



Kerman University of Medical Sciences and Health Services

**Faculty of Management and Medical Information Sciences Master's
Thesis**

Title:

**Health Technology Assessment of NT Ultrasound for First
Trimester Pregnancy Screening**

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Abstract:

The greatest concern of every woman during pregnancy is ensuring the health of the fetus. Down syndrome is a genetic disorder caused by the presence of all or part of an extra copy of chromosome 21. As the most common non-lethal trisomy, it has become the main focus of genetic screening programs. Nowadays, NT (Nuchal Translucency) ultrasound plays a major role in the diagnosis and management of prenatal conditions. Decision-making regarding the inclusion of new types of ultrasound in prenatal screening programs depends on a comprehensive evaluation of the technology in question. This study aims to assess NT ultrasound using a scientific Health Technology Assessment (HTA) approach. The present research evaluates NT ultrasound technology for first-trimester pregnancy screening.

Methods:

The Health Technology Assessment of NT ultrasound within the broader context of elastography technology for first-trimester screening was conducted in three phases: Phase I (Safety and Effectiveness): Performed through a systematic review and meta-analysis based on the PRISMA framework and PICO criteria. Phase II (Economic Evaluation): Conducted using a cost-benefit analysis approach. Costs were calculated from the societal perspective, and a decision-tree model was used. The outcomes focused on fetal anomalies (Down syndrome) and the cost-benefit ratio (CBR) was computed. Phase III (Ethical, Social, and Organizational Aspects): Explored through interviews and focused group discussions with stakeholders, based on relevant ethical and social frameworks.

Findings:

The estimated average human capital cost was approximately 470,460,000,000 IRR. The average diagnostic cost of Down syndrome per Iranian household was about 36,800,000 IRR, and the average lifetime cost per patient with Down syndrome was estimated at 3,249,900,000 IRR. Based on calculated costs and outcomes: Net Present Value (NPV): 324,868, 946,680 IRR. Cost-Benefit Ratio (CBR): ≈ 28 .

According to the meta-analysis, sensitivity was 95%, indicating high ability to correctly identify positive cases, and specificity was 90.06%, indicating good ability to correctly identify negative cases and avoid false negatives.

Conclusion:

The results of this study show that NT ultrasound, as a non-invasive prenatal screening technology, possesses significant safety and effectiveness in detecting chromosomal abnormalities, particularly Down syndrome. The reviewed evidence demonstrates that this technology has remarkable advantages in terms of clinical efficiency, cost-effectiveness, organizational feasibility, and ethical soundness. Overall, it can be concluded that NT ultrasound is among the most effective, cost-efficient, and ethically grounded technologies in the field of prenatal screening.

Keywords:

Pregnancy, Nuchal Translucency, Down Syndrome, Ultrasound, First Trimester Screening