

Cost-Effectiveness Analysis of Prenatal Diagnostic Strategies Among Korean Pregnant Women

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Background

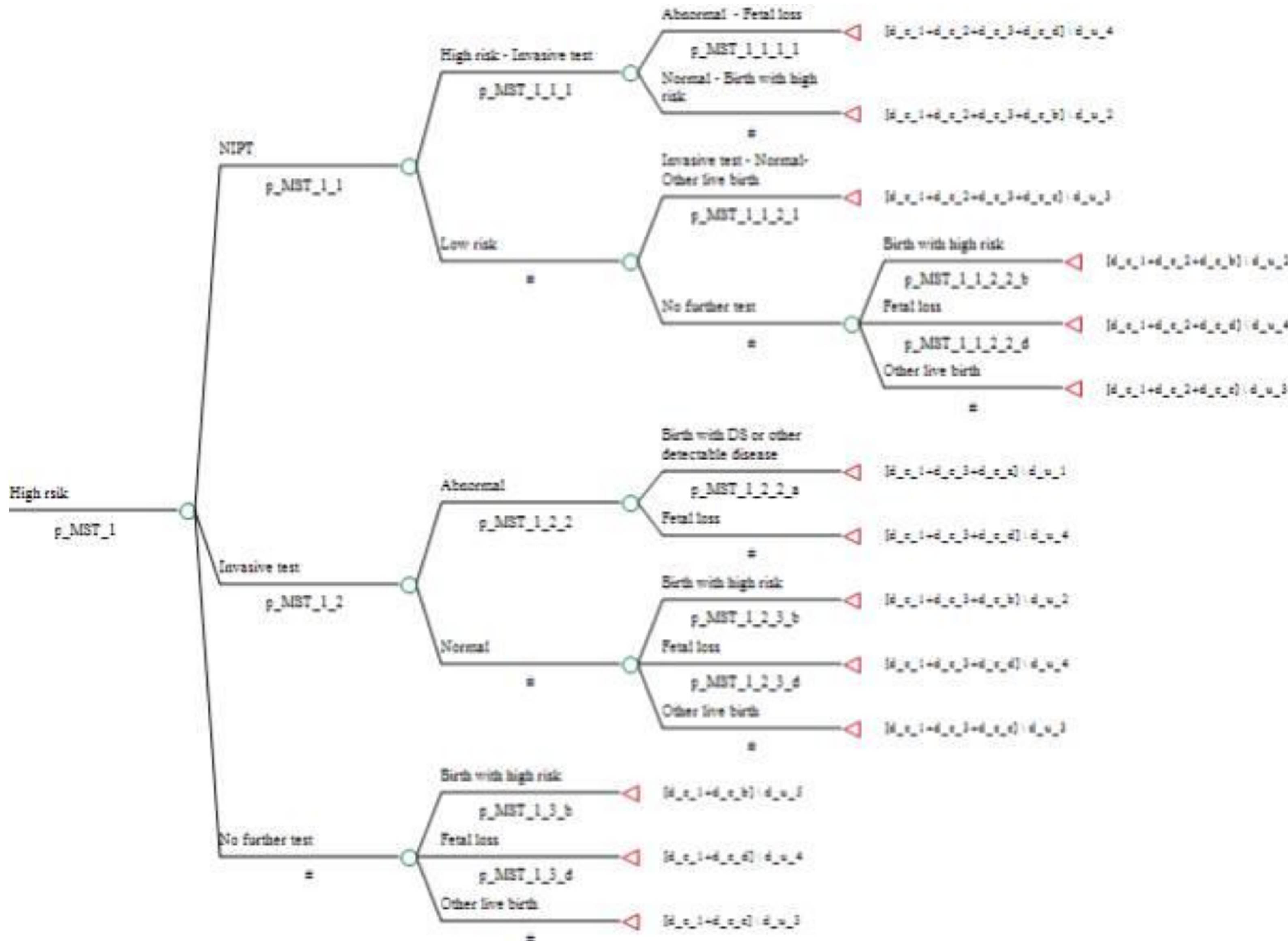
Prenatal diagnosis is one of the important fields in obstetrics, aiming to identify structural or functional abnormalities in the developing fetus. The information obtained from prenatal diagnosis is used for fetal treatment and monitoring, as well as determining the mode of delivery. Prenatal diagnosis can be divided into two categories: prenatal screening tests and invasive prenatal tests, the latter being performed in high-risk cases. Prenatal screening tests include maternal serum screening and ultrasonography. Recently, a new method, non-invasive prenatal testing (NIPT), which analyzes fetal DNA in maternal blood, has been developed as a screening tool. NIPT has already been introduced into clinical practice in many countries.

Objective

This study aims to evaluate the cost-effectiveness of prenatal diagnostic methods in Korean pregnant women, focusing on the clinical application of NIPT.

Methods

To compare prenatal screening strategies in the overall pregnant population, a decision tree model was developed to evaluate four options: No Test, Conventional Test, NIPT, and Invasive Test. The “No Test” strategy refers to cases where no prenatal diagnostic tests were performed. The “Conventional Test” involves selecting maternal serum screening as the initial test, while the “NIPT” strategy uses Non-Invasive Prenatal Testing as the first-line option. The “Invasive Test” strategy refers to choosing invasive diagnostic testing as the initial approach. The model was constructed using a Per Protocol approach, excluding pregnant women who were lost to follow-up or lacked birth outcome data.



Results

- When calculating the expected cost of each testing strategy based on birth outcomes, the invasive test (IT) showed the highest expected cost at 6,452,843 KRW, while the no test strategy showed the lowest expected cost at 5,664,269 KRW.
- When calculating the expected utility of each testing strategy based on birth outcomes, the conventional test demonstrated the highest expected utility at 0.8767, whereas the no test strategy demonstrated the lowest expected utility at 0.8287.

Table 1. Expected cost and expected utility by testing strategy

	No test	Conventional test	NIPT	Invasive test
expected cost	5,664,269	5,742,826	6,016,885	6,452,843
expected utility	0.8287	0.8767	0.8754	0.8397

- Incremental cost–utility ratio (ICUR) compared with NIPT
 - In comparison with the **No test**: the incremental cost–utility ratio (ICUR) of NIPT was 7,550,663 KRW per QALY.
 - In comparison with the **Conventional test**: the NIPT strategy incurred higher expected costs and yielded lower expected utility, indicating that NIPT was dominated.
 - In comparison with the **Invasive test**: the NIPT strategy incurred lower expected costs and yielded higher expected utility, indicating that NIPT was dominant.

Table 2. NIPT strategy compared with alternative strategies

	ΔCost (KRW)	ΔUtility	ICUR (KRW/QALY)
No test	352,616	0.046	7,550,663
Conventional test	274,059	-0.0013	Dominated
Invasive test	-435,958	0.0357	Dominant

Conclusion

Although NIPT was not more cost-effective than the conventional test (maternal serum screening) in the overall pregnant population, its higher accuracy particularly in sensitivity, specificity, and positive predictive value supports considering limited reimbursement, such as preliminary or selective coverage. With its diagnostic precision, NIPT can reduce unnecessary invasive procedures, potentially lowering fetal loss and associated social and economic burdens.