The Effectiveness of E-Learning in Maternal and Neonatal Health Education: A Systematic Review and Meta-Analysis

Hanieh Asgharian[1,2], Solmaz Ghanbari-Homaie[3],Ahmad Pourabbas[4]

1. PhD student in E-Learning in medical sciences, Department of E-learning, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Medical Education, Educational Development Center, Tabriz University of Medical Sciences, Tabriz, Iran.
3. Medical Education Research Center, Health Management and Safety, Promotion Research Institute, Clinical Research Development Unit of Taleghani Hospital, Tabriz University of Medical Sciences, Tabriz, Iran.
4. Medical Education Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran

Abstract

Background and Objective: E-learning is increasingly used in health professions education, including maternal and neonatal care. This systematic review evaluated the effects of e-learning interventions on knowledge and clinical skills among learners receiving maternal and neonatal health education.

Methods: We searched PubMed, Scopus, ProQuest, Web of Science, Cochrane Library, ERIC, MEDLINE, SID, and Magiran from inception to June 2025. Additional searches were conducted in relevant systematic-review databases, Google Scholar, and grey-literature sources. Two reviewers independently screened studies and assessed risk of bias using RoB 2.0 for randomized controlled trials and the JBI quasi-experimental checklist. Certainty of evidence was assessed using GRADE. Where sufficient quantitative data were available, meta-analyses were conducted using RevMan 5.4 and Comprehensive Meta-Analysis version 4.

Results: Sixteen interventional studies were included, comprising randomized controlled, quasi-experimental, and before-and-after interventions. Interventions included web-based modules, videos, simulations, serious games, mobile applications, and blended learning. In controlled studies, e-learning showed a favorable but non-significant effect on knowledge (SMD = 0.89, 95% CI −0.22 to 1.99; p = 0.12; I^2 = 93%; very low-certainty evidence). For clinical skills, the pooled effect favored e-learning (SMD = 0.43, 95% CI 0.05 to 0.82; p = 0.03; I^2 = 38%; low-certainty evidence). In two uncontrolled before-and-after studies, knowledge improved after e-learning (SMD = 1.108, 95% CI 0.273 to 1.943; I^2 = 88%); very low-certainty evidence, but the absence of a control group and substantial heterogeneity limit causal interpretation.

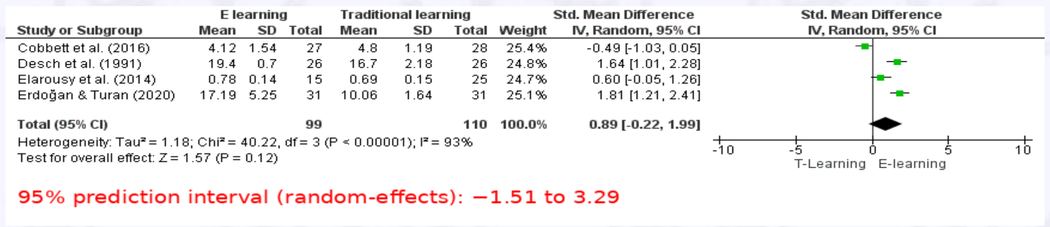


Figure 1: Forest plot of standardized mean differences for knowledge outcomes in controlled studies: e-learning vs. traditional learning. The pooled random-effects estimate is accompanied by an approximate 95% prediction interval.

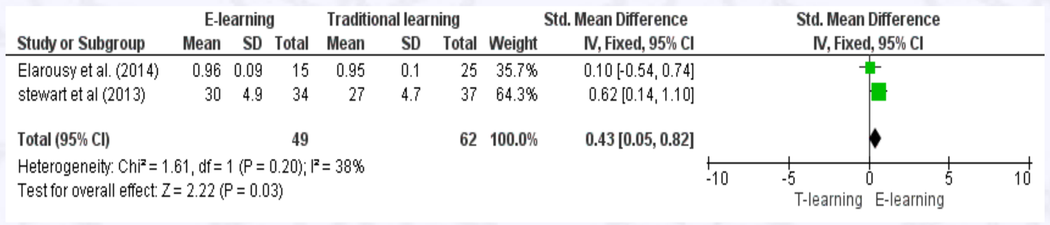


Figure 2: Forest plot of standardized mean differences for clinical skills in controlled studies: e-learning vs. traditional learning.

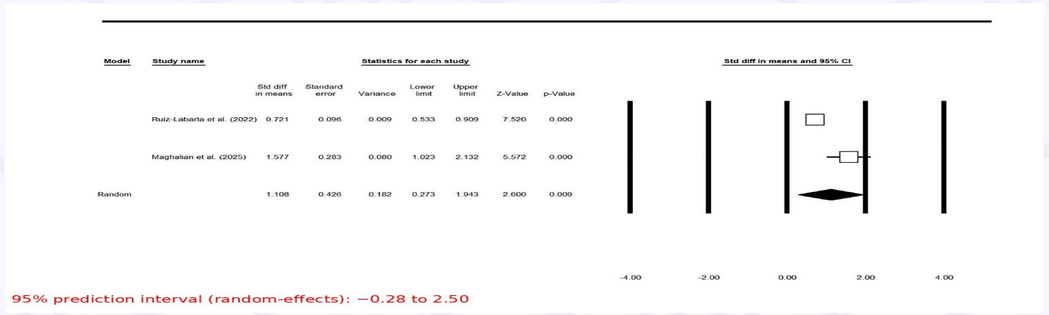


Figure 3: Forest plot for the change in knowledge scores following e-learning intervention in before-and-after studies.

Conclusion: E-learning may improve clinical skills in maternal and neonatal health education (low-certainty evidence), whereas evidence for an advantage in knowledge acquisition is less certain. Interpretation is constrained by substantial heterogeneity, incomplete outcome reporting, risk of bias, and the limited number of studies contributing to each meta-analysis.

Email: Haniehasgh1367@gmail.com