JMCH Journal of Maternal and Child Health (2022), 07(01): 64-74
Masters Program in Public Health, Universitas Sebelas Maret

Meta Analysis

Meta-Analysis the Effect of Baby Massage in Increasing Quality of Sleep and Infant Body Weight

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ABSTRACT

Background: Sleep patterns and weight in infants are identified as one of the most important topics related to infant growth and development. Baby massage is a slow and gentle stroke movement throughout the baby's body starting from the baby's feet, stomach, chest, face, hands and back. Baby massage is a form of touch stimulation. Babies who are massaged experience an increase in vagus nerve tone (10th brain nerve) which will lead to increased levels of gastrin and insulin absorption enzymes. Thus the absorption of food will be better. Therefore, body weight and sleep quality increased more than those who were not massaged.
Subjects and Method: This was a systematic review and meta-analysis conducted using PRISMA flow diagrams. Search articles through journal databases including: PubMed, Science Direct, Google Schoolar and SpingerLink by selecting articles published in 2010-2020. The keywords used were ("baby massage" OR "infant massage") AND ("sleep quality" OR "baby sleep quality") AND ("weight gain" OR "baby weight gain") AND "randomized controlled trial". Inclusion criteria were full paper articles with Randomized Controlled Trial (RCT) research methods, the relationship measure used was Mean SD, the intervention given was baby massage, research subjects were infants aged 0-3 years. Eligible articles were analyzed using the Revman 5.3 application.
Results: A meta-analysis of 16 articles showed that baby massage improved sleep quality (SMD 0.70; 95% CI= -0.05 to 1.46; p=0.07). In addition, baby massage increased body weight (SMD 0.52; 95% CI= 0.08 to 0.96; p=0.02).
Conclusion: Baby Massage has an effect on improving the quality of sleep and baby's weight.

Keywords: baby massage, sleep quality, baby weight gain.

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Cite this as:
Fauzia RL, Budihastuti UR, Adriani RB (2022). Meta-Analysis the Effect of Baby Massage in Increasing Quality of Sleep and Infant Body Weight. J Matern Child Health. 07(01): 64-74. https://doi.org/10.26911/-thejmch.2022.07.01.07.

BACKGROUND

Babies are children under one year of age who have just entered the early stages of life marked by rapid development. The baby's body will produce growth hormone while sleeping, so babies need enough sleep to get optimal development (Dalili et al., 2016). Sleep disturbances in infants are a form of problems faced by parents. WHO in 2012 in the journal Pediatrics stated, as many as 33% of infants had sleep disorders (Sadeh, 2012). In Indonesia, from several studies conducted in 2017, 44.2% of children under 3 years of age experienced sleep disorders (Nugraheni et al., 2018).

Infant sleep quality is a measure used to assess the ease with which a baby can initiate and maintain sleep. Sleep quality is

good if the length of sleep is balanced between night and day sleep (Tekgündüz et al., 2014). Babies with poor sleep quality have a negative impact on their development, such as babies becoming emotional easily and decreasing concentration and body immunity. Factors that affect sleep quality in infants include activity or fatigue, environment, health conditions and nutritional fulfillment (Mardiana & Martini, 2014). Babies aged 6-12 months need adequate sleep, so it is necessary to provide external stimulus in the form of massage therapy. One of the massage therapies that can be done is baby massage (Sadeh, 2012).

Growth and development is a process that starts from conception to adulthood. The period of infant growth and development is a golden period as well as a critical period of a person's development, namely at the age of 0-12 months (Massaro et al., 2010). The golden period of infancy is very short and cannot be repeated. It can be said to be a critical period because at this time babies are very sensitive to the environment and need good nutrition and stimulation for growth and development (Soetjiningsih & Ranuh, 2017).

Problems that often arise in growth and development include impaired physical growth, motor development, language, emotion and behavior (Hartati et al., 2020). Physical growth disorders include growth disorders above normal and growth disorders below normal, weight monitoring can be seen using KMS (Kartu Towards Healthy) (Kulkarni et al., 2010). Motor development disorders are disorders that cause delayed motor development due to many things, including muscle tone abnormalities and lack of stimulation to babies with babies who are often carried and placed on baby walkers. Language development disorders are caused by many factors, including hearing loss, lack of interaction between children and the environment, and physical abnormalities such as cleft lip and cerebral palsy (Pitre, 2012). Emotional and behavioral disorders, such as anxiety that affects social interactions, examples of anxiety experienced by children, namely anxiety about separation from parents, anxiety after experiencing trauma (Sulis et al., 2017).

According to several studies on the effectiveness of baby massage, babies who receive baby massage therapy, growth and development of motoric, sensory, language and social are faster and optimally according to the baby's age. Their babies sleep more quietly, babies are not fussy and the baby's appetite increases (Field, 2016).

Baby massage or baby massage is the oldest comprehensive touch therapy that has been practiced for decades which is believed to affect infant development (Hartati et al., 2012). Baby massage has benefits that can affect gross motor development in infants besides that, baby massage is also useful for increasing bounding and attachment between mother and baby, increasing body weight, and increasing the quantity of baby sleep (Khan, 2015). Baby massage helps increase serotonin secretion levels. Serotonin is a neurotransmitter hormone or hormone that delivers messages from one part of the brain to another. This serotonin hormone will be converted into melatonin. The function of melatonin is to provide stimulation in the form of drowsiness and provide calm which helps the baby to sleep soundly (Pitre, 2012).

Another study stated that after massage was performed in the intervention group, there was an increase in sleep quality compared to the control group. This researcher also found that one of the factors that greatly affect the quality of sleep in infants is age, which affects the body's immune system. A baby's immune system that is still weak is easily attacked by germs, cau-

sing his sleep quality to be disturbed (Saputro & Bahiya, 2021).

Based on the number of cases of problems with sleep patterns and baby weight that occur and the need for appropriate intervention, the researchers are interested in studying the effect of baby massage on sleep quality and baby weight. The data obtained will be analyzed using meta-analysis by synthesizing the results of studies carried out to reduce bias.

SUBJECTS AND METHOD

1. Study Design

This research was conducted using a systematic review and meta-analysis study design. Using the PRISMA flow chart guidelines. Article searches were carried out using journal databases including: PubMed, science Direct, Google Scholar and SpingerLink articles in the 2010-2020 range with the keywords ("baby massage" OR "infant massage") AND ("sleep quality" OR "baby sleep quality ") AND ("weight gain" OR "baby weight gain") AND "randomized controlled trial".

2. Inclusion Criteria

This study has inclusion criteria, including: Full paper article with a Randomized Controlled Trial (RCT) study design, articles published in Indonesian and English, the size of the relationship used with Mean SD, The intervention provided was baby massage, Research subjects infants aged 0 – 3 years and measuring sleep quality using BISQ and measuring weight using Growth Chart (KMS).

3. Exclusion Criteria

This study has exclusion criteria, including: Infants who have a fever or have infection problems, have heart problems, motor problems and often have seizures (Khan, 2015).

4. Operational Definition

The formulation of the research problem was carried out by considering the eligibility criteria defined using PICO, namely, Population: infants aged 0 months – 3 years, Intervention: baby massage, Comparison: no baby massage, and Outcome: sleep quality and baby weight. Baby massage, massage that is carried out closer to fine strokes or tactile stimulation performed on the surface of the skin, manipulation of body tissues or organs aims to produce effects on the nerves, muscles and respiratory system and facilitate blood circulation (Rahmatnezhad et al., 2018). Infant sleep quality is a measure used to assess the ease with which a baby can initiate and maintain sleep. Sleep quality is good if the length of sleep is balanced between night and day sleep (Tekgündüz et al., 2014). Infant weight is the most important anthropometric measure and should be measured at every opportunity to examine the health of children in all age groups. Body weight is the result of an increase or decrease in all existing tissues in the body, including bone, muscle, fat, body fluids and others (Vivian et al., 2010).).

5. Instrument

The instruments in this study were the Brief Infant Sleep Questionnaire (BISQ) as a measure of infant sleep quality and the Growth Chart or KMS as a means of measuring infant weight.

6. Data Analysis

Data analysis in this study was carried out using the Review Manager application (RevMan 5.3). Data were analyzed based on variations between studies by determining the use of random effects analysis models.

RESULTS

Research from the primary study related to the effect of baby massage on the quality of sleep and baby's weight contained 16 articles with a total sample of 1418 participants, 708 participants for the intervention and 710 participants for compa-

rison. Articles were obtained from 2 continents, namely, 12 studies came from the Asian continent and 4 studies came from the Americas. Each study had a sample of less than 100 participants. The outcome for some articles is that there is an increase in the quality of sleep and baby's weight after being given a baby massage.

The article search was carried out using a database based on the PRISMA flow diagram, which can be seen in Figure 1. The study quality assessment was carried out qualitatively and quantitatively. Assessment of research quality using the Critical Appraisal Skills Program (CASP) can be seen in Table 1. Each of the 11 questions was answered with the answer choices: Yes, No and Unclear. After assessing the quality of the study, a total of 16 articles included in the quantitative synthesis process of the meta-analysis were analyzed using RevMan 5.3.

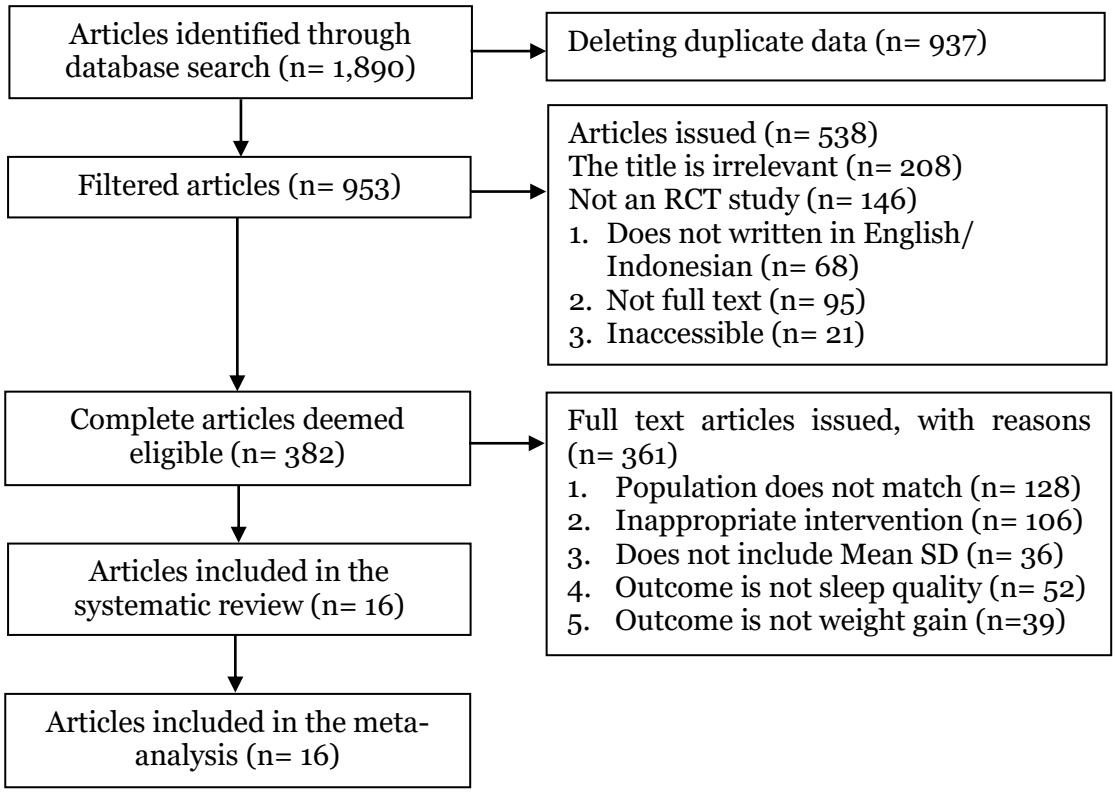

Figure 1. PRISMA Diagram

Table 1. Assessment of Research Quality Effect

No.	Questions	Kusumastuti *et al* (2016) Score	Hartanti *et al* (2019) Score	Rouzafzoon *et al* (2021) Score	Smith *et al* (2013) Score	Edraki *et al* (2015) Score	Lu *et al* (2018) Score
1.	Does the experiment answer the clinical problem clearly?	1	1	1	1	1	1
2.	Was the intervention given to the patient randomized?	1	1	1	1	1	1
3.	Are there blinding of patients, health workers, and researchers?	1	1	1	1	1	1
4.	Were the study groups similar at the start of the study?	1	1	1	1	1	1
5.	Outside of the intervention under study, were the study groups treated equally?	1	1	1	1	1	1
6.	Were all patients included in the study properly accounted for in the conclusions? were all patients analyzed according to the randomized study groups?	1	1	1	1	1	1
7.	Is the effect of the intervention large enough?	1	1	1	1	1	1
8.	How precise is the estimation of the effect of the intervention?	1	1	1	1	1	1
9.	Are the results applicable to the context of practice or local populations?	1	1	1	1	1	1
10.	Are all other clinically important outcomes considered in this article?	1	1	0	1	1	1
11.	Do the benefits provided by the intervention outweigh the costs and disadvantages?	1	1	1	1	1	1

Table 2. Quality assessment of studies on the effect of baby massage in infants body weight

No.	Question	Diego *et al* (2014) Score	Abdallah *et al* (2013) Score	Ho *et al* (2010) Score	Rangey *et al* (2014) Score	Gonzalez *et al* (2010) Score	Ang *et al* (2012) Score	Zhang *et al* (2019) Score	Moghadam *et al* (2015) Score	Fallah *et al* (2013) Score	Lu *et al* (2011) Score
1.	Does the experiment answer the clinical problem clearly?	1	1	1	1	1	1	1	1	1	1
2.	Was the intervention given to the patient randomized?	1	1	1	1	1	1	1	1	1	1
3.	Are there blinding of patients, health workers, and researchers?	1	1	1	1	1	1	1	1	1	1
4.	Were the study groups similar at the start of the study?	1	1	1	1	1	1	1	1	1	1
5.	Outside of the intervention under study, were the study groups treated equally?	0	0	1	0	1	1	1	1	1	1
6.	Were all patients included in the study properly accounted for in the conclusions? were all patients analyzed according to the randomized study groups?	1	1	1	1	1	1	1	1	1	1
7.	Is the effect of the intervention large enough?	1	1	1	1	1	1	1	1	1	1
8.	How precise is the estimation of the effect of the intervention?	1	1	1	1	1	1	1	1	1	1
9.	Are the results applicable to the context of practice or local populations?	1	1	1	1	1	1	1	1	1	1
10.	Are all other clinically important outcomes considered in this article?	0	1	1	1	1	1	1	1	1	1
11.	Do the benefits provided by the intervention outweigh the costs and disadvantages?	1	1	1	0	1	1	1	1	1	1

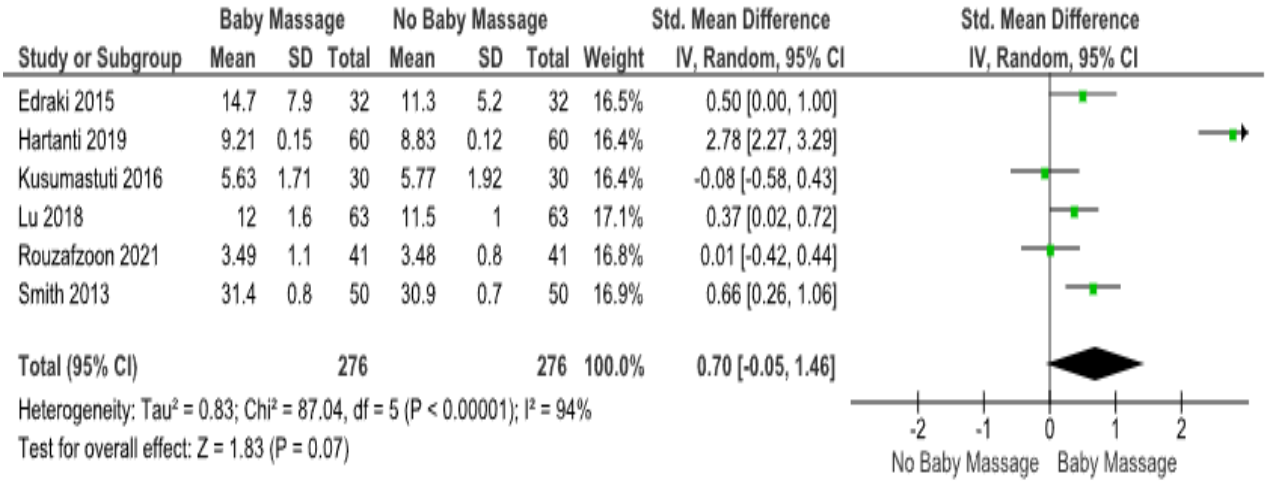

Figure 2. Forest plot of Baby Massage on Sleep Quality

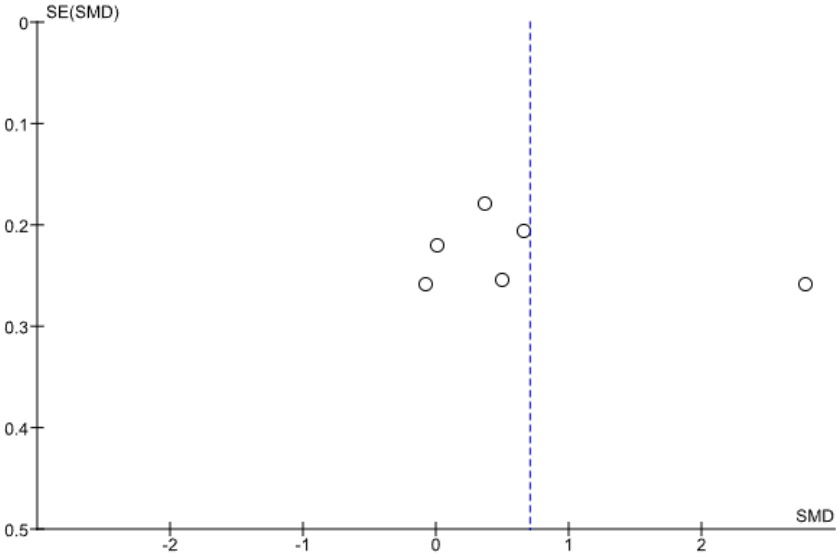

Figure 3. Funnel plot of Baby Massage on Sleep Quality

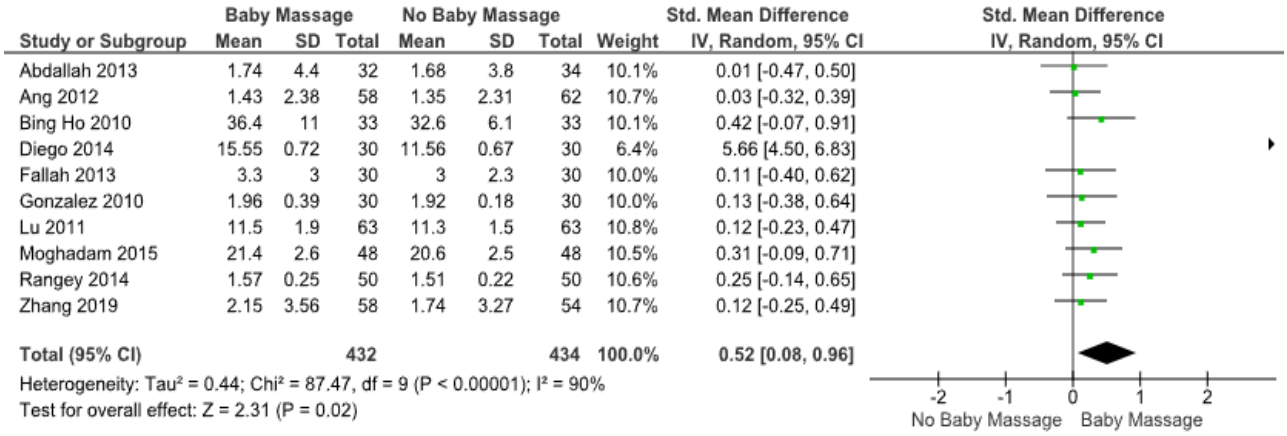

Figure 4. Forest plot of Baby Massage on Body Weight

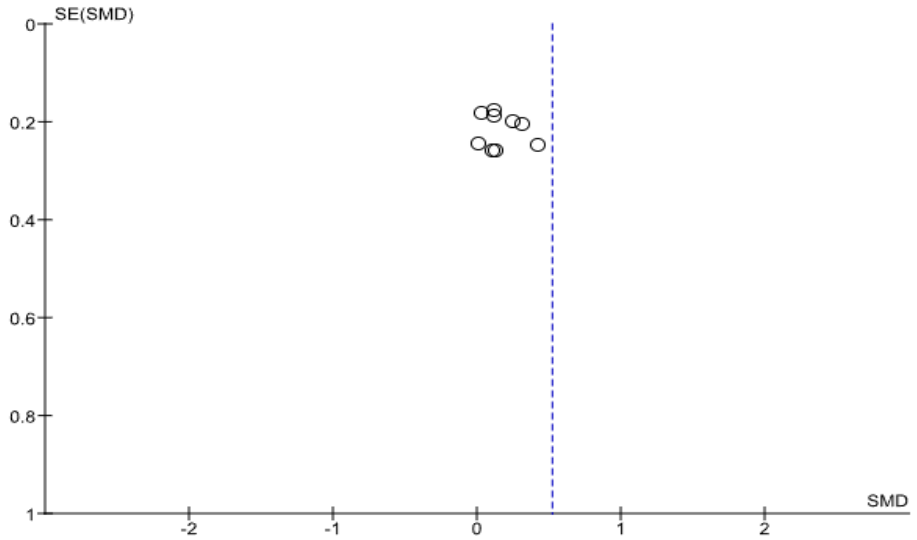

Figure 5. Funnel plot of Baby Massage on Body Weight

1. The effect of baby massage on sleep quality

a. Forest plot baby massage on sleep quality

Interpretation of the results of the meta-analysis process can be seen through the forest plot. Figure 2 shows as many as 6 articles of baby massage can improve sleep quality compared to other interventions or no intervention. Meanwhile, there was high heterogeneity between experiments (I^2= 94%; p< 0.001). Thus, the Random Effect Model (REM) was used to analyze the data in the forest plot. The results of the analysis of the baby massage intervenetion were found to be -0.70 times having an effect on improving sleep quality compared to other interventions or no intervention, but statistically not significant (SMD 0.70; 95% CI= -0.05 to 1.46; p=0.07).

b. Funnel Plot baby massage on sleep quality

A funnel plot is a plot that represents the approximate size of the effect of each study on the estimate of its accuracy which is usually the standard error. Figure 3 funnel plot of baby massage on sleep quality, shows that there is a publication bias which is characterized by the asymmetry of the right and left plots.

2. The effect of baby massage on body weight

a. Forest Plot baby massage on body weight

Interpretation of the results of the meta-analysis process can be seen through the forest plot. Figure 4 shows as many as 10 articles reporting that baby massage can increase body weight compared to other interventions or not given the intervention. Meanwhile, there was high heterogeneity between experiments (I^2= 90%; p<0.001). Thus, the Random Effect Model (REM) was used to analyze the data in the forest plot. The results of the analysis of the intervention of baby massage obtained as much as -0.52 times the effect of increasing body weight compared to other interventions or no intervention, and statistically significant (SMD= 0.52; 95% CI= 0.08 to 0.96; p= 0.02).

b. Funnel Plot baby massage on body weight

Figure 5 funnel plot of baby massage on body weight, shows that there is a publication bias which is indicated by the asymmetry of the right and left plots.

DISCUSSION

Sleep is a top priority for babies, because at this time neuro-brain repair occurs and about 75% of growth hormone is produced. During sleep, the baby's brain will develop and reach its peak because the body will produce more growth hormone than when the baby is awake. In addition, in the first year the baby's brain will grow 3 times from its birth state or about 80% of the adult brain (Dehghani et al., 2018). Each baby is expected to grow optimally and to achieve optimal growth in infants is the result of the interaction of various interrelated factors, namely genetic, environmental and behavioral factors, as well as useful stimuli or stimulation (Bannet et al., 2013).

One of the most important indicators in assessing growth in infants is to assess the baby's weight (Pitre, 2012). Body weight is the most important anthropometric measure, which is used at every opportunity to check the health of babies in all age groups.

There are many interventions that can be given to babies who have sleep problems and are underweight, one of which is baby massage. This intervention is a non-pharmacological management that is quite often used in managing infant growth and development (Bahrami et al., 2016).

Baby massage is giving a touch to the baby or child's body that is useful for stimulating the growth and development of the baby and as a way to express parental love for their child. Touch and massage therapy in infants has many benefits on the quality of sleep and weight gain of babies. Several mechanisms can explain the basic mechanism of infant massage, including the release of beta endorphins, vagus nerve activity, and serotonin production (Basiri-Moghadam et al., 2015).

There are 6 research articles with randomized controlled trials study design as a source of meta-analysis of the effect of baby massage on infant sleep quality. The forest plot results showed that baby massage could improve infant sleep quality by 0.70 times compared to other interventions or no intervention was given, but it was not statistically significant (SMD 0.70; 95% CI= -0.05 to 1.46; p=0.07).

There are 10 research articles with randomized controlled trials study design as a source of meta-analysis of the effect of baby massage on infant weight. The results of the forest plot show that baby massage can increase baby's weight by 0.52 times and has an effect on increasing baby's weight compared to other interventions or no intervention, and statistically significant (SMD 0.52; 95% CI= 0.08 to 0.96; p=0.02).

The results of this study are in line with Kulkarni et al. (2010) regarding the effect of baby massage on infant sleep quality in Iran. This study states that one of the responses that can be seen if massage is done regularly is the sleep response. Sleep is part of a healing, repair and physiological process that rotates and alternates with longer periods of wakefulness. Achieving good quality sleep is as important for health as recovering from illness. Half of all baby's sleep time is used for active sleep or Rapid Eye Movement (REM) sleep.

This statement is also in line with Sadeh (2012). The study concluded that some babies experienced poor sleep quality. This may be influenced by external factors such as the presence of an uncomfortable environment where the temperature of the baby's room tends to be stuffy and the influence of stimulus from other people or the baby's family. In addition, the baby's activities also affect the quality of sleep where during the day the baby is brought by the mother to move outside the house for a long time so that the baby often wakes up at night and the duration of awakening is more than

1 hour. Fatigue in infants will cause a shortening of the first period of REM sleep.

The results of this study are in line with Kachoosangy & Aliabadi (2011) regarding the Effect of tactile-kinesthetic stimulation on motor development of low birth weight neonates which stated that the results showed that babies who received tactile-kinesthetic stimulation 3 times a day for 10 days showed significant increase in body weight and motor development compared to the control group. It can be concluded that giving baby massage can optimize the development of neonates (Rafii et al., 2020).

This statement is also in line with Rahmatnezhad et al. (2018) where it was concluded that one of the stimuli to optimize the development of neonates is tactile stimulation in the form of massage or touch. Although there was an increase between the control group and the experimental group, the development of neonates in the experimental group was higher.

AUTHOR CONTRIBUTION

Raina Lola Fauzia is the main researcher who selects the topic, searches and collects research data. Uki Retno Budihastuti and Rita Benya Adriani analyze data and review research documents.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

ACKNOWLEDGMENT

The researcher would like to thank the database providers PubMed, Science Direct, Google Scholar and SpingerLink.

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