



Al-Muhajirin International Conference

Exploring the Relationship of the Qur'an, Hadith, and Gender Determination

Muhammad Khafidz Razaq

Undergraduate Program in Biology, Department of Biology, Faculty of Mathematics and Natural Science, University of Indonesia, Depok, West Java 16424, Indonesia
muhammad.khafidz@ui.ac.id

Anom Bowolaksono

Cellular and Molecular Mechanisms in Biological System (CEMBIOS) Research Group, Faculty of Mathematics and Natural Sciences, Department of Biology, Universitas Indonesia, Kampus FMIPA, Depok, UI 16424, Indonesia
alaksono@sci.ac.id

Astari Dwiranti

Cellular and Molecular Mechanisms in Biological System (CEMBIOS) Research Group, Faculty of Mathematics and Natural Sciences, Department of Biology, Universitas Indonesia, Kampus FMIPA, Depok, UI 16424, Indonesia
astari.dwiranti@sci.ui.ac.id

Abstract

This review explores the intersection of the Glorious Qur'an and Hadith with contemporary scientific studies on pH-based gender determination. The investigation begins by examining the physiological role of pH levels within female reproductive organs and semen, highlighting how these conditions can influence the viability and motility of sperm. Recent studies indicate that the pH of the female reproductive tract can create a more favorable environment for either X or Y sperm, thereby impacting the likelihood of conceiving a male or female child. Researchers have found that Y-bearing sperm exhibit a more incredible forward velocity and are more sensitive to changes in physiological conditions and sperm storage than those carrying the X chromosome. Studies on humans have shown that incubating sperm in an acidic environment, at higher temperatures, or under elevated reactive oxygen species (ROS) levels can enhance the proportion of X-bearing sperm. This nuanced understanding of sperm behavior with pH levels offers insights into natural gender selection processes. Finally, the review discusses the implications of these findings for sex determination theories, considering how passages reflected from the Glorious Qur'an and Hadith may intertwine with modern scientific perspectives. By integrating religious texts with empirical research, this study aims to relate gender determination mechanisms to the Glorious Qur'an and Hadith. The findings underscore the potential for pH-based methods to inform reproductive choices, opening avenues for further interdisciplinary research that bridges faith and science.

Keywords: pH; sperm; vagina

INTRODUCTION

The idea of choosing a child's sex has intrigued parents for generations. Today, this can be done using advanced medical methods such as preimplantation genetic diagnosis (PGD). However, these modern techniques are expensive, highly invasive, come with potential risks, and raise ethical concerns. On the other hand, some natural approaches are also considered, though they are not fully proven and remain somewhat speculative. One such method involves timing intercourse around ovulation, which is thought to increase the chances of conceiving a child of a specific sex. This is based on the idea that X and Y-chromosome-carrying sperm behave differently, making one more likely to fertilize the egg than the other (Geraedts & De Wert, 2009). From an Islamic perspective, the Qur'an and Hadith remind us that the creation of life and the determination of a child's sex is ultimately in the hands of Allah. The Qur'an explicitly affirms that both men and women play a role in the creation of offspring:

يَأَيُّهَا النَّاسُ إِنَّا خَلَقْنَاكُم مِّنْ ذَكَرٍ وَّأُنثَىٰ

O humanity! Indeed, We created you from a male and a female (The Qur'an 49:13).

Prophet Muhammad ﷺ stated in a ḥadīth about gender determination.

مَاءُ الرَّجُلِ أَبْيَضٌ وَمَاءُ الْمَرْأَةِ أَصْفَرٌ فَإِذَا اجْتَمَعَا فَعَلَّا مِنِي الرَّجُلُ مِنِي الْمَرْأَةِ أَذْكَرَ إِيمَانَ اللَّهِ وَإِذَا عَلَّا مِنِي الْمَرْأَةِ مِنِي الرَّجُلِ أَنْثَىٰ إِيمَانَ اللَّهِ

The reproductive substance of man is white and that of woman yellow, and when they have sexual intercourse and the male's substance prevails upon the female's substance, it is the male child that is created by Allah's Decree, and when the substance of the female prevails upon the substance contributed by the male, a female child is formed by the Decree of Allah (Ṣaḥīḥ Muslim).

In the rich tapestry of human existence, the Qur'an profoundly states, "O mankind! Indeed, We created you from a male and a female." This powerful verse serves as a cornerstone for understanding the essential roles that both males and females play in the fabric of creation. It emphasizes the divine wisdom behind gender differentiation, highlighting that each gender possesses unique roles and responsibilities essential for the sustenance and progression of life. Complementing this theological perspective, a hadith elucidates the biological underpinnings of human reproduction, stating that "the reproductive substance of man is white and that of woman is yellow." It further explains that the outcome of a child's gender is determined by the predominance of either the male's or female's reproductive substance, all under the decree of Allah.

This intersection of Hadith and biological science invites a comprehensive exploration of gender determination mechanisms. Recent scientific studies have introduced the concept of pH-based gender determination, revealing how the physiological environment within the female reproductive tract can influence the viability of X and Y sperm. This review aims to bridge the gap between passages encapsulated in the Glorious Qur'an and Hadith with contemporary scientific findings. By examining how pH levels may favor the conception of male or female offspring, we can foster a deeper understanding of gender selection processes while respecting the

Qur'an and Hadith. In doing so, this study seeks to illuminate the harmonious dialogue between faith and science in the quest to understand the complexities of human reproduction.

Body

pH condition vaginal and semen

The pH level in the human body reflects the concentration of free protons in its aqueous fluids. Healthy of the vagina has a strong correlation with the low pH. Elevated estrogen levels in women of reproductive age lead to significant glycogen accumulation in the vaginal epithelium. Microbial populations primarily metabolize this glycogen, producing organic acids. The resulting acidic environment, with a pH of 4–4.5, creates a restrictive condition that inhibits the growth of many pathogenic organisms. Over time, numerous species of lactic acid bacteria, particularly those within the *Lactobacillus* genus, have been identified as residents of the human vagina and are recognized as central contributors to this protective mechanism. The preservation of a low pH in the vagina, achieved through the production of lactic acid by resident microbes, is recognized as a crucial mechanism for protecting reproductive-age women against infectious diseases (Linhares *et al.*, 2019; Hassan, 2005; Witkin, 2017). Recent research on the vaginal microbiome has revealed differences in microbial communities, with the lowest median pH (4.0 ± 0.3) observed in vaginal communities dominated by *Lactobacillus crispatus* (Ravel *et al.*, 2011).

Ethnic differences have been observed in the composition and dominance of bacterial communities in the vagina, highlighting the influence of genetic, environmental, and cultural factors on vaginal microbiota. Research has shown that the prevalence and abundance of specific bacterial species, particularly those within the *Lactobacillus* genus, vary significantly among women of different ethnic backgrounds. For instance, studies have found that *Lactobacillus* sp. are more dominant in the vaginal microbiota of Caucasian and Asian women, while Black and Hispanic women often exhibit a more diverse microbial community with lower levels of *Lactobacillus* species and higher proportions of anaerobic bacteria. This eventually resulted in the elevated median vaginal pH levels observed in Hispanic ($pH 5.0 \pm 0.59$) and Black ($pH 4.7 \pm 1.04$) women, indicative of a greater prevalence of microbial communities that are not predominantly composed of *Lactobacillus* species (Ravel *et al.*, 2011; Zhou *et al.*, 2007).

Seminal plasma or semen primarily comprises secretions from the seminal vesicles, which contribute approximately 50% to 80% of its volume, while the prostate gland provides a smaller portion, ranging from 13% to 30%. Additionally, minor contributions come from the bulbourethral (Cowper's) and Littré glands. The pH of seminal fluid is an important factor in sperm function, with a typical range between 7.2 and 7.8 (WHO, 2010). A lower pH, below 7.2, may suggest a blockage in the seminal vesicles, whereas a more alkaline pH, around 8.0, is often linked to infections (WHO, 2010). This balance plays a crucial role in protecting and sustaining sperm viability by counteracting the acidic environment of the female reproductive tract (WHO, 2010). However, a study found that the average semen pH across all samples was 8.2, with only 48% of specimens falling within the WHO's defined normal range (Dhumal *et al.*, 2021). Similarly, Haugen and Grotmol (1998) observed consistently higher semen pH levels in their study population despite analyzing a relatively small sample of 207 patients. They measured semen pH using pH paper and a pH meter, recording values of 8.2 with the

meter and 8.4 with the paper. Additionally, their research identified elevated semen pH levels among young, healthy medical students (Haugen & Grotmol, 1998).

X or Y sperm are related to various pH conditions

Spermatozoa are motile carriers that contain either an X or Y chromosome, which determines the sex of the fertilized oocyte (MacLaughlin & Donahoe, 2004). While the theoretical ratio of X- to Y-bearing sperm in semen is 1:1, this balance can be influenced by certain stressors, such as changes in pH or exposure to environmental toxins (Umebara *et al.*, 2019). Y-bearing sperm exhibit a greater forward velocity compared to X-bearing sperm (Shettles & Rorvik, 2006). However, researchers have found that sperm carrying the Y chromosome are more sensitive to changes in physiological conditions and sperm storage than those carrying the X chromosome (You *et al.*, 2017). Studies on humans have shown that incubating sperm in an acidic environment, at higher temperatures, or under elevated reactive oxygen species (ROS) levels can enhance the proportion of X-bearing sperm. These findings suggest the potential for semen sexing by manipulating various physiological factors (Oyeyipo *et al.*, 2017).

Shettles (1970) reported that X-bearing sperm are more resilient to acidity and other adverse conditions than Y-bearing sperm. However, the other findings indicate that X-bearing sperm demonstrate greater resistance across a broader pH range when cultured at 37°C for 3 to 5 days (You *et al.*, 2017). This suggests that differences in the survival rates of X and Y sperm may play a key role in cases where there is a prolonged interval between intercourse and fertilization.

Study of how the X/Y sperm relationship with various pH conditions in sex determination

A recent study investigated the effect of vaginal pH on fetal sex determination where conducted on 20 patients aged 21 to 37, and the research utilized vaginal swabs to assess pH levels during the preovulatory period. The researcher found that acidic vaginal pH is significantly associated with female fetuses, while alkaline vaginal pH correlates with male fetuses, indicating a potential biological mechanism for preconceptional sex determination (Gaber *et al.*, 2020). This scientific finding parallels the hadith's description of the interaction between male and female reproductive substances, where the hadith says, "The substance of the female prevails upon the substance contributed by the male, a female child is formed by the Decree of Allah" which indicates the woman's water prevails and leads to the acidic environment that kills the Y-bearing sperm whilst leaving the sperm that carries the X chromosome. Thus, the baby will be female, XX. The Decree of Allah indicates that Allah will determine the result, and the concept will not 100% work.

Conclusion

Connecting the verses of the Glorious Qur'an and Hadith to recent scientific discoveries reflects the greatness of Allah's power. However, it is essential to emphasize that the Qur'an and Hadith primarily serve as guides for humanity rather than as sources of scientific knowledge. This paper emphasizes the importance of conducting further research on simulate how sperm enters the female reproductive organs to fertilize the egg with detailed and specific environmental conditions of the female reproductive organs. Then, it can be seen how the environmental conditions of the

female reproductive organs can affect which types of sperm are more likely to fertilize the egg.

References

Dhumal, S. S., Naik, P., Dakshinamurthy, S., & Sullia, K. (2021). Semen pH and its correlation with motility and count - A study in subfertile men. *JBRA*, 25(2).

Gaber, M. A., Saleh, S. A., & Allam, N. H. (2020). Effect of vaginal pH in preconceptional fetal sex determination. *Menoufia Medical Journal*, 33(3), 1063.

Geraedts, J., & De Wert, G. (2009). Preimplantation genetic diagnosis. *Clinical Genetics*, 76(4), 315–325.

Hassan, D.A. (2005) Separation Techniques for X and Y Chromosome Bearing Human Spermatozoa (Doctoral disser tation). Tshwane University of Technology.

Haugen, N., & Grotmol, N. (1998). pH of human semen. *Andrology*, 21(2), 105–108.

MacLaughlin DT, Donahoe PK. Sex determination and differentiation. *NEngl JMed* 2004;350:367–378.

Oyeyipo, I.P., van der Linde, M. and du Plessis, S.S. (2017) Environmental exposure of sperm sex-chromosomes: A gender selection technique. *Toxicol. Res.*, 33(4): 315.

Ravel, J., Gajer, P., Abdo, Z., Schneider, G. M., Koenig, S. S. K., McCulle, S. L., Karlebach, S., Gorle, R., Russell, J., Tacket, C. O., Brotman, R. M., Davis, C. C., Ault, K., Peralta, L., & Forney, L. J. (2010). Vaginal microbiome of reproductive-age women. *Proc Natl Acad Sci USA* 2011;108:4680–4687.

Şahîh Muslim. Kitâb al-ḥayd. Bâb bayân şifa maniyy al-rajul wa al-mar'a wa anna al-walad makhlûq min mâ'ihimâ. Hadith no. 315. <https://sunnah.com/>

Shettles, L. B. (1970). Factors influencing sex ratios. *International Journal of Gynecology & Obstetrics*, 8(5P1), 643–647.

Shettles, L.B. and Rorvik, D.M. (2006) How To Choose The Sex Of Your Baby: Fully Revised And Updated (Rev Upd edition). Broadway.

The Glorious Qur'an, Chapter 49, Verse 13.

Umehara, T., Tsujita, N., and Shimada, M. (2019). Activation of Toll-like receptor 7/8 encoded by the X chromosome alters sperm motility and provides a novel simple technology for sexing sperm. *PLoS Biol.* 17:e3000398.

World Health Organization (WHO). WHO laboratory manual for the examination and processing of human semen. 5th ed. Geneva: WHO; 2010.

You, Y.A., Kwon, W.S., Rahman, M.S., Park, Y.J., Kim, Y.J. and Pang, M.G. (2017) Sex chromosome-dependent differential viability of human spermatozoa during prolonged incubation. *Hum. Reprod.*, 32(6): 1183–1191.

Zhou, X., Brown, C. J., Abdo, Z., Davis, C. C., Hansmann, M. A., Joyce, P., Foster, J. A., & Forney, L. J. (2007). Differences in the composition of vaginal microbial communities found in healthy Caucasian and black women. *The ISME Journal*, 1(2), 121–133.

