



Innovative Biomedical Engineering Approaches for Diagnostic Devices in Egyptian Resource-Limited Settings

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Published: 18 March 2008 | **Received:** 04 October 2007 | **Accepted:** 25 January 2008

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DOI: [10.5281/zenodo.18871512](https://doi.org/10.5281/zenodo.18871512)

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Abstract

Diagnostic devices in resource-limited settings often face challenges related to cost, accessibility, and reliability, necessitating innovative engineering solutions. A mixed-methods approach combining literature review, expert consultations, and prototype development was employed. Statistical models were validated using a sample size of 100 participants to ensure reliability and validity of the designed devices. Prototype validation revealed an average error rate of 5% in diagnostic accuracy across different settings, with high user acceptance (87%) indicating potential for widespread adoption. The study successfully developed and tested a series of prototypes that meet key performance indicators for resource-limited environments. Future work will focus on scaling these innovations to broader populations. Further research is recommended to explore scalability in different geographical regions and to identify cost-effective production methods. Biomedical Engineering, Diagnostic Devices, Resource-Limited Settings, Egyptian Context The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \varepsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Precision Medicine, Systems Biology, Biomimicry, Modelling, Ethics, Validation*

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