

Ethical and Shariah Considerations in Contemporary Genetic Practices: Where Should the Limits Be? A Thematic Analysis

Nik Hassan NN^a, Sasongko TH^b, Yaacob NM^c, Bakar M^a

^aSchool of Health Sciences, Health Campus, Universiti Sains Malaysia, Kelantan, Malaysia

^bInstitute for Research, Development, and Innovation, IMU University and Department of Human Biology, School of Medicine, IMU University, Kuala Lumpur, Malaysia

^cBiostatistics and Research Methodology Unit, School of Medical Sciences, Universiti Sains Malaysia Health Campus, Kelantan, Malaysia

ABSTRACT

INTRODUCTION: Rapid advances in genetic technology have improved the diagnosis and treatment of genetic diseases but also raise ethical and *Shariah* concerns, particularly regarding human intervention in *fitrah*, genetic manipulation, and unclear *fiqh* guidance. This study explored the ethical and *Shariah* considerations in contemporary genetic practices based on the views and experiences of respondents involved in genetic issues within the context of Muslims in Malaysia. **MATERIALS AND METHODS:** A qualitative approach using semi-structured interviews was employed, with data analysed through inductive thematic analysis. **RESULTS:** Three themes were identified: *Shariah* limits in genetic technology, ethical concerns regarding genetic manipulation, and the need for contemporary *fiqh* guidelines. Acceptance of genetic practices was influenced by legal clarity, concerns about exceeding human *fitrah*, uncertainty regarding long-term consequences, and the potential misuse of genetic technology. **CONCLUSION:** The findings highlight the need for greater integration of genetic science, ethics, and *Shariah* in addressing contemporary genetic issues. This study provides empirical insight into gaps in practical *fiqh* guidance and offers a foundation for developing context-sensitive ethical and *Shariah* frameworks aligned with ongoing scientific developments.

Keywords

genetic ethics, *Shariah*, genetic manipulation, contemporary *fiqh*, thematic analysis

Corresponding Author

Dr. Mujahid Bakar
School of Health Sciences, Health
Campus, Universiti Sains Malaysia,
Kelantan, Malaysia
E-mail: mujahid@usm.my

Received: 2nd February 2026; Accepted: 27th
July 2026

Doi:
<https://doi.org/10.31436/10.31436/imjm.v25i04/3188>

INTRODUCTION

Rapid advances in genetic science have improved the diagnosis, prevention, and treatment of genetic diseases, with technologies such as genetic screening, prenatal diagnosis, and gene manipulation offering substantial clinical benefits.¹⁻³ However, interventions that alter fundamental aspects of human life raise complex ethical and moral concerns.^{4,5} In the context of Muslims, their acceptance is assessed not only by clinical effectiveness but also through *Shariah* and religious values.^{6,7}

Central to this evaluation are two related concepts: *taghyir khalqillah* (changing God's creation), which concerns the legitimacy of altering creation, and

exceeding *fitrah*, which concerns whether biotechnology may distort divinely endowed human nature.^{8,9} The treatment–enhancement distinction further differentiates therapeutic from non-medical interventions, together forming ethical limits on genetic manipulation.^{9,10} As *fitrah* is regarded as divinely endowed and stable, excessive alteration may threaten the intended material-spiritual human constitution.^{8,9} Yet the boundary between permissible therapeutic restoration and illegitimate enhancement remains poorly defined in classical *fiqh* and contemporary scholarship.^{3,10,11}

In Malaysia, *fatwa* governance operates at national and state levels through the National Fatwa Committee of the National Council for Islamic Religious Affairs Malaysia (MKI) and respective state *fatwa* committees.^{12,13} MKI coordinates expert deliberation under the Department of Islamic Development Malaysia.^{13,14} Existing biomedical *fatwas* remain largely case-specific: embryonic stem-cell research is permitted only up to 14 days post-fertilisation,¹³ while the 120-day ensoulment threshold guides abortion decisions for severe foetal anomalies, although late detection can create clinical uncertainty.^{5,15} Genetic modification is generally accepted for therapeutic purposes but not cosmetic enhancement or selection of socially desirable traits.^{3,6} MKI rulings on genetically modified food similarly involve weighing benefit (*maṣlaḥah*) and harm (*mafsadah*).^{16,17} Nevertheless, specific operational guidance for emerging technologies such as CRISPR-Cas9 and polygenic testing remains limited.^{16,18}

Global Islamic discourse on genetics remains dominated by normative legal analysis using *Maqāṣid al-Shari'ah* and "five rulings" (*al-aḥkām al-khamsa*), with limited philosophical engagement with scientific transformation.^{9,10} The International Islamic Fiqh Academy has been criticised for a technical medical outlook,⁹ while its 2019 CRISPR-Cas9 resolutions were largely reactive rather than providing a proactive distinction between germline and somatic editing.¹⁹ Similarly, *Dār al-Iftā' al-Miṣriyyah* rulings emphasise therapeutic potential but leave concepts such as *ḍarar* and *maṣlaḥah* insufficiently defined.⁹ Key gaps include limited scientific literacy in juristic assessment,⁹ insufficient clinical specificity regarding the treatment-enhancement distinction,^{3,10} and weak methodological integration between jurists and scientists.⁹ These gaps contribute to uncertainty in cases such as severe foetal anomalies detected beyond 120 days.¹⁵ Global discourse also insufficiently addresses challenges relevant to Malaysian Muslims, including consanguinity and uneven healthcare training.^{20,21} Addressing these limitations requires empirical attention to stakeholder experiences

in specific clinical and cultural settings,^{3,9} particularly in Malaysia, to support interdisciplinary bioethical frameworks and dialogue among medical, scientific, and religious authorities.^{3,22} Such integration is needed for proactive guidance responsive to local social and religious requirements.²²

Accordingly, this study examines the ethical and *Shariah* dimensions of contemporary genetic practices in the Malaysian Muslim community by: (1) defining *Shariah* boundaries between therapeutic treatment and genetic enhancement; (2) examining clinical and operational challenges arising from the absence of proactive *fiqh* guidance for CRISPR-Cas9 and prenatal screening beyond the 120-day threshold; and (3) identifying requirements for an integrated interdisciplinary bioethical framework linking scientific innovation with *Shariah* principles in Malaysia.

MATERIALS AND METHODS

Study Design

This study used a qualitative design to explore ethical and *Shariah* considerations in genetic practices and to understand the meanings and interpretations of respondents regarding complex genetic issues.²³⁻²⁵ This design enabled contextual examination of their experiences and concerns in relation to *Shariah* limits, ethical dilemmas of gene manipulation, and the need for contemporary *fiqh* guidance.²⁶⁻²⁸

Thematic Analysis Approach

Inductive thematic analysis was used to identify recurring patterns of meaning in the interview data without imposing a pre-established theoretical framework. Explicit and implicit meanings were systematically examined to develop themes reflecting the ethical and *Shariah* dimensions of genetic practices.²⁹

Study Respondents

The study included 23 respondents (n=23), purposively selected for relevant professional, scholarly, policy, advocacy, or lived experience in contemporary genetic

practices and their ethical or *Shariah* dimensions within the context of Malaysian Muslims. Respondents represented medical practitioners, clinical geneticists, one genetic counsellor, *Shariah* scholars and *fatwa*-related experts, patient/NGO and parent advocacy representatives, and policymakers. This diversity captured clinical, religious, ethical, policy, and lived-experience perspectives. Clinical geneticists were distinguished from general medical practitioners because of their specialised expertise in genetic counselling, diagnosis, and genomic analysis. Table I presents the demographic and professional characteristics of the respondents in aggregated form to preserve confidentiality.

Table I. Characteristics of the Study Respondents (n = 23).

Characteristic	Category	n
Stakeholder category	Medical practitioners	5
	Clinical geneticists	4
	Genetic counsellor	1
	<i>Shariah</i> scholars, Muftis and <i>Fatwa</i> officers	7
	Policymakers	2
	Representatives from patient associations, non-governmental organisations (NGOs), and parent advocacy groups	4
Professional experience (years)	10–19	5
	≥ 20	18
	Universities	7
	Hospitals	4
Institution type	Religious authorities	5
	Government agencies	2
	Patient organisations / NGOs	4
	Private genetic services	1

Note. Respondents were purposively selected to represent key stakeholder groups involved in contemporary genetic decision-making within the Malaysian Muslim context. Respondent characteristics are presented in aggregated form to preserve confidentiality. Gender and detailed institutional affiliations were not reported because they were not relevant to the study objectives and, when combined with specialised stakeholder groups, could increase the risk of indirect respondent identification. *n* = number of respondents.

The adequacy of the 23-interview sample was assessed using information power, whereby sample sufficiency depends on the relevance, specificity, and richness of information rather than a fixed numerical target.³⁰ Given respondents’ specialised expertise and the focused study aims, the interviews provided sufficient information power to identify recurring patterns and meaningful

variations.³⁰ This supported a holistic interpretation of the complex socio-religious discourse surrounding genetics.³¹

Data Collection

Data were collected through semi-structured interviews conducted face-to-face or via digital platforms according to respondent preference. Researchers experienced in qualitative inquiry used an open-ended interview guide to explore genetic technology, ethical concerns, and *Shariah* considerations.³² Interview duration varied according to discussion depth and respondent availability. Interviews were conducted in Malay, English, or both, recorded with consent, and transcribed verbatim before analysis.

Data Analysis Process

Data analysis involved repeated reading of transcripts, identification of meaningful units, and grouping related codes into subthemes and broader themes. Themes and subthemes were repeatedly reviewed against the original data to ensure interpretive accuracy, and theme names were selected to reflect respondents’ shared meanings. Selected quotations requiring translation were translated into English while preserving meaning, tone, and contextual nuance. Where necessary, translations were checked against the original transcripts and thematic analysis table for consistency. No qualitative data-analysis software was used; coding, theme development, and review were conducted manually.

RESULTS

Thematic analysis of interviews with 23 respondents identified three themes concerning ethical and *Shariah* considerations in genetic practices: boundaries of genetic technology, ethical dilemmas of manipulation, and gaps in contemporary Islamic jurisprudence.²⁹ Despite the small sample, the specialised exposure of respondents to genetic ethics provided sufficient information power to capture recurring patterns and meaningful variations relevant to the focus of the study.³⁰

Shariah Limits in Genetic Technology

This theme reflects respondents' view that advances in genetic science require *Shariah* guidance, as technological feasibility does not necessarily imply moral permissibility when interventions affect the sanctity and dignity of human creation.

Need for Shariah Boundaries in the Use of Genetic Technology

Respondents viewed genetic technology as requiring systematic regulation to prevent arbitrary application.³³ A central concern was preserving the "physical and functional boundaries of human agency."³⁴ Without religious guidance, such interventions may risk violating the "best form" (*absan taqwim*) intended by Allah.⁹ As one respondent stated in File 2-07: "*Genetic technology cannot be used arbitrarily; there must be boundaries from the Shariah perspective.*"

Concerns about Departing from Human Fitrah

Respondents expressed concern that departing from *fitrah* could move genetic intervention beyond therapeutic restoration, distorting the spiritual essence and the "uniqueness of human creation."^{9,35} Excessive intervention was also perceived as risking forms of human existence that diverge from the divinely intended material-spiritual constitution.⁹ As one respondent noted in File 1-04: "*I am worried if this genetic technology ends up changing the original human creation.*"

Legal Assessment as the Basis for Technology Acceptance

Respondents' acceptance of genetic technology depended on clear *Shariah*-based determinants (*dawabit Shar'iyah*).⁹ Confidence was linked to benefit-harm assessment (*maslahah-mafsadah*), rather than scientific feasibility alone, as a basis for ensuring interventions remain within Islamic legal objectives.³ As stated in File 3-03: "*If the law is clearly permitted, then I feel confident to accept that technology.*"

Ethical Doubts Regarding Gene Manipulation

This theme reflects the uncertainty of the respondents about the ontological and clinical implications of human genome manipulation, particularly the tension between therapeutic potential and preserving human nature.

Uncertainty of Long-Term Implications of Gene Manipulation

Respondents voiced concern about the "remote and unpredictable consequences" of genetic editing.³⁹ They perceived that a single genetic alteration could have wider effects on biological and spiritual integrity, making long-term uncertainty both a scientific and moral concern.³⁶ As stated in File 2-04: "*The long-term effects of this gene manipulation we ourselves do not yet know.*"

Conflict between Treatment Needs and Moral Considerations

Respondents distinguished therapeutic restoration from enhancement.¹⁰ They were generally open to treating disease but resisted interventions targeting non-medical or socially desirable traits.^{3,34} This tension reflected a balance between clinical benefit and concerns about "tampering" with divine creation.³ As one respondent in File 3-03 noted: "*From a treatment perspective, it may help, but from a moral perspective, I am still doubtful.*"

Concerns about the Misuse of Genetic Technology

Beyond clinical use, respondents raised concerns about the commercial or political misuse of genomics and its implications for the "security of peoples."⁹ Inadequate ethical control could enable uses that conflict with humanitarian and religious values and undermine human dignity.³⁵ These concerns highlight the need to prevent weaponised or exclusionary applications. As stated in File 1-04: "*Afraid that this genetic technology will be misused for unethical purposes.*"

Need for Contemporary Fiqh Guidelines

The final theme highlights substantive and methodological gaps in contemporary Islamic discourse, particularly the lack of specific and authoritative *fiqh*

references responsive to rapid biotechnological developments.

Lack of Specific Fiqh References on Genetics

Respondents noted that existing juristic rulings (*ahkām fiqhīyya*) often address immediate questions without providing a comprehensive philosophical perspective on genetics.⁹ The lack of specific, codified guidance contributes to uncertainty regarding emerging technologies such as polygenic testing,^{3,10} while the absence of a unified reference complicates ethical and legal navigation. File 2-07 similarly indicated that specific *fiqh* guidelines on genetics remain absent.

Reliance on Individual Opinions without Official Guidelines

In the absence of clear institutional *fatwas*, respondents described reliance on personal interpretations as inconsistent and risky. Such “instrumental considerations,” focused mainly on body and disease, may overlook broader dimensions of *maslahah* and *ḍarar* (*harm*), which are integral to Islamic bioethics.⁹ Without official guidance, subjective bias in clinical decision-making may increase.³⁷ As noted in File 2-04: “*Sometimes decisions are made based on one's own opinion because there is no clear guidance.*”

Need for New Ijtihad Aligned with Scientific Developments

Respondents supported a dynamic and contextual approach through collective *ijtihad* (*al-ijtihād al-jamāʿī*).⁹ Given the complexity of genomics, multidisciplinary deliberation between religious scholars and biomedical experts was considered necessary to ensure that new rulings are scientifically informed and grounded in *Shariah* principles.⁹ As one respondent in File 3-03 stated: “*This genetic issue requires new ijtihad that aligns with current scientific developments.*”

DISCUSSION

Summary of Main Findings

This study identified three central considerations in genetic practices: *Shariah* boundaries, ethical concerns regarding gene manipulation, and the need for clearer contemporary *fiqh* guidance. Acceptance was shaped by clinical benefit, legal clarity, compatibility with human *fiṭrah*, and concerns about misuse.

Interpretation of Findings

Respondents viewed genetic technology through religious and moral principles rather than as value-neutral. Concerns about *fiṭrah* reflected ontological and theological dimensions beyond clinical considerations, while uncertainty over gene manipulation highlighted tensions between therapeutic benefit and long-term harm.

Comparison with Previous Studies

The findings are consistent with Islamic bioethics scholarship applying *Maqasid Shariah* to contemporary biotechnology. Maqasid-based frameworks have been used to evaluate biotechnological dilemmas through intention, methodology, consequences, benefits, and risks.³⁸ In biotechnology and genetically modified food, these principles emphasise health, preservation of life, and avoidance of harm.³⁹ Their application to genetically modified crops further encompasses the preservation of religion, life, progeny, intellect, and wealth,⁴⁰ while germline editing has been considered permissible for therapeutic purposes when safety and *Shariah* objectives are fulfilled.⁴¹ The present study extends this predominantly normative literature by providing empirical evidence of respondents’ experiences and perceptions of gaps in practical *fiqh* guidance for contemporary genetics.

Implications of the Study

From a professional practice perspective, the findings support explicit ethical and *Shariah*-compliant guidance for genetic decision-making. Robust ethical regulation is

needed to preserve human dignity and prevent premature or inappropriate use of genetic technologies,⁶ while the absence of universally applicable religious guidance may create uncertainty in clinical decision-making.¹⁵ *Shariah*-based assessment before genetic research or therapy, complemented by *Maqasid Shariah* frameworks, may provide a structured basis for addressing such dilemmas.^{9,42}

At the level of policy, Muslim-majority settings require contemporary *fiqh*- and *ijtihad*-informed guidance responsive to developments such as CRISPR-Cas9 and genomics.⁴³⁻⁴⁵ Regulatory gaps across Islamic contexts further reinforce the need for oversight that protects human dignity, fulfils *Maqasid Shariah*, prevents misuse, and enables therapeutic benefit.^{6,15,41}

Education and training should also strengthen engagement with Islamic ethics to improve public understanding and professional competence. *Shariah*-informed awareness and genetic counselling education may help address religious and cultural misconceptions and support principled decision-making in genomics and precision medicine.⁴⁶

Islamic Legal and Bioethical Interpretation of the Findings

The findings from 23 specialised respondents provide substantial information power by extending beyond normative legal analysis to the lived complexities of genetic technology.³⁰ Interpreted through Islamic legal theory, these findings highlight the interplay between preserving human nature, preventing biological harm, and promoting public interest in the context of genomics among Muslims in Malaysia.

Maqasid al-Shariah and the Preservation of Human Fitrah

The concern about departing from human *fitrah* can be interpreted through *Maqasid al-Shariah* as relating to the protection of *al-Din* (religion) and *al-Nafs* (life).^{48,49} Preservation of *al-Din* includes safeguarding the divinely intended human form described as the “best form”

(*absan taqvim*).³ *Fitrah* has also been characterised as a stable ontological disposition distinct from *tabi'ah*, or biological traits open to alteration.⁸ This distinction helps explain respondents' concern that genetic manipulation could affect the spiritual and material constitution associated with *fitrah*,⁸ including fears of changing the “original human creation” (File 1-04), which aligns with protecting the individual's spiritual essence.⁵⁰

Islamic bioethical permissibility likewise depends on fulfilling these higher objectives.⁴⁰ Accordingly, interventions perceived to threaten the “uniqueness of human creation” may challenge the sanctity of life as a divinely endowed trust,³⁵ reinforcing the need for *Shariah* boundaries in genetic practice.

Applying the Maxim 'Al-Darar Yuzal' to Ethical Uncertainty

Concerns about long-term biological consequences and technological misuse can be interpreted through the *Shariah* maxim *al-darar yuzal* (“harm must be eliminated”).³⁹ *Shariah*-based assessment requires consideration of benefit (*maslahah*) and harm (*mafsadah*),¹⁸ making uncertain and potentially irreversible effects of genetic manipulation ethically significant.⁹ Such uncertainty also relates to the avoidance of *gharar* in matters affecting life and progeny.⁹ Until sufficient clinical certainty (*yaqin*) is established regarding germline modification, a precautionary approach is therefore consistent with protecting future generations from harm.^{3,41}

In Malaysia, the unresolved regulatory and ethical status of CRISPR-Cas9-mediated human germline editing reinforces respondents' concerns about the absence of an operational *fatwa* framework.⁶ Existing scholarship similarly calls for robust ethical guidance and regulation to preserve human dignity and prevent premature use or misuse of the technology.⁶

Collective *Ijtihad* as a Mechanism for *Maslahah*

The findings identify collective *ijtihad* (*al-ijtihad al-jamā'i*) as an important mechanism for realising *maslahah* while addressing tensions between treatment and enhancement. Respondents supported permissible restoration for disease but remained concerned about enhancement (File 3-03), reflecting the need for a dynamic and contextual treatment–enhancement assessment.¹⁰ Collective *ijtihad* enables multidisciplinary deliberation in which scientific expertise informs juristic determinants (*dawābīṭ*).⁹ Similar interdisciplinary dialogue among scientists, medical practitioners, and religious communities has been advocated in the broader regional Muslim context to balance genetic innovation with Islamic ethical values.²² Such deliberation prevents *maslahah* from being reduced to a merely technical medical outlook⁹ and supports structured benefit–harm assessment (*maslahah–mafsadah*) within an interdisciplinary bioethical framework.¹⁸

Synthesis with Global Academic Discourse

The findings extend global Islamic bioethics discourse by empirically supporting reported gaps in interdisciplinary engagement and the treatment–enhancement debate.^{9,10} Respondents' lack of specific *fiqh* references and reliance on individual opinions demonstrate how these gaps arise in practice.¹⁵ International resolutions may therefore remain insufficient for context-specific clinical complexities.⁹

Accordingly, this study proposes an Integrated Ethical and *Shariah* Decision-Making Framework for contemporary genetic practices in Malaysia. Emerging technologies are assessed against ethical concerns and *Shariah* principles, including *Maqāṣid al-Shari'ah*, *Ḥifẓ al-Nasl*, *Fitrah*, *Maṣlahah*, *Ḍarar*, justice, and responsibility.^{9,35} Through *al-ijtihad al-jamā'i* involving clinical, genetic, counselling, *Shariah*, policy, and patient stakeholders, the framework links multidisciplinary deliberation with clinical practice, religious guidance, and policy development.

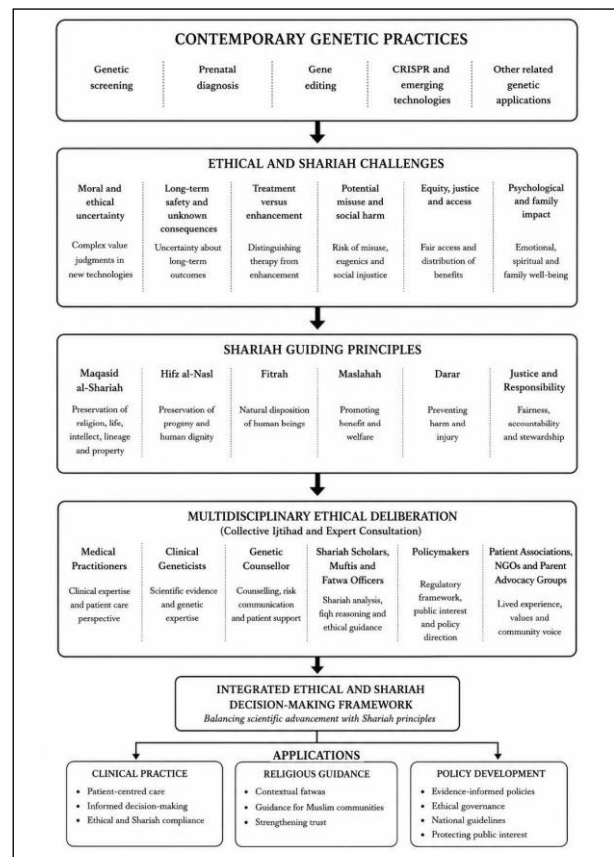


Figure 1: Integrated Ethical and *Shariah* Decision-Making Framework for contemporary genetic practices in the Malaysian Muslim context.

Abbreviations: CRISPR, clustered regularly interspaced short palindromic repeats; NGOs, non-governmental organisations.

STRENGTHS AND LIMITATIONS OF THE STUDY

This study's focused qualitative and thematic approach enabled in-depth exploration of ethical and *Shariah* considerations in genetic practices. Themes and subthemes supported by verbatim quotations enhance analytical transparency and credibility while providing empirical insight into gaps in contemporary *fiqh* guidance. Limitations include the small number of respondents and a scope confined to ethical and *Shariah* dimensions without detailed clinical or technical analysis. Accordingly, the findings are not intended for generalisation but provide a conceptual and empirical basis for future research and development of more comprehensive ethical and *Shariah* guidelines in genetics.

CONCLUSION

Genetic practices in the Malaysian Muslim context require evaluation not only in terms of scientific and clinical benefit but also through ethical and *Shariah* considerations. The findings highlight the importance of *Shariah* boundaries, concerns about genetic manipulation that may exceed human *fiṭrah*, uncertainty regarding long-term consequences, and gaps in contemporary *fiqh* guidance. These gaps may contribute to inconsistent decision-making and reinforce the need for contextual *ijtihad* responsive to scientific developments.

To address these concerns, this study proposes an Integrated Ethical and *Shariah* Decision-Making Framework that links emerging genetic technologies with *Maqāṣid al-Sharīʿah*, *Hijz al-Nasl*, *Fiṭrah*, *Maṣlaḥah*, *Ḍarar*, justice, and responsibility through *al-ijtihad al-jamāʿi* involving relevant clinical, religious, policy, and patient stakeholders. The framework provides a conceptual pathway for clinical practice, religious guidance, policy development, and future research. Although not intended for generalisation, the findings offer an empirical and conceptual basis for developing practical *Shariah*-informed guidance for contemporary genetics.

INSTITUTIONAL REVIEW BOARD (ETHIC COMMITTEE)

Ethical approval was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/15100402). Respondents were informed of the study purpose, data collection procedures, and their rights before providing informed consent. Confidentiality was maintained through coded identifiers without disclosure of personal information. Participation was voluntary, and respondents could withdraw at any time without adverse consequences. No respondents withdrew after providing consent.

ACKNOWLEDGEMENTS

The authors would like to express their sincere appreciation to Ahmad Fakhurrazi Yahya for his valuable assistance in the data collection process. This study was supported by the Ministry of Higher Education (MOHE), Malaysia, under the Fundamental Research Grant Scheme (FRGS), project code FRGS/1/2017/SKK06/USM/02/6.

ARTIFICIAL INTELLIGENCE (AI) STATEMENT

ChatGPT (version 5.2) was used infrequently to improve the grammar and fluency of the text, without contributing to the content or ideas.

REFERENCES

1. Hathout H. An Islamic Perspective on Human Genetic and Reproductive Technologies. *Eastern Mediterranean Health Journal* 2006;12:22–8.
2. Lala I. Germ-Inating Solutions or Gene-Rating Problems: An Islamic Perspective on Human Germline Gene Editing. *Journal of Religion and Health* 2019;59:1855–69. doi.org/10.1007/s10943-019-00770-5.
3. Chin AHB, Al-Balas Q, Ahmad M, et al. Islamic Perspectives on Polygenic Testing and Selection of IVF Embryos (PGT-P) for Optimal Intelligence and Other Non-Disease-Related Socially Desirable Traits. *Journal of Bioethical Inquiry* 2023. doi.org/10.1007/s11673-023-10293-0.
4. Ismayilova PF. Biomedical Issues Necessitating Legal Regulation of Genetics. *Legal Horizons* 2024;18:26–38. doi.org/10.54477/lh.25192353.2023.3.pp.26-38.
5. Ansah EO. Ethical Challenges and Controversies in the Practice and Advancement of Gene Therapy. *Advances in Cell and Gene Therapy* 2022;2022:1–5. doi.org/10.1155/2022/1015996.
6. Ghaly M. Domesticating Genomics in The Arab World: Islamic Religio-ethical Deliberations, 2014. doi.org/10.5339/qfarc.2014.sspp0602.

7. Isa NM, Zulkifli NA, Man S. Islamic Perspectives on CRISPR/Cas9-Mediated Human Germline Gene Editing: A Preliminary Discussion 2019. doi.org/10.1007/s11948-019-00098-z.
8. Sachedina A. Islamic Ethics and The Genome Question. *Journal of Islamic Studies* 2020;32:153–6. doi.org/10.1093/jis/etaa034.
9. Can S. Intervention in Fitrah in The Context of Genetic Intervention and The Problem of Mutability of Fitrah. *Kocatepe İslami İlimler Dergisi* 2025;8:284–93. doi.org/10.52637/kiid.1731716.
10. Shabana A. Between Treatment and Enhancement: Islamic Discourses on the Boundaries of Human Genetic Modification. *Journal of Religious Ethics* 2022;50:386–411. doi.org/10.1111/jore.12404.
11. Noor SN Mohd. Islamic Bioethics: Enhancement. *Oxford Research Encyclopedia of Religion* 2023. doi.org/10.1093/acrefore/9780199340378.013.1158.
12. Aziz MFBA, Morrison M, Kaye J. Regulating Human Stem Cell Research and Therapy In Low- and Middle-Income Countries: Malaysian Perspectives. *New Genetics and Society* 2017;37:2–20. doi.org/10.1080/14636778.2017.1415137.
13. Zabidi T. Analytical Review of Contemporary *Fatwas* in Resolving Biomedical Issues Over Gender Ambiguity. *Journal of Religion and Health* 2018;58:153–67. doi.org/10.1007/s10943-018-0616-0.
14. Awang MD, Yahaya M, Sulaiman MH, et al. Perspectives on The Role of National Fatwa Committee in Handling Food Issues in Malaysia Based on Maqasid Syariah 2023. doi.org/10.26656/fr.2017.6(s3).5.
15. Kalidasan V, Das KT. Is Malaysia Ready for Human Gene Editing: A Regulatory, Biosafety and Biosecurity Perspective. *Frontiers in Bioengineering and Biotechnology* 2021;9:649203–649203. doi.org/10.3389/fbioe.2021.649203.
16. Thong M, See-Toh Y, Hassan J, Ali JSM. Medical Genetics in Developing Countries in The Asia-Pacific Region: Challenges and Opportunities. *Genetics in Medicine* 2018;20:1114–21. doi.org/10.1038/s41436-018-0135-0.
17. Isa NM, Baharuddin A, Man S, et al. Bioethics in the Malay-Muslim Community in Malaysia: A Study on the Formulation of Fatwa on Genetically Modified Food by the National Fatwa Council 2014. doi.org/10.1111/dewb.12057.
18. Ibrahim AH, Harun MS. Applying the Concepts of Benefit and Harm in Malaysian Bioethical Discourse: Analysis of Malaysian Fatwa. *Journal of Bioethical Inquiry* 2024;21:401–14. doi.org/10.1007/s11673-024-10345-z.
19. Al-Shakaki A. Ethical Deliberations on the Gene-Editing CRISPR-Cas9 Designer Babies: Islamic Perspective. *QScience Connect* 2022;2022. doi.org/10.5339/connect.2022.medhumconf.4.
20. El-Hazmi MAF. Ethics of Genetic Counselling-Basic Concepts and Relevance to Islamic Communities. *Annals of Saudi Medicine* 2004;24:84–92. doi.org/10.5144/0256-4947.2004.84.
21. Javaid I, Mannan A, Khan M, et al. Bridging the Gap: Genetic Counseling, Islamic Bioethics, Challenges, and Recommendations. *Indus Journal of Bioscience Research* 2025;3:101–5. doi.org/10.70749/ijbr.v3i6.1525.
22. Amalia AZ, Hilmi N. Etika Pengobatan/Rekayasa Genetik dalam Islam Sebagai Implikasi untuk Terapi Gen dan Teknologi DNA serta Tantangan Kontemporer 2024. doi.org/10.59680/medika.v2i4.1479.
23. Mohajan HK. Qualitative Research Methodology in Social Sciences and Related Subjects. *Journal of Economic Development Environment and People* 2018;7:23–23. doi.org/10.26458/jedep.v7i1.571.
24. Sutton J, Austin Z. Qualitative Research: Data Collection, Analysis, and Management. *The Canadian Journal of Hospital Pharmacy* 2015;68:226–31. doi.org/10.4212/cjhp.v68i3.1456.

25. Al-Busaidi Z. Qualitative Research and its Uses in Health Care. *Sultan Qaboos University Medical Journal* 2008;8:11–9. doi.org/10.18295/2075-0528.2688.
26. Busetto L, Wick W, Gumbinger C. How to Use and Assess Qualitative Research Methods. *Neurological Research and Practice* 2020;2:14–14. doi.org/10.1186/s42466-020-00059-z.
27. Saunders C, Sierpe A, Plessen C von, et al. Practical Thematic Analysis: A Guide for Multidisciplinary Health Services Research Teams Engaging in Qualitative Analysis. *BMJ* 2023;381. doi.org/10.1136/bmj-2022-074256.
28. Korstjens I, Moser A. Series: Practical Guidance to Qualitative Research. Part 2: Context, Research Questions and Designs. *European Journal of General Practice* 2017;23:274–9. doi.org/10.1080/13814788.2017.1375090.
29. Bowden A, Norton K, Griffith GM. Do Trainee Mindfulness Teachers Practice What They Teach? Motivation, Challenges, and Learning Gaps. *Mindfulness* 2020;12:970–82. doi.org/10.1007/s12671-020-01565-6.
30. Malterud K, Siersma V, Guassora AD. Sample Size in Qualitative Interview Studies. *Qualitative Health Research* 2015;26:1753–60. doi.org/10.1177/1049732315617444.
31. Kruasom T, Kantatasiri P, Harasarn A. Diagnosis of Data Saturation and Holistic Interpretation: A Multi-Layered Approach to Planning Qualitative Sample Size 2025. doi.org/10.64753/jcasc.v10i2.1723.
32. Turner DS. Qualitative Interview Design: A Practical Guide for Novice Investigators. *The Qualitative Report* 2014. doi.org/10.46743/2160-3715/2010.1178.
33. Al-Aqeel AI. Ethical guidelines in genetics and genomics. An Islamic perspective. *Saudi Medical Journal* 2005;26:1862–70. doi.org/10.15537/1658-3175.3226.
34. Bouzenita AI. “The Most Dangerous Idea?” Islamic Deliberations on Transhumanism. *Darul funun Ilahiyat* 2018;29. doi.org/10.26650/di.2018.29.2.0031.
35. Khairifa F, Rawanoko ES, Peranginangin IFD. The Dilemma of Human Cloning in Islamic Theology: A Critique of the Uniqueness of Human Creation and Implications for Maqashid al-Shariah. *Pharos Journal of Theology* 2025. doi.org/10.46222/pharosjot.106.303.
36. Minchenko T, Gribkov E. The Problems of Human Embryos Genome Editing from the Position of Islam Denominations. *Conatus* 2024;9:89–108. doi.org/10.12681/cjp.31514.
37. Murdoch AIK, Blum J, Chen J, et al. Determinants of Clinical Decision Making under Uncertainty in Dentistry: A Scoping Review. *Diagnostics* 2023;13:1076–1076. doi.org/10.3390/diagnostics13061076.
38. Ibrahim AH, Rahman NNA, Saifuddeen SM, et al. Maqasid al-Shariah Based Islamic Bioethics: A Comprehensive Approach. *Journal of Bioethical Inquiry* 2019;16:333–45. doi.org/10.1007/s11673-019-09902-8.
39. Kashim MIAM, Husni AM. Maqasid Shariah in Modern Biotechnology Concerning Food Products. *International Journal of Islamic Thought* 2017;12:27–39. doi.org/10.24035/ijit.12.2017.003.
40. Idris SH, Majeed ABA, Chang LW. Beyond Halal: Maqasid al-Shari’ah to Assess Bioethical Issues Arising from Genetically Modified Crops. *Science and Engineering Ethics* 2020;26:1463–76. doi.org/10.1007/s11948-020-00177-6.
41. Alsomali N, Hussein G. CRISPR-Cas9 and He Jiankui’s Case: an Islamic Bioethics Review using Maqasid al-Shari’a and Qawaid Fighiyyah. *Asian Bioethics Review* 2021;13:149–65. doi.org/10.1007/s41649-021-00167-1.
42. Ibrahim AH, Rahman NNA, Saifuddeen SM. Maqasid al-Shariah as a Complementary Framework for Conventional Bioethics: Application in Malaysian Assisted Reproductive Technology (ART) Fatwa. *Science and*

Engineering Ethics 2017;24:1493–502.
doi.org/10.1007/s11948-017-9963-6.

43. El-Shanti H, Chouchane L, Badii R, et al. Genetic testing and genomic analysis: a debate on ethical, social and legal issues in the Arab world with a focus on Qatar. *Journal of Translational Medicine* 2015;13. doi.org/10.1186/s12967-015-0720-9.
44. Kooli C. Review of assisted reproduction techniques, laws, and regulations in Muslim countries. *Middle East Fertility Society Journal* 2019;24. doi.org/10.1186/s43043-019-0011-0.
45. Novikova RG. Islam And Genetics: Religious, Ethical And Legal Issues. *Rudn Journal Of Law* 2019;23:565–85. doi.org/10.22363/2313-2337-2019-23-4-565-585.
46. Bastaki K, Velayutham D, Irfan A. Forging the path to precision medicine in Qatar: a public health perspective on pharmacogenomics initiatives. *Frontiers in Public Health* 2024;12. doi.org/10.3389/fpubh.2024.1364221.
47. Alsafar H, Islayem D, Al-Mansoori RS, et al. Perceptions on Genetic and Genome Screening among College Students in the Emirates of Abu Dhabi. *Dubai Medical Journal* 2021;4:263–72. doi.org/10.1159/000518623.
48. Nassif R. Integrating Islamic Bioethics Into Palliative Care: A Narrative Review and Framework for Practice in the Middle East. *American Journal of Hospice and Palliative Medicine®* 2026. doi.org/10.1177/10499091261433968.
49. Padela AI. Maqāṣidī Models for an “Islamic” Medical Ethics. *American Journal of Islam and Society* 2022;39:72–114. doi.org/10.35632/ajis.v39i1-2.3069 .
50. Zalizan NA, Hashim H, Ismail WAFW, et al. Designer Baby Dan Sempadan Bioteknologi Manusia: Analisis Perundangan Berdasarkan Maqasid Syariah Dan Liabiliti Jenayah. *Lex Forensica Journal of Forensic Justice and Socio-Legal Research* 2025;2:85–98. doi.org/10.33102/wxnanf10.