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The effect of the mother's heartbeat sound on physiological parameters and pain intensity after blood sampling in neonates in the intensive care unit: A randomized controlled clinical trial

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ABSTRACT

Aim: To examine the effect of the mother's heartbeat sound on physiological parameters and pain intensity after blood sampling in neonates in the intensive care unit.

Methods: A randomized controlled clinical trial was conducted on 60 neonates admitted to the intensive care unit. They were assigned to intervention and control groups (n = 30 in each group). The intervention group listened to the mother's heartbeat sound, 10 min before up to 10 min after taking arterial blood samples. Pain intensity was measured every 10 min in 3 steps using the neonatal infant pain scale 10 min before the intervention, immediately after and 10 min after the intervention. At the same time, physiologic parameters including oxygen saturation, respiratory rate, heart rate and mean arterial blood pressure were recorded. Data were analyzed using descriptive and inferential statistics using SPSS.

Results: Listening to the mother's heartbeat sound did not influence on mean arterial pressure in the intervention group. However, it had significant medium to large effects on oxygen saturation and respiratory rate immediately after and 10 min after the intervention. Also, it had a large effect on heart rate immediately after the intervention ($P < 0.05$). Also, significant medium to large effects of the intervention on pain intensity immediately after and 10 min after blood sampling were reported ($P < 0.05$).

Conclusion: The mother's heartbeat sound can be used by nurses as a non-pharmacologic and safe intervention along with routine care in order to reduce suffering and pain in neonates undergoing invasive and painful procedures in the intensive care unit.

1. Introduction

Invasive procedures conducted by clinical nurses on neonates admitted to the intensive care unit including heel blood sampling, respiratory tract suction, peripheral vein path insertion, gastric tube and urinary catheter insertions are painful (Eghbalian and Shalchi, 2014; Marofi et al., 2015). Severity of pain can be from mild to severe in gastric tube insertion procedure (mild pain), heel blood sampling procedure (moderate pain) and spinal cord fluid sampling procedure (severe pain) (Hall and Anand, 2014). Full-term and preterm neonates can feel pain in response to annoying and painful stimuli and uncontrolled pain can impact on neural development. Therefore, painful procedures such as neonates' blood sampling cause psychological trauma and stress to neonates and even impacts on the brain structural development (Maroney, 2003; Sanders and Hall, 2018; WHO, 2010). Painful and stressful stimuli can increase catecholamine release, heart rate, blood pressure and intracranial pressure (Claes et al., 2017; Imani and Moradi, 2016; Azarmnejad et al., 2015). In addition to the reduction of blood oxygen saturation and heart rate it causes acidosis and irregular breathing, increases blood sugar and stimulates the release of inflammatory hormones (Unesi et al., 2014; Marofi et al., 2015). Pain relief during painful procedures can help with the prevention of

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