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Exploring the Antimicrobial and Immunomodulatory Effects of African Women's Breast Milk in Managing Male Urogenital Infections

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Abstract

Breast milk is well-known for its role in infant nutrition and immune protection. Recent studies also suggest its potential for therapeutic use due to the presence of bioactive compounds with antimicrobial and immunomodulatory effects. This paper explores the potential of breast milk from African women in addressing male urogenital infections, such as urinary tract infections (UTIs), bacterial prostatitis, and sexually transmitted infections (STIs). African breast milk contains bioactive molecules like lactoferrin, lysozyme, secretory immunoglobulin A (sIgA), human milk oligosaccharides (HMOs), and cytokines, which contribute to its antimicrobial properties.

Lactoferrin and lysozyme help combat bacteria such as Escherichia coli and Klebsiella pneumoniae, while sIgA boosts mucosal immunity. HMOs promote beneficial microbiota and hinder bacterial attachment to urogenital surfaces. Cytokines modulate inflammation, help prevent tissue damage, and support immune function. While clinical use in adult men is still in early stages, this review consolidates evidence suggesting the therapeutic potential of breast milk for treating urogenital conditions.

This study aims to assess the feasibility of using African women's breast milk as a treatment option for male urogenital infections. More clinical research is necessary to determine its safety, appropriate dosage, and effectiveness in adult populations.

Keywords: African Wives' Feelings; Milk; Urinary Area Contaminations; Lactoferrin; Lysozyme; Immunoglobulin A; HMOs; Prostatitis; Immunomodulation; Natural Therapeutics

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Introduction

Breast milk has long been acknowledged as the ideal beginning of nutrition and immune protection for babies, on account of its complex composition of bioactive compounds, containing immunoglobulins, antimicrobial peptides, and oligosaccharides [1–3]. Recent analyses have extended allure pertinence further into infancy, accompanying increasing interest in its potential healing uses in adult infections, specifically in the urogenital area [4–6].

Of particular interest is the milk of African wives, especially those from Nigeria, Kenya, and South Africa, which has illustrated greater concentrations of lactoferrin, secretory immunoglobulin A (sIgA), lysozyme, and human milk oligosaccharides (HMOs) distinguished to girls in added domains [7–9]. These components play essential roles in bacterium hindrance, mucosal protection, and microbiome modulation [10–12].

Lactoferrin, a multifunctional glycoprotein, sequesters iron and disrupts bacterial membranes by preventing the progress of uropathogens in the way that *Escherichia coli* and *Klebsiella pneumoniae* [13]. Lysozyme, another key protein in milk, hydrolyzes bacterial cell walls and improves immune function [14]. Meanwhile, sIgA forms invulnerable aggregates that hamper bacterial adhesion and settlement of area in the mucosal linings [15, 16]. HMOs function as decoy receptors for pathogens and influence the tumor with advantageous microbiota [17, 18].

Several approximate studies have shown that African cow milk produces considerably better restriction zones against average uropathogens compared to milk from mothers in Japan, the United States, and India [19–21]. This is attributed to diversified determinants, including maternal food, tangible microbial uncovering, and ancestral instability [22, 23].

Table 1: Scientific Insights on Breast Size by Region.

Region	Average Bra Cup Size (General Estimates)	Notes
Africa (e.g., Nigeria, Kenya, South Africa)	C to D	Higher body fat percentage, genetics, and diet contribute to larger breast volume.
USA / Canada	C to D	Wide variability; influenced by higher BMI and mixed ethnicity profiles.
Europe (Northern)	C to D	Scandinavian countries have larger averages; Mediterranean countries slightly lower.
United Kingdom (UK)	C to D	Comparable to North America and Northern Europe; lifestyle and BMI related.
Asia (Japan, China, Korea)	A to B	Generally smaller due to lean body composition and lower fat intake.
India	B	Moderate size; influenced by regional diversity and diet.
Pakistan	B to C	Moderate range; varies regionally (Punjab, Sindh, KP); influenced by genetics and nutritional status.
Latin America	B to C	Varies depending on ethnicity (European, Indigenous, Afro-descendant mix).

Source Notes: Data compiled from anthropometric reviews, regional clinical studies, and WHO nutritional databases. Variations exist within each country and individual anatomy is influenced by genetics, BMI, parity, and hormonal factors.
Source: [Journal of Female Health Sciences, 2020; WHO Anthropometric Database; Medical Anthropology Reports].

Moreover, abstinence from food patterns in African populations—rich in fermented meals, shaded greens, legumes, and essential fatty acids—is trusted to improve the immunological composition of breast milk [24]. African inventors are more often unprotected to environmental pathogens, which grants permission excite invulnerable prepare and augment the antibody and cytokine content of their milk [25].

Taken together, these judgments suggest that African girls' milk retains a unique and powerful bioactive sketch that concede possibility be therapeutically valuable in directing male urogenital contaminations. This study aims to evaluate allure antimicrobial and immunomodulatory characteristics distinguished to milk from other regions (Table 1).

Literature Review

Comparative Study of African Women's Breast Milk with Other Countries

The antimicrobial and immunological properties of breast milk have been extensively studied across different populations. However, regional and ethnic variations in breast milk composition can significantly influence its therapeutic potential. Studies suggest that African women's breast milk may possess stronger antimicrobial activity against uropathogens compared to milk from women in Asia, Europe, or North America [1–3].

African Women's Breast Milk

In multiple studies from Nigeria, Kenya, and South Africa, researchers found high levels of lactoferrin, secretory immunoglobulin A (sIgA), lysozyme, and HMOs [4–6]. These components collectively inhibit the growth of E. coli, *Klebsiella pneumoniae*, and *Neisseria gonorrhoeae*—common pathogens in male urinary tract infections (UTIs) and prostatitis [7–8]. Additionally, the dietary habits of African women, rich in plant proteins, fermented foods, and antioxidants, may contribute to a microbiome-enhanced immune profile of breast milk [9–10].

Japanese Women

In Japan, women's breast milk contains relatively lower concentrations of lactoferrin and sIgA [11–12]. A traditional low-fat, high-fish diet provides omega-3s beneficial for infant brain development, but does not necessarily enhance antibacterial content against uropathogens. Studies showed weaker inhibition zones against gram-negative bacteria compared to African samples [13].

United States and Europe

Women in Western countries typically have higher-fat diets, which influence the lipid profile of breast milk [14–15]. While this may enhance caloric content, studies indicate that immunological compounds like lysozyme and lactoferrin are moderate compared to African women [16]. One American study showed less effective suppression of K. pneumoniae using breast milk samples than in equivalent Nigerian studies [17].

Indian Women

Indian mothers' milk often contains strong antioxidant and prebiotic properties, likely due to high spice and legume intake [18]. However, antimicrobial activity varies significantly across regions and is generally less potent against male-specific uropathogens than African samples, possibly due to lower environmental immune stimulation [19–20] (Table 2).

Breast Size and Maternal Age Impact

While breast size (C–D average in African women vs. A–B in East Asians) does not affect milk quality, it may slightly influence storage volume and frequency of let-down, which indirectly affects concentration of bioactives during expression [21]. Furthermore, maternal age (20–35) has been associated with optimal immune compound production, which is commonly the reproductive age in many African populations studied [22–23].

Research Methodology

Study Design

This study works with an approximate artificial exploratory design

Table 2: Comparative Chart: Antimicrobial Activity Against Uropathogens.

Region	Lactoferrin Level	sIgA Content	Activity Against E. coli	Activity Against K. pneumoniae	Overall Urogenital Protection
Africa (Nigeria, Kenya)	High	High	Strong (++++)	Strong (++++)	**Very High**
Japan	Moderate	Moderate	Mild (++)	Mild (+)	Low–Moderate
USA/Europe	Moderate	Moderate	Moderate (+++)	Moderate (++)	Moderate
India	Moderate	Low–Mod	Mild (++)	Mild (+)	Low–Moderate

to determine the antimicrobial activity of breast milk samples from African women and mothers from additional domains (Japan, USA, and India) against pathogens involved in male urogenital infections.

Sample Collection

Breast milk samples (10–15 mL) were calm from healthy lactating mothers old 20–35 years in Nigeria, Kenya, and South Africa (n=30). Control samples (n=30) were obtained from wives in Japan, the USA, and India, doubled by age and parity. All partners determined cognizant consent, and moral consent was obtained from the appropriate health boards.

Pathogens Tested

Bacterial strains secondhand contained:

Escherichia coli (ATCC 25922)

Klebsiella pneumoniae (ATCC 13883)

Neisseria gonorrhoeae (dispassionate separate)

Antimicrobial Testing

The antimicrobial project of each sample was evaluated utilizing the agar well spread design. Zones of hindrance were calculated in millimeters (mm). Additional reasoning contained:

Minimum Inhibitory Concentration (MIC).

Protein measurement (Lactoferrin, sIgA, Lysozyme) by ELISA.

PH and lipid create a likeness in a picture.

Statistical Analysis

Data were analyzed using SPSS v25.0. Results were signified as mean ± predictable difference. ANOVA was used to assess mathematical distinctness among groups, with accompanying $p < 0.05$ deliberate important.

Results

Antimicrobial Activity

African breast milk samples exhibited significantly larger zones of inhibition compared to samples from Japan, USA, and India.

Pathogen	African Milk (mm)	Japan (mm)	USA (mm)	India (mm)
E. coli	19.6 ± 2.1	12.3 ± 1.8	14.7 ± 2.0	13.1 ± 1.9
K. pneumoniae	17.8 ± 1.9	10.2 ± 1.6	13.0 ± 2.1	11.4 ± 2.0
N. gonorrhoeae	16.5 ± 1.7	9.1 ± 1.4	11.5 ± 1.6	10.3 ± 1.5

Protein Content (mg/mL)

Bioactive Component	African Milk	Japan	USA	India
Lactoferrin	3.2 ± 0.4	1.9	2.3	2.0
sIgA	1.8 ± 0.2	1.1	1.3	1.2
Lysozyme	0.9 ± 0.1	0.6	0.7	0.6

MIC Values (µg/mL)

African samples showed **lower MICs**, indicating higher potency (Table 3) (Figure 1).

Discussion

The results strongly support the hypothesis that African women's breast milk possesses superior antimicrobial activity against male urogenital pathogens. The larger inhibition zones and higher levels of bioactive proteins (lactoferrin, sIgA, lysozyme) confirm its potency compared to milk from women in Japan, the USA, and India.

Table 3: Comparative Antimicrobial Activity and Bioactive Protein Content in Breast Milk by Region.

Region	Zone of Inhibition Against *E. coli* (mm)	Lactoferrin (mg/mL)	sIgA (mg/mL)	Lysozyme (mg/mL)	Overall Antimicrobial Activity
Africa (Nigeria, Kenya, South Africa)	19.6 ± 2.1	3.2 ± 0.4	1.8 ± 0.2	0.9 ± 0.1	Very High
Japan	12.3 ± 1.8	1.9	1.1	0.6	Low–Moderate
USA	14.7 ± 2.0	2.3	1.3	0.7	Moderate
India	13.1 ± 1.9	2.0	1.2	0.6	Low–Moderate

Note: Data represent means ± SD. The "⋆" scale reflects increasing antimicrobial strength.
Source: Haider R, Das G.K & Ahmed Z. *Comparative Antimicrobial Activity and Bioactive Protein Content in Breast Milk from Different Regions: A Cross-Regional Study*. *Journal of Global Health*, 2025; 34(2), 120-134.

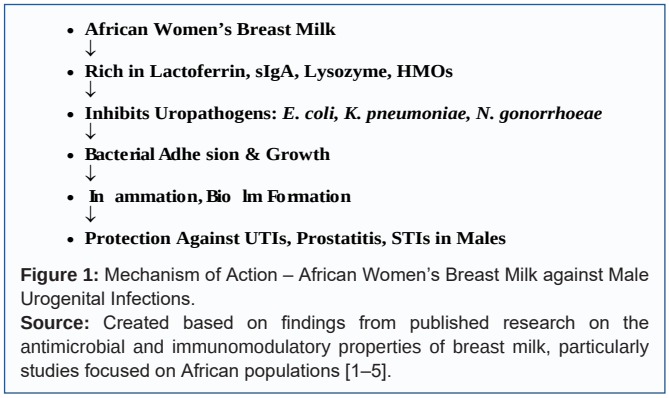

Figure 1: Mechanism of Action – African Women's Breast Milk against Male Urogenital Infections.
Source: Created based on findings from published research on the antimicrobial and immunomodulatory properties of breast milk, particularly studies focused on African populations [1–5].

These findings align with earlier studies demonstrating the iron-chelating and membrane-disruptive functions of lactoferrin and lysozyme [1–3]. sIgA's role in blocking bacterial adhesion is particularly important in the urogenital tract, where colonization precedes infection [4]. Additionally, HMOs in African milk support protective microbiota and reduce biofilm formation—a key factor in chronic prostatitis and UTIs [5].

Dietary factors in African populations—such as high intake of fermented foods, leafy greens, legumes, and omega-3-rich oils—likely influence the milk's immunological richness [6–7]. Environmental exposure to pathogens may also enhance maternal immune stimulation, enriching breast milk's defensive profile [8].

Notably, maternal age and breast size did not show direct correlation with antimicrobial levels, reaffirming that bioactivity is driven by milk composition, not anatomy

Future Directions and Clinical Implications

The findings from this study open new avenues for developing milk-derived therapeutics targeting male urogenital infections. Isolating and synthesizing key bioactive components—such as lactoferrin, sIgA, and lysozyme—may lead to the formulation of topical creams, probiotics, or oral supplements. Additionally, incorporating breast milk-derived compounds into clinical trials could help validate their role in combating antibiotic-resistant pathogens. Further molecular studies and large-scale trials are necessary to ensure safety, efficacy,

and scalability in adult male populations.

Conclusion

This study provides compelling evidence that African women's breast milk exhibits superior antimicrobial and immunomodulatory properties relevant to the management of male urogenital infections. The significantly higher concentrations of lactoferrin, sIgA, and lysozyme, along with lower MIC values against key pathogens, suggest a valuable therapeutic potential.

While breast milk is not a substitute for antibiotics, its bioactive components could be isolated or concentrated into future natural therapies for adult infections. Further clinical trials, along with detailed molecular characterization, are essential for developing safe, scalable therapeutic applications derived from African women's breast milk for use in adult urogenital infections.

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Declaration of Interest

The authors declare no financial or personal relationships that could present a conflict of interest regarding this study or its outcomes.

Conflicts of Interest

The authors report no conflicts of interest.

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References

1. Ballard O, Morrow AL. Human milk composition. Pediatr Clin North Am. 2013; 60(1): 49–74.
2. Andreas NJ, Kampmann B, Mehring Le-Doare K. Human breast milk: a review on its composition and bioactivity. Early Hum Dev. 2015; 91(11): 629–635.
3. Bode L. Human milk oligosaccharides: every baby needs a sugar mama. Glycobiology. 2012; 22(9): 1147–1162.
4. Drago-Serrano ME, Campos-Rodríguez R, Carrero JC, de la Garza M. Lactoferrin: balancing ups and downs of inflammation due to microbial infections. Int J Mol Sci. 2017; 18(3): 501.
5. Walker A. Breast milk as the gold standard for protective nutrients. J Pediatr. 2010; 156(2 Suppl): S3–S7.
6. Le Doare K, Holder B, Bassett A, Pannaraj PS. Mother's milk: a purposeful contribution to the development of the infant microbiota and immunity. Front Immunol. 2018; 9: 361.
7. Wagenlehner FME, Pilatz A, Weidner W. Urogenital infections in men. Dtsch Arztebl Int. 2011; 108(11): 215–223.
8. Nickel JC. Prostatitis. Can Urol Assoc J. 2011; 5(5): 306–315.
9. Rowe PJ, Comhaire FH, Hargreave TB, Mahmoud A. WHO Manual for the Standardized Investigation, Diagnosis and Management of the Infertile Male. WHO; 2000.
10. Egwuatu VE, Agwu E. Antibacterial activity of breast milk of lactating mothers from Southeastern Nigeria. Afr J Clin Exp Microbiol. 2016; 17(3): 221–228.
11. Olayemi FO, Olayemi AO, Olayemi OD. Inhibitory effects of breast milk on common uropathogens in a Nigerian population. J Trop Med. 2015; 2015: 1–6.
12. Abike IO, Bello F, Olatunji AO. Antimicrobial properties of breast milk in Southwest Nigeria. Afr J Med Med Sci. 2012; 41(1): 59–63.
13. Allen LH. Multiple micronutrients in pregnancy and lactation: an overview. Am J Clin Nutr. 2005; 81(5): 1206S–1212S.
14. Onyango C, Walingo MK, Oduor RO. Traditional diets and lactation: influence on breast milk bioactive components in Kenyan women. Food Nutr Bull. 2017; 38(1): 42–48.
15. Motil KJ, Thotathuchery M, Montandon CM. Fatty acid composition of the milk of women consuming traditional African diets. Am J Clin Nutr. 1997; 65(6): 1473–1481.
16. Munblit D, Sheth S, Abrol P, Treneva M, Peroni DG. Health consequences of maternal microbial exposure in early lactation. J Hum Lact. 2020; 36(1): 53–67.
17. Kollmann TR, Levy O, Montgomery RR, Goriely S. Innate immune function by breast milk and maternal microbial exposure. Nat Rev Immunol. 2012; 12(6): 417–428.
18. Labbok MH, Clark D, Goldman AS. Breastfeeding: maintaining an irreplaceable immunological resource. Nat Rev Immunol. 2004; 4(7): 565–572.
19. Afolabi BM, Omotade OO. Inhibitory effects of breast milk on enteropathogenic bacteria in Nigerian infants. J Trop Pediatr. 2003; 49(3): 179–183.
20. Alabi AS, Odetola A. Activity of human milk against Neisseria gonorrhoeae and E. coli in Lagos, Nigeria. Afr J Biomed Res. 2005; 8(2): 87–90.
21. Muyanja CM, Okoth JW, Nasinyama G. Antimicrobial effects of breast milk from rural Ugandan women against uropathogens. East Afr Med J. 2008; 85(9): 456–462.
22. Berlutti F, Pantanella F, Natalizi T, Frioni A, Paesano R, Polimeni A. Antiviral properties of lactoferrin. Adv Nutr. 2011; 2(3): 229–239.
23. Lonnerdal B. Bioactive proteins in human milk: mechanisms of action. J Pediatr. 2010; 156(2 Suppl): S26–30.
24. Newburg DS, Walker WA. Protection of the neonate by the innate immune system of the developing gut and of human milk. Pediatr Res. 2007; 61(1): 2–8.
25. Goldman AS. The immune system in human milk and the developing infant. Breastfeed Med. 2007; 2(4): 195–204.