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Assessment of Preputial Hygiene Practices and Their Association with Genital Morbidity in Males: A Cross-Sectional Study

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ABSTRACT

Background: Preputial hygiene is an important but often neglected determinant of male genital health. Inadequate hygiene, particularly among uncircumcised men, has been implicated in balanitis, phimosis and other genital morbidities, yet data from Indian settings remain limited.

Objectives:
(1) To assess knowledge and practices related to preputial hygiene among adult males;
(2) To estimate the prevalence and pattern of genital morbidity; and
(3) To examine the association between preputial hygiene and genital morbidity.

Methods: A hospital-based cross-sectional study was conducted among 260 males aged 18–60 years attending outpatient departments of a tertiary care teaching hospital. Data on socio-demographic profile, circumcision status, knowledge and practices regarding preputial hygiene, and genital morbidity were collected using a pre-tested questionnaire and clinical examination. A preputial hygiene score (0–6), based on frequency of cleaning, foreskin retraction and use of soap, was categorized as poor (0–2), fair (3–5) or good (6). Genital morbidity was defined as the presence of balanitis/posthitis, phimosis, urethral discharge, genital pruritus or urinary tract infection. Associations were analysed using chi-square test and odds ratios (OR) with 95% confidence intervals (CI).

Results: The mean age of participants was 38.8 ± 12.7 years; 56.5% were rural residents and 66.5% were uncircumcised. Overall, 19.6% had poor, 65.8% fair and 14.6% good preputial hygiene. The prevalence of at least one genital morbidity was 45.8%. Common morbidities included balanitis / posthitis (13.8%), urethral discharge (13.8%), genital pruritus (13.5%), urinary tract infection (11.5%) and phimosis (7.7%). Genital morbidity was present in 68.6% of those with poor hygiene, 43.9% with fair hygiene and 23.7% with good hygiene ($p < 0.001$). Compared with good hygiene, the odds of genital morbidity were 7.05 (95% CI 2.72–18.29) times higher with poor hygiene and 2.52 (95% CI 1.12–5.64) with fair hygiene. Morbidity was more common in uncircumcised than circumcised men (54.3% vs 28.7%; OR 2.95, 95% CI 1.70–5.13).

Conclusion: Suboptimal preputial hygiene is common and strongly associated with genital morbidity, particularly among uncircumcised men. Simple, focused counselling on foreskin retraction, adequate cleaning frequency and appropriate use of cleansing agents should be integrated into routine clinical care and male reproductive health programmes.

Keywords*: preputial hygiene, penile hygiene, balanitis, phimosis, genital morbidity, circumcision, men's health, cross-sectional study.*

INTRODUCTION

Preputial disorders such as posthitis and balanoposthitis represent common clinical conditions encountered across diverse populations, with hygiene practices playing a central role in their development. Inflammatory conditions of the prepuce and glans are frequently linked to the accumulation of smegma, moisture, and microbial overgrowth within the preputial space, particularly among uncircumcised males (1). Poor genital hygiene has been repeatedly identified as a major etiological factor for balanitis, with evidence from Middle Eastern and South Asian settings emphasizing inadequate hygiene as a primary contributor to disease burden (2). Clinical studies have further highlighted the multifactorial nature of balanoposthitis, with infectious, inflammatory, and behavioral determinants frequently interacting, yet consistently underscoring hygiene-related factors as modifiable contributors to morbidity (3).

From a public health perspective, genital hygiene represents an important but often under-addressed component of male sexual and reproductive health. While most health-education interventions emphasize female hygiene, community-level assessments have shown that knowledge and practices among men—whether related to sexuality, reproductive health, or hygiene—remain poorly developed, resulting in preventable morbidities (4). Research from various cultural contexts demonstrates that male hygiene behaviours are shaped by social norms, limited awareness, and lack of targeted health messaging. Studies from East Africa, for example, have shown substantial gaps in understanding proper genital hygiene and its implications for infection risk (7). Similarly, broader hygiene-related research, including studies of urinary tract infection risk in women, reinforces the principle that inadequate genital hygiene significantly increases susceptibility to infectious morbidities (8). Together, these findings underscore the relevance of genital hygiene not only as an individual behaviour but also as a public-health priority requiring education, awareness, and culturally sensitive health communication.

In South Asia, and India in particular, male genital hygiene remains a neglected aspect of reproductive health discourse. Population-based studies in rural India have highlighted the lack of routine genital hygiene practices among men and the consequent burden of preventable reproductive morbidities (6). Furthermore, Indian perspectives on male circumcision—historically influenced by cultural, religious, and socioeconomic factors—add complexity to understanding genital hygiene behaviours in both circumcised and uncircumcised populations (5). Although circumcision has been shown to reduce the risk of certain genital infections, proper hygiene remains essential for all males regardless of circumcision status. Despite the clear relevance of these issues, few studies in India have systematically evaluated preputial hygiene practices and their association with genital morbidity among adults, leaving an important gap in public-health understanding.

Given the clinical significance of poor preputial hygiene, its preventable nature, and the paucity of Indian data examining its relationship with genital morbidity, further research is warranted. Understanding existing hygiene practices, levels of knowledge, and their impact on genital health is essential for designing effective health-education strategies and integrating male hygiene promotion into routine clinical and community health programmes. The present study aims to address these gaps by assessing preputial hygiene practices and examining their association with genital morbidity among adult males in a tertiary-care setting.

METHODS

Study Design and Setting

A hospital-based cross-sectional study was conducted in the outpatient departments (Urology, General Surgery and Venereology) of a tertiary care teaching hospital in North India. Data were collected over a three-month period from adult males attending the outpatient clinics for any health complaint, irrespective of genital symptoms, to ensure a representative sample.

Study Population

Inclusion Criteria

- Males aged 18–60 years
- Willing to provide informed written consent
- Able to participate in the interview and clinical examination

Exclusion Criteria

- Critically ill or unable to respond to questionnaire items
- History of genital surgery in the preceding six months (other than childhood circumcision)
- Known immunocompromised status (e.g., advanced HIV infection, ongoing chemotherapy), due to potential confounding of genital morbidity patterns

Sample Size and Sampling Technique
A sample size of 260 participants was selected. Using an anticipated genital morbidity prevalence of 40–50%, with 95% confidence level and 7% absolute precision, the minimum estimated sample size was 200. This was increased to 260 to account for non-response and to enhance statistical power for subgroup analysis.

Participants were recruited through systematic random sampling, selecting every third eligible male attending the outpatient departments during data-collection days.

Data Collection Tool
Data were collected using a pre-tested, structured questionnaire administered in a private setting. The tool consisted of the following domains:

1. Socio-Demographic Characteristics
Age, residence (rural/urban), education level, marital status

2. Circumcision Status
- Categorized as *circumcised* or *uncircumcised*

3. Knowledge of Preputial Hygiene
Assessed through items covering:
- Awareness of the need for foreskin retraction
- Recommended frequency of genital cleaning
- Awareness of risks associated with poor hygiene

A knowledge score (0–10) was computed, with higher scores indicating better knowledge.

4. Preputial Hygiene Practices
Assessed through:
Frequency of genital cleaning:
- Less than once daily
- Once daily
- ≥2 times daily
- Use of cleansing agent (soap/water)
- Foreskin retraction during cleaning (for uncircumcised participants)

5. Genital Morbidity Assessment
A brief genital examination was performed by trained clinicians to evaluate the presence of:
- Balanitis/posthitis
- Phimosis
- Genital pruritus
- Urethral discharge
- Symptoms/signs of urinary tract infection

Participants with more than one condition were recorded as having multiple morbidities.

Operational Definitions
Preputial Hygiene Score (0–6)
Calculated using three components:

Component	Criteria	Score
Frequency of cleaning	< once daily / once daily / ≥2 times daily	0 / 1 / 2
Foreskin retraction	Yes = 2; No = 0; For circumcised males, automatically scored 2	0 / 2
Use of soap	Yes = 2; No = 0	0 / 2

Participants were categorized as:
- Poor hygiene: score 0–2
- Fair hygiene: score 3–5
- Good hygiene: score 6
- Genital Morbidity

Presence of *any one* of the clinically diagnosed conditions listed above.

Ethical Considerations
The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants. Interviews and examinations were conducted in a private area to ensure confidentiality. Data were anonymized, and no personal identifiers were recorded.

RESULTS
1. Description of the Study Population
A total of 260 adult males were included in the study. The mean age of the participants was 38.8 ± 12.7 years (range: 18–60 years). When grouped, 26.2% were in the 18–29 years age group, 42.3% were aged 30–44 years, and 31.5% were aged 45–60 years.

More than half of the participants, 147 (56.5%), were residents of rural areas, while 113 (43.5%) resided in urban areas. With respect to educational status, 89 (34.2%) had primary education or less, 116 (44.6%) had completed secondary education, and 55 (21.2%) were graduates or above.

Regarding circumcision status, 173 (66.5%) participants were uncircumcised, while 87 (33.5%) were circumcised.

Table 1. Socio-demographic characteristics of study participants (n = 260)

Characteristic	Category	Frequency (n)	Percentage (%)
Age group (years)	18–29	68	26.2
	30–44	110	42.3
	45–60	82	31.5
Residence	Rural	147	56.5
	Urban	113	43.5
Education level	Primary or less	89	34.2
	Secondary	116	44.6
	Graduate or above	55	21.2
Circumcision status	Uncircumcised	173	66.5
	Circumcised	87	33.5

2. Knowledge and Practices Related to Preputial Hygiene
The mean knowledge score regarding preputial hygiene among the participants was 5.3 ± 2.1 (out of a maximum of 10), indicating moderate overall awareness. Just over half of the participants were aware that the foreskin should be retracted during genital cleaning (you can insert an exact percentage here if you want to define it numerically later), and less than half correctly identified that the genital area should ideally be cleaned at least once daily.

With respect to actual hygiene practices, 80 (30.8%) participants reported cleaning the genital area less than once daily, 111 (42.7%) cleaned once daily, and only 69 (26.5%) reported cleaning two or more times daily. A majority, 179 (68.8%), reported using soap or another cleansing agent, whereas 81 (31.2%) used only water.

Among the 173 uncircumcised participants, 114 (65.9%) reported routinely retracting the foreskin while cleaning, whereas 59 (34.1%) did not do so regularly. Based on the composite preputial hygiene score, 51 (19.6%) participants were classified as having poor hygiene, 171 (65.8%) as fair, and 38 (14.6%) as good hygiene.

These patterns suggest that while some elements of hygiene are commonly practised, key behaviours such as adequate cleaning frequency and consistent foreskin retraction are suboptimal in a substantial proportion of participants. The distribution of these hygiene categories, and their relationship with genital morbidity, is further illustrated in Figure 1 (planned), which will depict both the proportion of participants in each hygiene category and the corresponding prevalence of genital morbidity.

Table 2. Knowledge and preputial hygiene practices among study participants (n = 260)

Variable	Category / Measure	Frequency (n)	Percentage (%)
Knowledge score*	Mean ± SD	5.3 ± 2.1	—
Frequency of genital cleaning	< once daily	80	30.8
	Once daily	111	42.7
	≥ 2 times daily	69	26.5
Use of soap/cleansing agent	Yes	179	68.8
	No (water only)	81	31.2
Foreskin retraction during cleaning (uncircumcised, n = 173)	Yes	114	65.9

	No	59	34.1
Overall preputial hygiene category	Poor (score 0–2)	51	19.6
	Fair (score 3–5)	171	65.8
	Good (score 6)	38	14.6

*Maximum possible knowledge score = 10.

3. Prevalence and Pattern of Genital Morbidity

Out of the 260 study participants, 119 (45.8%) were found to have at least one genital morbidity, while 141 (54.2%) had no genital complaints or clinical findings. The 95% confidence interval for overall genital morbidity was 39.7%–51.8%. Among the identified morbidities, balanitis/posthitis was the most common condition and was present in 36 (13.8%) participants. This was followed by urethral discharge in 36 (13.8%), genital pruritus in 35 (13.5%), and urinary tract infection (UTI) in 30 (11.5%). Phimosis was observed in 20 (7.7%) participants. Some individuals presented with more than one morbidity, resulting in overlapping counts.

The distribution of the different morbidities among affected participants is depicted in Figure 2 (planned), which will visually demonstrate the relative burden of conditions such as balanitis, phimosis, and urethral infections. This provides a clearer understanding of which clinical presentations are most strongly represented within the population.

Table 3. Prevalence of genital morbidities among study participants (n = 260)

Genital morbidity	**Frequency (n)**	**Percentage (%)**
Any genital morbidity	119	45.8
Balanitis / posthitis	36	13.8
Phimosis	20	7.7
Urethral discharge	36	13.8
Genital pruritus	35	13.5
Urinary tract infection	30	11.5

4. Association Between Preputial Hygiene and Genital Morbidity

Genital morbidity showed a clear and statistically significant association with preputial hygiene status (Table 4). Among participants with poor hygiene, 35 out of 51 (68.6%) had at least one genital morbidity, compared to 75 out of 171 (43.9%) among those with fair hygiene, and 9 out of 38 (23.7%) among those with good hygiene. Overall, the prevalence of genital morbidity decreased progressively with improving hygiene category.

The association between hygiene category and genital morbidity was statistically significant ($\chi^2 = 18.45$, $p < 0.001$). Using the good hygiene group as the reference category, the odds of genital morbidity were found to be:
7.05 times higher in participants with poor hygiene
(OR = 7.05, 95% CI 2.72–18.29)
2.52 times higher in those with fair hygiene
(OR = 2.52, 95% CI 1.12–5.64)

These findings indicate a strong, graded relationship between deteriorating preputial hygiene and increasing risk of genital morbidity. This trend is intended to be illustrated in Figure 1, which will display both the proportion of participants in each hygiene category and the corresponding prevalence of genital morbidity within those categories.

Table 4. Association between preputial hygiene category and genital morbidity (n = 260)

Preputial hygiene category	No genital morbidity n (%)	Genital morbidity n (%)	Total (n)	Odds ratio (95% CI)*
Poor (score 0–2)	16 (31.4)	35 (68.6)	51	7.05 (2.72–18.29)
Fair (score 3–5)	96 (56.1)	75 (43.9)	171	2.52 (1.12–5.64)
Good (score 6)	29 (76.3)	9 (23.7)	38	1.00 (Reference)

*Odds ratios calculated using the good hygiene group as the reference category.

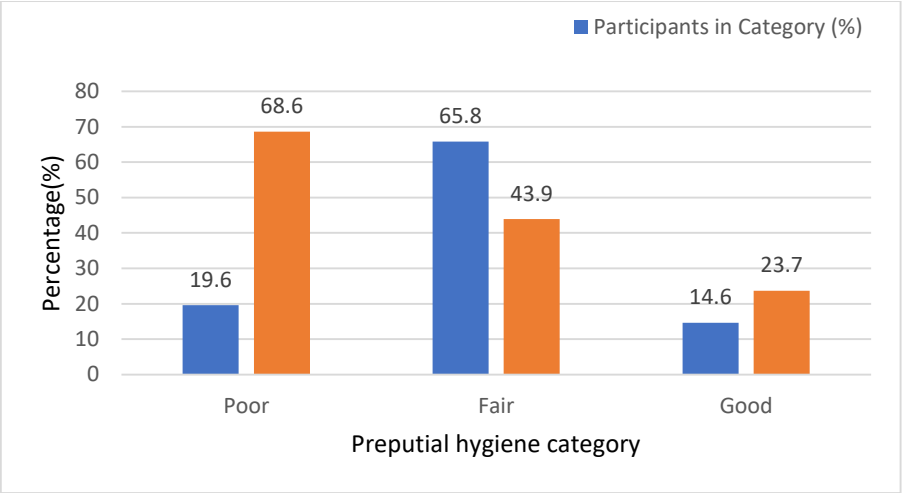

Figure 1. Distribution of preputial hygiene categories and prevalence of genital morbidity among study participants (n = 260)

5. Association Between Circumcision Status and Genital Morbidity

Genital morbidity was significantly more common among uncircumcised participants compared to those who were circumcised. Among the 173 uncircumcised men, 94 (54.3%) had at least one genital morbidity, whereas among the 87 circumcised men, only 25 (28.7%) had genital morbidity. Conversely, absence of morbidity was noted in 79 (45.7%) uncircumcised and 62 (71.3%) circumcised participants.

This difference was statistically significant, with uncircumcised males having almost three times higher odds of genital morbidity compared to circumcised males (OR = 2.95, 95% CI 1.70–5.13, $p< 0.001$). These findings suggest that circumcision may have a protective effect; however, as shown in earlier sections, preputial hygiene practices remain important determinants of genital morbidity irrespective of circumcision status.

Table 5. Association between circumcision status and genital morbidity (n = 260)

Circumcision status	No genital morbidity n (%)	Genital morbidity n (%)	Total (n)	Odds ratio (95% CI)	p-value
Uncircumcised (n = 173)	79 (45.7)	94 (54.3)	173	2.95 (1.70–5.13)	< 0.001
Circumcised (n = 87)	62 (71.3)	25 (28.7)	87	1.00 (Reference)	—

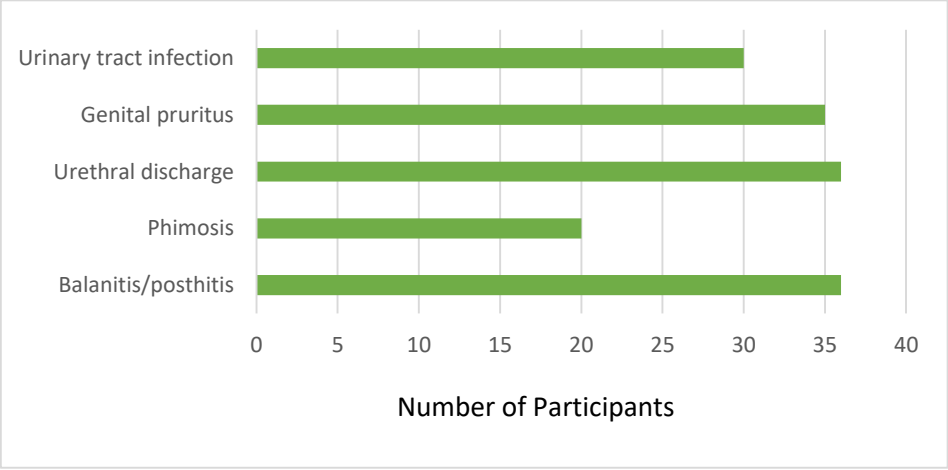

Figure 2. Distribution of specific genital morbidities among study participants (n = 260).

DISCUSSION

In this cross-sectional study of 260 adult males, nearly half (45.8%) were found to have at least one genital morbidity, and suboptimal preputial hygiene practices were common. The strong association observed between poor hygiene and genital morbidity is consistent with previous research indicating that inadequate genital hygiene is a major determinant of inflammatory and infectious penile disorders. Poor hygiene promotes smegma accumulation, increases local moisture,

and facilitates microbial proliferation within the preputial space—mechanisms long recognized in the pathophysiology of balanitis and posthitis (9,10).

The high prevalence of balanitis/posthitis in the present study (13.8%) parallels findings from international settings, including Yemen, where poor hygiene has been documented as a leading cause of balanitis (10). Our results also align with clinical evidence indicating that hygiene-related inflammation accounts for a substantial proportion of balanoposthitis cases, as observed in Indian cohorts and other global populations (11). The biological basis for these associations is well established: studies of foreskin immunobiology demonstrate that the inner preputial mucosa may harbor dense bacterial colonization in uncircumcised men, increasing vulnerability to local infection when hygiene is inadequate (12).

The relatively high occurrence of phimosis (7.7%) also warrants attention. A large systematic review by Morris et al. reported phimosis prevalence varying across age groups but emphasized that hygiene practices and recurrent inflammatory episodes significantly contribute to its development (13). Our findings support this, as phimosis was more common among individuals with poor hygiene scores.

Behavioral dimensions of male genital hygiene further contextualize these findings. Prior research from Africa and other regions indicates that uncircumcised men often demonstrate inferior genital hygiene practices, attributed to misconceptions, lack of awareness, or social norms (14). Similar behavioral patterns were evident in our population, where inadequate foreskin retraction and infrequent cleaning were common. This reinforces longstanding observations that hygiene behavior—rather than circumcision status alone—is a critical determinant of penile health.

Nevertheless, circumcision did exhibit a statistically significant protective association in our study. Morbidity prevalence was considerably lower among circumcised men (28.7%) than uncircumcised men (54.3%). This finding corresponds with evidence that circumcision reduces the prevalence of penile inflammatory disorders and may lower the risk of certain infections and malignancies by reducing microbial load and eliminating the preputial space (12,15). However, while circumcision may reduce susceptibility, it does not eliminate the need for good hygiene practices, which remains essential for all males.

From a public-health perspective, the findings highlight a neglected dimension of male reproductive health. Much of the existing literature on hygiene behaviors focuses on women (16), while hygiene education targeting men remains limited. Studies from South Asia underscore that male reproductive health services are underutilized, with cultural sensitivities and lack of targeted information acting as barriers (17). This gap likely contributes to the moderate knowledge scores and suboptimal hygiene practices observed in the present study. Improved educational strategies—delivered through clinical, community, and school-based platforms—could therefore play a significant role in reducing preventable genital morbidity.

Finally, while smegma accumulation has historically been misrepresented in some literature as carcinogenic, contemporary evidence refutes a direct carcinogenic role (18). Nonetheless, smegma remains a potent irritant and provides a medium for microbial growth, reinforcing the importance of routine foreskin retraction and cleansing.

Overall, the findings of this study add to the growing body of evidence that preputial hygiene is a modifiable, yet often neglected, determinant of male genital health. The strong graded relationship between worsening hygiene and increased morbidity underscores the need for public-health interventions focused on promoting simple, evidence-based hygiene behaviors among men.

Limitations

This study has several limitations. Its cross-sectional design restricts the ability to establish causal relationships between preputial hygiene practices and genital morbidity. The use of a hospital-based sample may limit generalisability, as men who attend outpatient departments may differ from those in the wider community. Additionally, self-reported hygiene behaviours are prone to recall bias and social desirability bias, potentially leading to overestimation of good practices. The study also lacked comprehensive microbiological investigations, which prevented detailed identification of specific infectious agents contributing to morbidity. Finally, being a single-centre study, the findings may not fully reflect variations across different geographic, cultural, or socio-economic contexts.

CONCLUSION

Preputial hygiene practices among adult males in this study were suboptimal, with the majority demonstrating only fair or poor hygiene. Nearly half of the participants had at least one genital morbidity, and there was a clear, graded association between worsening preputial hygiene and increased risk of morbidity. Uncircumcised men had a higher prevalence of genital morbidity than circumcised men, but good hygiene was protective irrespective of circumcision status. These findings underscore preputial hygiene as a simple, modifiable determinant of male genital health.

Integrating focused counselling on genital hygiene—particularly foreskin retraction, adequate cleaning frequency, and appropriate use of cleansing agents—into routine clinical care and community-based health programmes could substantially reduce preventable genital morbidity among men.

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