REVIEW ARTICLE

Genetic Testing in Islamic Perspective: Updates and Challenges – A Narrative Review

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ABSTRACT

Background: Genetic testing is a rapidly evolving field with significant implications for healthcare, particularly in Muslim-majority societies where religious, ethical, and cultural values deeply influence medical practices. The high prevalence of hereditary disorders underscores the urgency of aligning genetic advancements with Islamic bioethical and legal principles. This review explores genetic testing through an Islamic lens, aiming to present updated insights, examine ethical and social challenges, and identify future directions for policy and research. **Methods:** A narrative review methodology was employed drawing from databases such as Semantic Scholar and PubMed. The search strategy targeted Islamic perspectives on genetic testing, focusing on ethics, legal norms, clinical applications, and policy evolution. From 1,032 initial records, 777 were screened, and 251 met the inclusion criteria, with the 50 most relevant articles included in the final analysis. Only peer-reviewed papers discussing human genetics within an Islamic context were considered, excluding those unrelated to religious or ethical dimensions. **Results:** Islamic bioethics grounded in the Qur'an, Hadith, and jurisprudential principles, supports genetic testing for disease prevention and treatment but raises concerns over non-therapeutic applications. Clinical applications like premarital screening and prenatal diagnosis are expanding in Muslim societies, supported by state policies yet met with varied public acceptance due to differing interpretations of religious permissibility. Emerging technologies such as CRISPR have intensified ethical debates, particularly around germline modification and enhancement. Regulatory frameworks vary widely across Islamic countries, ranging from formal fatwas to national guidelines, often lacking cohesion. Issues of informed consent, confidentiality, and culturally competent genetic counselling remain pressing concerns. Key research gaps include limited empirical studies on Muslim minorities in non-Muslim countries, the psychological impact of genetic testing, and the operationalisation of Islamic ethical frameworks in clinical practice. **Conclusion:** Genetic testing in Islamic contexts presents both opportunities and ethical dilemmas. While disease-related applications gain broad acceptance, newer technologies require cautious deliberation. A harmonised, faith-aligned regulatory approach, bolstered by community engagement and culturally sensitive counselling, is essential for ethically responsible integration of genetics into healthcare in Muslim societies.

Keywords:
genetic testing; Islamic perspective; healthcare.

INTRODUCTION

Genetic testing and genomic technologies have significantly transformed modern medicine, offering powerful tools for the prevention, diagnosis, and management of hereditary diseases. In Muslim-majority societies, the integration of these innovations into clinical and legal practices must be carefully evaluated through the lens of Islamic bioethics, which is rooted in the Qur'an, the Hadith, and the principles of Islamic jurisprudence (Aqeel, 2007; Shabana, 2022). Applications such as preimplantation genetic testing (PGT), premarital screening, and the use of genetic evidence in legal proceedings raise important questions concerning the sanctity of lineage, the protection of life, and the preservation of individual and familial rights (Arijo, 2020; Shoaib, 2024).

The emergence of advanced techniques including polygenic testing and embryo selection for non-medical traits such as intelligence or physical characteristics has intensified ethical scrutiny. Although some procedures may initially appear to align with Islamic teachings, deeper analysis often reveals concerns related to intention (*niyyah*), certainty (*yaqin*), harm prevention (*darar*), and societal norms (*'urf*) (Chin et al., 2023; Shabana, 2022). These debates are further complicated by the rapid pace of biotechnological development, diversity in scholarly

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interpretations, and the need for localised ethical guidance that respects both religious doctrine and community well-being (Amalia & Hilmi, 2024; Shanti et al., 2015; Muhsin et al., 2023; Sachedina, 2020). Against this backdrop, clarifying why genetic testing requires careful examination from an Islamic perspective becomes essential. Many Muslim-majority countries such as Saudi Arabia, Malaysia, Iran, Pakistan, and those in the Gulf are expanding national genomic screening initiatives, driven by factors including high rates of consanguinity, public health priorities, and developing legal and regulatory structures (Alkuraya, 2014; Tadmouri et al., 2009). At the same time, Muslim diaspora communities in Europe and North America face their own set of ethical and legal challenges as they engage with biomedical systems shaped by secular norms and differing regulatory expectations (Ghaly, 2012; Padela & Auda, 2020).

As Muslim communities confront the implications of these technologies, a nuanced understanding is required. Especially the one that harmonises scientific progress with religious values. This paper provides an updated examination of genetic testing within Islamic contexts. It explores the application of Islamic ethical principles to emerging technologies, highlights the legal and social challenges associated with their use, and identifies areas where ongoing dialogue, research, and policy development are essential. Through an interdisciplinary approach, the review seeks to contribute to the evolving discourse on how biomedical innovation can be ethically implemented in a manner that remains faithful to Islamic moral and legal traditions.

METHODS

Study Design

This study adopted a narrative review design to examine the ethical, legal, and social implications of genetic testing from an Islamic perspective. The review aimed to consolidate current knowledge, identify thematic patterns, and highlight policy and research gaps relevant to Muslim populations.

Data Sources and Search Strategy

A structured search was conducted using Consensus AI across three primary academic databases: PubMed, Scopus, and Semantic Scholar. Literature published in English between 2000 and 2024 was considered. Search terms included *"genetic testing"*, *"Islamic bioethics"*, *"Shariah"*, *"Muslim ethics"*, *"premarital screening"*, *"genomic policy"*, and *"Islamic law and healthcare"*. Additional articles were retrieved through manual searches of bibliographies from key publications and relevant policy reports.

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they:

- Addressed genetic testing or genomics in relation to Islamic ethics, law, or socio-cultural contexts.
- Discussed clinical, ethical, or regulatory implications relevant to Muslim-majority populations.
- Were peer-reviewed original research, reviews, or recognized policy documents.

Studies were excluded if they:

- Focused solely on laboratory techniques or molecular genetics without reference to Islamic perspectives.
- Did not involve Muslim populations or lacked relevance to Islamic frameworks.
- Were non-English language or lacked full-text access.

Study Selection and Data Extraction

All identified titles and abstracts were screened for relevance as mentioned in Figure 1. A full-text review was performed on potentially eligible articles. A standardised data extraction form was used to collect information on study objectives, methodology, population or context, key findings, and relevance to Islamic bioethical principles.

Figure 1: Flow diagram of literature search using *Consensus AI Tools*

Data Synthesis

A thematic synthesis approach was utilised. Both inductive and deductive coding methods were applied to categorise findings into thematic domains such as:

- Religious and legal frameworks
- Premarital and prenatal testing
- Community perceptions
- Regulatory approaches
- Emerging technologies and ethical challenges

Quality Appraisal

Included studies were appraised for relevance and methodological rigor using adapted qualitative review criteria suitable for ethical and sociocultural literature.

RESULTS AND DISCUSSION

Recent literature highlights both the rapid advancement and the complex challenges of genetic testing within Islamic contexts. The findings in Table 1 synthesises key themes from recent research, focusing on ethical, legal, and social dimensions, as well as community attitudes and policy developments.

Table 1: Key Themes in Genetic Testing from an Islamic Perspective

Theme	Key Findings	Citations
Ethical/Religious Issues	Disease prevention supported; non-medical enhancement controversial	(Chin et al., 2023; Khan & Konje, 2019; Muhsin et al., 2023; Amalia & Hilmi, 2024)
Legal Regulation	Varies by country; trend toward integrating ethics into law	(Novikova, 2019; Al-Aqeel, 2005)
Social Implications	High consanguinity rates; premarital screening growing; concerns about stigma/discrimination	(Shanti et al., 2015; Zhong et al., 2018)
Community Attitudes	Support for health-related testing; hesitancy for controversial uses	(Muhsin et al., 2023; Zhong et al., 2018; Sulaiman, 2018)
Counselling and Education	Need for culturally/religiously sensitive counselling and public education	(Shanti et al., 2015; Zhong et al., 2018)
Emerging Technologies	Therapeutic gene editing cautiously accepted; enhancement and sex selection opposed	(Chin et al., 2023; Muhsin et al., 2023; Amalia & Hilmi, 2024)
Policy/Implementation	Regulatory gaps; need for harmonised guidelines; access issues	(Novikova, 2019; Zhong et al., 2018; Al-Aqeel, 2005)

Ethical, Legal, and Social Issues

Islamic bioethics generally supports genetic testing for disease prevention and treatment, provided it aligns with Shariah principles such as the preservation of life and lineage. However, the use of genetic technologies for non-medical enhancements (e.g., intelligence, physical traits) is widely viewed as inconsistent with Islamic law and raises significant ethical concerns (Chin et al., 2023; Khan & Konje, 2019; Muhsin et al., 2023; Amalia & Hilmi, 2024). A critical ethical concern is informed consent which is foundational to ethical biomedical practice but presents unique challenges in many Muslim-majority contexts. While Islam encourages the pursuit of knowledge and individual accountability, cultural norms such as family-centered decision-making, gender dynamics, and varying levels of health literacy can complicate the process. For example, patients may defer decisions to family elders or male guardians, particularly in more conservative settings, which may limit their autonomy. Furthermore, language barriers, limited access to genetic counselling, and insufficient understanding of complex genomic concepts can hinder truly informed decision-making. Scholars have argued for culturally sensitive consent models that respect

Islamic values while promoting patient autonomy and understanding (Alahmad et al., 2018). In terms of legal regulation, Middle Eastern countries vary in their legal approaches, with some developing national guidelines and others relying on fatwas or local customs. There is a trend toward integrating ethical standards into legal norms, with some countries drafting new laws or updating existing regulations to address genomics and genetic testing (Novikova, 2019; Al-Aqeel, 2005).

As for social Implications, high rates of consanguinity in many Islamic societies increase the prevalence of genetic disorders, making premarital and prenatal genetic screening particularly relevant. For example in Pakistan, β-thalassaemia (β-thal) trait prevalence is estimated at 5–7%, amounting to more than 10 million carriers nationwide. Each year, roughly 5,000 children are newly diagnosed with β-thalassaemia major (β-TM), placing a considerable and continuing burden on affected families and on the national healthcare system (Khaliq, 2022). In the Gulf Cooperation Council (GCC) region, the pattern of haemoglobinopathies is equally concerning: the prevalence of sickle cell disease (SCD) ranges from 0.24% to 5.8%, while the sickle cell trait is reported at rates between 1.02% and 45.8%. Consanguineous marriage remains an important contributing factor, heightening the risk of children being affected by haemoglobinopathies (Abu-Shaheen et al., 2022). Although premarital genetic testing is increasingly accepted and even mandated in some countries, concerns remain about privacy, stigma, and the potential for discrimination (Shanti et al., 2015; Zhong et al., 2018; Sulaiman, 2018).

Community Attitudes and Counselling

Many Muslims express support for genetic testing when it is used for health-related purposes, particularly in the prevention and management of hereditary conditions. However, hesitancy arises when such procedures intersect with religious sensitivities, especially in cases involving pregnancy termination or non-medical sex selection. These attitudes are influenced by a combination of religious beliefs, cultural traditions, and varying levels of genetic literacy across communities (Muhsin et al., 2023; Zhong et al., 2018; Sulaiman, 2018). In this context, genetic counselling plays a vital role in facilitating informed and ethically sound decision-making. Despite its importance, challenges persist in ensuring that counselling practices are culturally appropriate and aligned with Islamic ethical values. Furthermore, there is a pressing need for broader public education to correct misconceptions, enhance awareness, and empower individuals to make decisions that are both medically sound and religiously informed (Shanti et al., 2015; Zhong et al., 2018).

Emerging Technologies and Ongoing Debates

Emerging technologies such as CRISPR gene editing and polygenic embryo selection have sparked significant ethical debate within Islamic discourse. While gene editing is generally considered permissible for therapeutic purposes, Islamic scholars strongly caution against germline modifications and enhancements that may fundamentally alter human nature or contravene the principle of not "changing what Allah has created" (Chin et al., 2023; Amalia & Hilmi, 2024). Similarly, the application of preimplantation genetic testing (PGT) for non-medical sex selection or the pursuit of socially desirable traits, such as intelligence or physical appearance, is widely viewed as problematic. Such practices raise serious concerns regarding gender imbalance, equity, and social justice, and are generally not supported within Islamic bioethical frameworks (Chin et al., 2023; Muhsin et al., 2023).

From the perspective of Islamic bioethics, these discussions rest on core principles such as the preservation of life (*ḥifẓ al-nafs*), the safeguarding of lineage (*ḥifẓ al-nasl*), and the avoidance of harm (*darʾ al-mafāsid*). Within the framework of the *maqāṣid al-sharīʿah*, these principles help guide ethical judgement by emphasising the protection of human dignity, the prevention of harm, and the maintenance of familial and generational integrity. As a result, emerging genetic technologies are considered not only in terms of their potential medical benefits but also through their wider moral, social, and theological consequences.

Policy and Implementation Challenges

The regulatory landscape for genetic testing across Islamic countries is marked by fragmentation, with a lack of unified frameworks leading to inconsistencies in policy development and clinical practice. This regulatory gap has prompted calls for harmonised guidelines that can balance the ethical imperatives of Islamic teachings with the realities of scientific advancement (Novikova, 2019; Al-Aqeel, 2005). In addition to regulatory challenges, issues of access and equity persist, particularly in low- and middle-income Islamic countries where resource limitations, a shortage of trained professionals, and persistent social stigma hinder the widespread availability and acceptance of genetic services (Zhong et al., 2018).

Research Gaps

Despite progress, gaps persist in empirical research on community attitudes, the impact of genetic counselling, and the development of unified regulatory frameworks. There is also limited research on the practical implementation of Islamic bioethical principles in clinical settings and on the perspectives of minority Muslim populations in non-Muslim-majority countries as stated in Figure 2.

Topic/Outcome	Premarital Screening	Prenatal Diagnosis	Gene Editing	Community Attitudes	Policy/Regulation
Disease Prevention	12	10	2	4	6
Non-medical Enhancement	1	GAP	3	2	1
Ethical/Legal Analysis	5	6	8	3	7
Counseling Practices	7	5	GAP	6	2
Minority/Migrant Populations	2	1	GAP	2	1

Figure 2: Matrix of Research Topics and Study Attributes generated using *Consensus AI Tools*

CONCLUSION

Genetic testing in Islamic contexts offers important benefits for disease prevention but also raises ethical, legal, and social concerns that must be addressed in accordance with Islamic values. Continued collaboration among scholars, healthcare professionals, and policymakers is essential to ensure that these technologies are applied responsibly and respectfully within Muslim communities.

Future research should focus on how Muslim minorities in non-Muslim-majority countries experience genetic testing and counselling, the long-term social and psychological effects of mandatory premarital screening, and practical ways to apply Islamic bioethical principles in clinical and policy settings. These areas of inquiry, together with broader longitudinal and empirical research aimed at filling existing gaps in the literature, are vital for creating healthcare approaches that are both effective and culturally appropriate.

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