was publicly available, contact the corresponding author for more data if needed.

References

1. Blencowe H, Cousens S Fau - Oestergaard MZ, Oestergaard Mz Fau - Chou D, Chou D Fau - Moller A-B, Moller Ab Fau - Narwal R, Narwal R Fau - Adler A, Adler A Fau - Vera Garcia C, Vera Garcia C Fau - Rohde S, Rohde S Fau - Say L, Say L Fau - Lawn JE and Lawn JE. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications.
2. Verklan M and Walden M. (USA: Elsevier, 2015).
3. Verklan MT, Walden M and Forest S. *Core curriculum for neonatal intensive care nursing e-book*. (Elsevier Health Sciences, 2020).

4. Bahman BB, Iranmanesh SF-EF, Eshghi F Fau - Baneshi MR and Baneshi MR. Gentle Human Touch and Yakson: The Effect on Preterm's Behavioral Reactions.
5. Cruz MD, Fernandes AM and Oliveira CR. Epidemiology of painful procedures performed in neonates: A systematic review of observational studies.
6. Perry M, Tan Z, Chen J, Weidig T, Xu W and Cong XS. Neonatal Pain: Perceptions and Current Practice.
7. Razeq NMA, Akuma AO and Jordan S. Status of neonatal pain assessment and management in Jordan. *Pain Management Nursing* 17, 239-248 (2016).
8. Pölkki T, Laukkala H and Korhonen A. Nurses' and Parents' Perceptions of Parental Guidance on Using Nonpharmacological Pain-Relieving Methods Among Neonates in the NICU. *Pain Management Nursing* 17, 272-280 (2016). https://doi.org:https://doi.org/10.1016/j.pmn.2016.04.002
9. Hernandez-Reif M, Diego M Fau - Field T and Field T. Preterm infants show reduced stress behaviors and activity after 5 days of massage therapy.
10. Can ŞA-OX and Kaya HA-O. The effects of yakson or gentle human touch training given to mothers with preterm babies on attachment levels and the responses of the baby: a randomized controlled trial.
11. Dur Ş, Çağlar S, Yıldız NU, Doğan P and Güney Vİ. The effect of Yakson and Gentle Human Touch methods on pain and physiological parameters in preterm infants during heel lancing.
12. Parashar P, Samuel AJ, Bansal A and Aranka VP. Yakson touch as a part of early intervention in the Neonatal Intensive Care Unit: A systematic narrative review.
13. Zimmerman A, Bai L and Ginty DD. The gentle touch receptors of mammalian skin.
14. Bahman BB, Iranmanesh S, Eshghi F and Baneshi MR. Gentle human touch and yakson: the effect on preterm's behavioral reactions. *International Scholarly Research Notices* 2012 (2012).
15. Harrison LL, Williams Ak Fau - Berbaum ML, Berbaum Ml Fau - Stem JT, Stem Jt Fau - Leeper J and Leeper J. Physiologic and behavioral effects of gentle human touch on preterm infants.
16. Im H and Kim E. Effect of Yakson and Gentle Human Touch versus usual care on urine stress hormones and behaviors in preterm infants: a quasi-experimental study.
17. Harrison L Fau - Olivet L, Olivet L Fau - Cunningham K, Cunningham K Fau - Bodin MB, Bodin Mb Fau - Hicks C and Hicks C. Effects of gentle human touch on preterm infants: pilot study results.
18. Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ and Welch VA. *Cochrane handbook for systematic reviews of interventions*. (John Wiley & Sons, 2019).
19. Page MJ and Moher D. Evaluations of the uptake and impact of the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement and extensions: a scoping review. *Systematic reviews* 6, 1-14 (2017).
20. Higgins JP, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, Savovic J, Schulz KF, Weeks L and Sterne JA. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *Bmj* 343, d5928 (2011). https://doi.org:10.1136/bmj.d5928
21. Asadollahi M, Jabraeili M, Mahallei M, Asgari JM and Ebrahimi S. Effects of Gentle Human Touch and Field Massage on Urine Cortisol Level in Premature Infants: A Randomized, Controlled Clinical Trial.
22. Belpınar A and Yayan EH. Effect of Yakson touch and mother's voice on pain and comfort level during nasal CPAP application in Turkey: A randomized controlled study. LID - S1550-8307(23)00061-7 [pii] LID - 10.1016/j.explore.2023.02.010 [doi].
23. Im H, Kim E Fau - Cain KC and Cain KC. Acute effects of Yakson and Gentle Human Touch on the behavioral state of preterm infants.
24. Parhi RR, Das N and Sahoo P. Efficacy of Yakson touch and kinesthetic stimulation on the behavioral development, pain and vitals of pre-term neonates during critical care stay: A randomized controlled trial. *Current Pediatric Research* (2021).
25. Sezer EY, Erdem E, Caner N and Güneş T. The effect of gentle human touch on pain, comfort and physiological parameters in preterm infants during heel lancing.
26. Sun Y, Zhang J, Chen X, Yang Y, Qiu J, Lu KY and Cheng R. Effectiveness of Gentle Human Touch for Pain Control During Examination for Retinopathy of Prematurity: A Randomized Controlled Trial.
27. Dehghani K, Ahmadabadi AB, Fallahzade H and Salimi T. Comparison of the Effect of Yakson Touch and Oral Glucose on the Severity of Phlebotomy Pain in Preterm Infants. *Iranian Journal of Neonatology* 10 (2019).
28. Parashar P and Samuel AJ. Yakson touch and kinesthetic stimulation on development of high-risk neonates in neonatal intensive care units: A randomized controlled trial. *Journal of Clinical Neonatology* 7, 12-19 (2018).
29. Witt N, Coynor S, Edwards C and Bradshaw HA Guide to Pain Assessment and Management in the Neonate.
30. Sarkaria EA-O and Gruszfeld DA-O. Assessing Neonatal Pain with NIPS and COMFORT-B: Evaluation of NICU's Staff Competences.
31. Yang S-C, Yang A and Chang Y-J. Validation of Actiwatch for Assessment of Sleep-wake States in Preterm Infants. *Asian Nursing Research* 8, 201-206 (2014). https://doi.org:https://doi.org/10.1016/j.anr.2014.06.002
32. Dehghani K, Bagheri AA, Fallahzade H and Salimi T. Comparison of the Effect of Yakson Touch and Oral Glucose on the Severity of Phlebotomy Pain in Preterm Infants. *Iranian Journal of Neonatology IJN* 10, 25-32 (2019). https://doi.org:10.22038/ijn.2019.38769.1614.