Editorial Letter **Open Access**

Toll-like Receptors and Artificial Intelligence in Fertility Management: Clinical Research Snapshot in United States of America and Asia-Pacific India Genetic Landscapes

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Abstract

Dissecting the intricate "maternal-fetal immune cross-talks" in the complex etiopathogenesis of reproductive endocrinology disorders primarily Mycobacterium tuberculi mediated female infertility and Chlamydia trachomatis mediated male infertility in genetically disparate susceptible "at-risk" cohorts of heterogeneous population-pools by amalgamating precision-based therapeutic targeting of Ceramide-Wnt/Frizzled-Toll like receptors-autophagy biochemical/metabolic signaling cascades with Artificial Intelligence (AI) offers fascinating healthcare management avenues in timeline-driven pragmatic, evidence-based predictive biomarker development in the Covid-19/Omicron vaccination era.

Keywords: fertility; etiopathogenesis; immune; healthcare; biomarker; reproductive

Introduction

Dissecting the intricate "maternal-fetal immune cross-talks" in the complex etiopathogenesis of reproductive endocrinology disorders primarily Mycobacterium tuberculi mediated female infertility and Chlamydia trachomatis mediated male infertility in genetically disparate susceptible "at-risk" cohorts of heterogeneous population-pools by amalgamating precision-based therapeutic targeting of Ceramide-Wnt/Frizzled-Toll like receptors-autophagy biochemical/metabolic signaling cascades with Artificial Intelligence (AI) offers fascinating healthcare management avenues in timeline-driven pragmatic, evidence-based predictive biomarker development in the Covid-19/Omicron vaccination era [1-4]. Interestingly, CRISPR-Cas genetic bio-engineering is emerging as an enigmatic modulator of complex human diseases including urological and sexually transmitted diseases by using genome editing and detecting specific DNA/RNA sequences to control gene expression warranting future multicentric dynamic collaborations for immuno-inflammatory disease(s)-management in the global Covid-19/Omicron pandemic and Covid-19 vaccination era [5]. In my expert opinion, the disproportionate share of overwhelming psychosexual distress and neuro-behavioral deficits warrants a robust, evidence-based, pragmatic "AI-fertility immunotherapeutic algorithmic precision medicine model" for design of pharmacological scaffolds, novel drugs and clinically validated predictive biomarkers for effective management of STDs and clinical infertility amongst genetically susceptible at-risk cohorts of asymptomatic vs borderline vs symptomatic subsets of varying life-styles, including tobacco-users (smokers/chewers).

During my recent meaningful collaborative discussions with urology-fertility-oncology experts of New York, USA and Lucknow/New Delhi, India, I gained critical insights in the AI algorithms and sophisticated predictive nomograms for precision-based image-quality and time-lapse real-time embryo-morpho kinetics immune-diagnostic assessment(s) of the hypoxic, vascular insufficient and inflammatory maternal-fetal microenvironment/ heterogeneous tissue core in the developing fetus and embryonic tissue; AI-fertility management in clinical infertility patients of American and Asian-Indian genetic profiles/ethnicities would eventually lead to evidence-based reproductive outcomes for high-quality treatment and patient-satisfaction on a global platform.

Abnormal endocytosis and cleavage-patterns in embryonic induction, embryogenesis, viral/bacterial infection(s) in female/male infertility may be attributed to alterations in the Toll-like Receptors/Wnt-Frizzled receptors/ Autophagy biochemical/metabolic immune-intersections [6]. Intriguingly, the emergence of AI in fertility-medicine clinical research undoubtedly offers myriad immune-pharmacological opportunities to demystify the

intricacies involved in tobacco-mediated infertility for achieving the "quadruple objective(s)": improving patient experience (enhancing productivity along with efficacy in healthcare delivery); improving population health; transcribing prescriptions, treating patients remotely/virtually, and diminishing per person healthcare expenses [7-10]; and increasing the working conditions of healthcare professionals worldwide.

AI algorithms are extensively used in healthcare, including accuracy-based diagnostics, development of treatment protocols, medication research and therapeutics, customized "tailor-made" treatment regimens, clinical risk-assessment, healthcare data-privacy/security, image quality-analysis, digital health, AI-assisted robotic surgery, and health monitoring/surveillance. Overall, the future years hold tremendous potential for designing a well-defined pragmatic and ethical "AI-TLR-Autophagy-Wnt/CRISPR-Cas Fertility-Immune Genetic Blue-Print" healthcare roadmap for diminishing the overwhelming public health challenge of tobacco-mediated infertility amongst diverse population-pools of genetically mixed ethnicities worldwide.

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