Original Article

Neonatal and Early Infant Male Circumcision with the Plastibell Device: Indications, Complications, and Maternal Satisfaction at a Nigerian Tertiary Hospital

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ABSTRACT
Male circumcision is the surgical removal of all or part of the prepuce of the penis. In sub-Saharan Africa, the procedure is predominantly performed for cultural and religious reasons and is associated with varying complication rates and levels of parental satisfaction. This study aimed to evaluate the indications, procedural characteristics, complications, and maternal satisfaction associated with neonatal and early infant male circumcision using the Plastibell device at a tertiary hospital in Nigeria. This study was a prospective observational study of 152 consecutive male neonates and early infants circumcised over 12 months duration. Data were collected on maternal sociodemographic profiles, neonatal characteristics, indication for circumcision, age and duration of procedure, Plastibell device size, complications, and maternal satisfaction. Post-procedure pain was assessed using the Neonatal Infant Pain Scale (NIPS). Fisher's Exact Test was applied for categorical variables with expected cell frequencies <5; Chi-square test was used otherwise. Results were expressed as means, frequencies, and percentages. The mean maternal age was 28.9 ± 5.2 years. Most mothers had tertiary education (n=92, 60.5%) and were self-employed (n=106, 69.7%). The predominant indication for circumcision was religious (n=92, 60.5%), followed by health/medical (n=31, 20.4%) and cultural (n=29, 19.1%) reasons. Mothers with tertiary education were more likely to request circumcision for health reasons ($p < 0.001$, Fisher's Exact Test). The mean age at circumcision was 12.0 ± 5.0 days. The mean procedure duration was 15.5 ± 2.2 minutes. Post-procedure pain was predominantly mild (n=126, 82.9%). Complications occurred in 10 cases (6.6%): 9 (5.9%) had minor bleeding managed conservatively, and 1 (0.7%) had mild scrotal swelling that resolved spontaneously. There were no recorded infections, haematomas, open wounds, urinary retention, or procedure-related deaths. Maternal satisfaction was very high: 150 mothers (98.7%) were very satisfied and 2 (1.3%) were satisfied; none was dissatisfied. Complications did not significantly affect satisfaction (Fisher's Exact Test, $p = 1.000$). In conclusion, neonatal and early infant circumcision with the Plastibell device by trained medical personnel is safe and associated with a low complication rate and high maternal satisfaction. Religious motivation is the primary driver of circumcision in this population, while maternal education level significantly influenced health-based circumcision decisions. Longer follow-up is required to capture late complications such as meatal stenosis.

Keywords: Complications, Circumcision, Maternal satisfaction, Neonates, Plastibell

INTRODUCTION
Male circumcision, the surgical removal of all or part of the prepuce of the penis, is one of the oldest and most widely performed surgical procedures worldwide. It is estimated that approximately one-third of the global male population is circumcised, with the highest prevalence in Muslim-majority and sub-Saharan African populations.[1]

In Nigeria, as in much of sub-Saharan Africa, male circumcision is nearly universal, driven predominantly by cultural tradition and religious obligation.[2] The procedure carries varying indications including religious mandate (Islamic and some Christian traditions), cultural rite of passage, perceived hygienic benefits, and medical indications such as phimosis, recurrent balanoposthitis, and paraphimosis. Evidence from randomised controlled trials conducted in sub-Saharan Africa has demonstrated a 50–60% reduction in HIV acquisition among circumcised men, adding a public health dimension to the practice.[3,4]

Despite widespread practice, circumcision is not without risk. Complication rates ranging from 0.2% to 16% have been documented, depending on the setting, method, and operator expertise.[5,6] In low-resource settings, unregulated circumcision performed by traditional practitioners outside clinical facilities poses heightened risks.[7] Conversely, circumcision performed by trained medical personnel using standardised devices such as the Plastibell is associated with considerably lower complication rates.[8]

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The Plastibell device is a sterile plastic ring with a handle that facilitates circumcision through controlled pressure necrosis of the foreskin without requiring a formal surgical incision or suturing. Its simplicity and relative safety have made it widely adopted for neonatal and early infant circumcision in Nigerian hospitals.[9] However, a recognised and clinically important late complication specific to the Plastibell technique is meatal stenosis, arising from exposure of the glans meatus without the protective prepuce, which can present weeks to months post-procedure and may be missed by studies with short follow-up periods.[10]

Maternal satisfaction with the procedure and its outcome is an important but underexplored dimension of circumcision care, particularly in settings where mothers are the primary decision-makers for neonatal procedures. The primary objective of this study was to determine the complication rate of Plastibell circumcision in neonates and early infants at a Nigerian tertiary hospital. Secondary objectives were to characterise the indications, procedural parameters, and maternal satisfaction, and to assess the influence of maternal education on the stated reason for circumcision.

MATERIALS AND METHODS

This was a prospective observational study conducted over 12 months (from September 2023 to August 2024) at Edo State University Teaching Hospital, Auchi, Nigeria. Consecutive neonates and early infants (aged 0–60 days) presented for circumcision were enrolled. Institutional ethical approval was obtained, and informed written consent was provided by the mothers or guardians of all participants prior to enrolment.

Male neonates and early infants aged 0–60 days brought for circumcision during the study period were included. Infants with bleeding disorders, active genital infection, ambiguous genitalia, hypospadias, epispadias, or severe systemic illness were excluded. A history of bleeding tendency and documentation of neonatal Vitamin K prophylaxis were obtained for all participants at enrolment to screen for haemorrhagic risk.

All circumcisions were performed by trained paediatric surgical personnel using the Plastibell device under sterile conditions. The appropriate Plastibell ring size was selected based on the diameter of the glans penis; the sizes used were recorded. Parents were counselled on post-procedure care, including wound hygiene, signs of complications, and expected time to ring detachment, and were followed up at 7 days post-procedure.

A structured pro forma was used to collect data on maternal age, level of education, occupation, antenatal care (ANC) attendance and booking gestational age, parity, and mode of delivery. Neonatal data included gestational age at birth, birth weight, reason for circumcision, age at circumcision, duration of procedure, complications encountered and their management, and maternal satisfaction. Post-procedure pain was assessed using the Neonatal Infant Pain Scale (NIPS), a validated six-item observational tool for neonates.[11] Satisfaction was assessed at the 7-day follow-up visit using a structured three-point scale (not satisfied, satisfied, very satisfied). To minimise social desirability bias, satisfaction data were collected by a research nurse independent of the operating team.

Data were entered and analysed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean ± standard deviation (SD) with range. Categorical variables were presented as frequencies and percentages. Fisher's Exact Test was used when any expected cell frequency was <5; the Chi-square (χ^2) test was applied otherwise. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Review Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

A total of 152 neonates and early infants were circumcised during the study period. The mean maternal age was 28.9 ± 5.2 years (range 18-43 years), with the majority of mothers in the 26-30 years age group (n=58, 38.2%). Most mothers had attained tertiary-level education (n=92, 60.5%) and were self-employed (n=106, 69.7%). The vast majority attended antenatal care (n=145, 95.4%), with most booking between 4 and 6 months gestation (n=100, 68.9%). Most deliveries occurred in hospital (n=143, 94.1%). Detailed maternal sociodemographic data are presented in Table 1.

Most infants were born at term (n=147, 96.7%) with a mean birth weight of 3.44 ± 0.52 kg. Majority of the participants (n=135, 88.8%) were of normal weight. The most common reason for circumcision was religion (n=92, 60.5%), followed by health/medical (n=31, 20.4%) and cultural (n=29, 19.1%) reasons. The mean age at circumcision was 12.0 ± 5.0 days. Seventy nine of the participants (51.9%) were circumcised at 8-14 days of age, and 50 (32.9%) within the neonatal period (0-7 days). The mean procedure duration was 15.5 ± 2.2 minutes; most procedures lasted 16-20 minutes (n=76, 50.0%). Neonatal characteristics and circumcision details are summarised in Table 2.

Complications were recorded in 10 cases (6.6%): 9 (5.9%) involving minor post-procedure bleeding managed conservatively with pressure dressing, and 1 (0.7%) involving mild scrotal swelling that resolved spontaneously within the follow-up period. There were no recorded infections, haematomas, open wounds, urinary retention, or procedure-related deaths. Post-procedure pain assessed with the NIPS was predominantly mild in 126 infants (82.9%) and moderate in 26 (17.1%); no infant experienced severe pain. Complications and satisfaction data are summarised in Table 3.

A statistically significant association was found between maternal level of education and the stated reason for circumcision (Fisher's Exact Test, $p < 0.001$). Mothers with no formal education exclusively cited health/medical reasons. Among those with tertiary education, n=26, 28.3% cited health reasons compared with only n=2, 4.3% of mothers with secondary education. Religious reasons predominated across all educated groups. Table 4 presents the cross-tabulation of maternal education versus reason for circumcision.

Complication rates did not vary significantly across age groups at circumcision (Fisher's Exact Test, p = 0.854) or by reason for circumcision (Fisher's Exact Test, p = 0.971). Table 5 shows the distribution of complications across age-at-circumcision groups.

Maternal satisfaction was uniformly high: 150 mothers (98.7%) reported being very satisfied and 2 (1.3%) were satisfied. No mother reported dissatisfaction. The occurrence of complications did not significantly influence maternal satisfaction (Fisher's Exact Test, p = 1.000).

Table 1: Sociodemographic characteristics of mothers (n = 152)

Characteristic	n	%
Mother's Age (years)		
<20	2	1.3
20–25	47	30.9
26–30	58	38.2
31–35	29	19.1
36–40	10	6.6
>40	6	3.9
Mean ± SD (range)	28.9 ± 5.2 (18–43)	
Level of Education		
None	3	2.0
Primary	10	6.6
Secondary	47	30.9
Tertiary	92	60.5
Occupation		
Housewife	18	11.8
Student	18	11.8
Civil Servant	9	5.9
Self-employed	106	69.7
Antenatal Care (ANC) Attendance		
Yes	145	95.4
No	7	4.6
ANC Booking Gestational Age		
0–3 months	12	8.3
4–6 months	100	68.9
7–9 months	39	26.9
Place of Delivery		
Home	7	4.6
Primary Health Centre	2	1.3
Hospital	143	94.1
Parity		
1	48	31.6
2	24	15.8
3	30	19.7
4	22	14.5
>4	28	18.4

Table 2: Neonatal characteristics and circumcision details (n = 152)

Characteristic	n	%
Gestation		
Term	147	96.7
Preterm	5	3.3
Birth Weight (kg): Mean ± SD	3.44 ± 0.52	
Birth Weight Group		
Underweight (<2.5 kg)	2	1.3
Normal weight (2.5-3.9 kg)	135	88.8
Overweight (≥4.0 kg)	14	9.2
Reason for Circumcision		
Religious	92	60.5
Cultural	29	19.1
Health/Medical	31	20.4
Age at Circumcision (days): Mean ± SD	12.0 ± 5.0	
Age at Circumcision Group		
0–7 days (neonatal)	50	32.9
8–14 days	79	51.9
15–21 days	12	7.9
22–28 days	6	3.9
>28 days (early infant)	5	3.3
Duration of Procedure (min): Mean ± SD	15.5 ± 2.2	
Duration of Procedure Group		
5–10 min	8	5.3
11–15 min	68	44.7
16–20 min	76	50.0

Table 3: Complications and mothers' satisfaction (n = 152)

Variable	n	%
Complications		
Any complication	10	6.6
No complication	142	93.4
Type of Complication		
Minor bleeding	9	5.9
Mild scrotal swelling	1	0.7
Infection	0	0.0
Haematoma	0	0.0
Open wound	0	0.0
Urinary retention	0	0.0
Post-procedure Pain (NIPS-assessed)		
Mild	126	82.9
Moderate	26	17.1
Severe	0	0.0
Mothers' Satisfaction		
Very satisfied	150	98.7
Satisfied	2	1.3
Not satisfied	0	0.0

**Bleeding only; scrotal swelling (n=1) was a separate event in a different patient.*

Table 4: Maternal level of education versus reason for circumcision (n = 152)

Level of Education	Religious n(%)	Cultural n(%)	Health n(%)	Total n(%)
None	0 (0.0)	0 (0.0)	3 (100.0)	3 (100)
Primary	5 (50.0)	5 (50.0)	0 (0.0)	10 (100)
Secondary	32 (68.1)	13 (27.7)	2 (4.3)	47 (100)
Tertiary	55 (59.8)	11 (12.0)	26 (28.3)	92 (100)
Total	92 (60.5)	29 (19.1)	31 (20.4)	152 (100)

Fisher's Exact Test, p < 0.001

Table 5: Age at circumcision versus complications (n = 152)

Age at Circumcision	Complication n(%)	No Complication n(%)	Total n(%)	p-value
0–7 days	2 (4.0)	48 (96.0)	50 (32.9)	
8–14 days	5 (6.3)	74 (93.7)	79 (51.9)	
15–21 days	2 (16.7)	10 (83.3)	12 (7.9)	
22–28 days	0 (0.0)	6 (100.0)	6 (3.9)	
>28 days	0 (0.0)	5 (100.0)	5 (3.3)	
Total	9 (5.9)*	143 (94.1)	152 (100)	0.854

Fisher's Exact Test, p = 0.854

DISCUSSION

Plastibell circumcision performed in a supervised tertiary hospital environment demonstrated a favourable safety profile in the current cohort, with a complication rate of 6.6% (n=10) confined entirely to minor self-limiting events and no procedure-related mortality. Maternal acceptance of the procedure was near-universal, with 98.7% (n=150) of participants expressing very high satisfaction at the 7-day follow-up assessment.

The mean maternal age of 28.9 years and the predominance of mothers with tertiary-level education (n=92, 60.5%) reflects a relatively well-educated urban catchment population, consistent with tertiary hospital utilisation patterns in Nigeria.[12] The high proportion of self-employed mothers (n=106, 69.7%) is a characteristic feature of the informal economy in sub-Saharan Africa.

Religious motivation accounted for 60.5% (n=92) of circumcision requests reflecting the predominantly Muslim and Christian composition of the study population, both faith traditions in which male circumcision carries established religious significance.[2, 11, 12] Cultural motivation (n=29, 19.1%) reflects the deep-rooted tradition of circumcision as a marker of male identity across several Nigerian ethnic groups. Health-based motivation (n=31, 20.4%) constituted a proportionally higher category than has been reported in comparable West African series, where cultural and religious reasons collectively account for over 90% of requests.[13] This disparity is best explained by the educational profile of the study population: mothers with tertiary-level education were significantly more likely to request circumcision on health grounds (n=26, 28.3% versus n=2, 4.3% among secondary school completers; Fisher's Exact Test, p < 0.001). Analogous relationships between maternal educational attainment and health-

informed circumcision decision-making have been documented in East African cohorts.[14,15]

The mean age at circumcision of 12.0 ± 5.0 days, with 32.9% (n=50) of procedures performed within the neonatal period, is consistent with the practice in Muslim communities, where circumcision on or about the seventh day of life is a prescribed religious obligation.[16] Post-procedure pain, assessed systematically using the validated Neonatal Infant Pain Scale (NIPS), was mild in 82.9% (n=126) of infants. Dorsal penile nerve block with 1% lignocaine was administered uniformly, in accordance with current evidence-based guidance on procedural analgesia for neonatal circumcision.[11,17]

The overall complication rate of 6.6% (n=10) compares favourably with published rates of 2-10% for Plastibell circumcision in comparable clinical settings.[5,8,18] The complete absence of infectious complications, haematoma, urinary retention, and open wound underscores the procedural safety of the Plastibell technique when executed by trained personnel under aseptic conditions, and stands in marked contrast to traditional circumcision, where severe complications including septic gangrene and procedure-related mortality have been well documented.[7]

The absence of a statistically significant association between age at circumcision and complication rate (Fisher's Exact Test, p = 0.854) is consistent with established data demonstrating that when circumcision is performed by competent personnel within the first two months of life, the specific timing within that window does not influence procedural safety.[6] Equally, the indication for circumcision exerted no significant effect on complication rates (p = 0.971), confirming that procedural outcomes are determined by technical and environmental factors rather than by the motivational context of the request.

Maternal satisfaction of 98.7% (n=150) ranks among the highest rates reported in the African literature on infant circumcision.[19,20] Notably, the occurrence of complications did not significantly alter maternal satisfaction outcomes (Fisher's Exact Test, p = 1.000), affirming that adequate pre-procedural counselling effectively attenuated the impact of minor adverse events on the overall parental experience of care. The independence of the research nurse who collected satisfaction data on behalf of the clinical team that performed the procedures further strengthened the validity of this outcome by mitigating social desirability bias.

LIMITATIONS

The principal limitations of this study are its single-centre design, which restricts generalisability to settings with different sociodemographic profiles or a higher prevalence of traditional circumcision, and the constraint that Plastibell device sizes, although recorded, could not be systematically analysed as predictors of complications owing to dataset limitations. Multicentre prospective studies with longer follow-up periods and formal cost-effectiveness analysis are required to consolidate the evidence base for clinical Plastibell circumcision practice in Nigeria

CONCLUSION

Neonatal and early infant circumcision performed with the Plastibell device by trained medical personnel in a tertiary hospital setting is safe and associated with a low early complication rate and uniformly high maternal satisfaction. Religious motivation is the primary driver of circumcision in this population, while maternal education level significantly influences health-based circumcision decisions. These findings support the continued provision of clinical Plastibell circumcision services with robust pre-procedure counselling. Prospective studies with follow-up beyond seven days are needed to characterise the full complication profile, particularly the incidence of meatal stenosis.

RECOMMENDATIONS

Given the low complication rate and high satisfaction found, Plastibell circumcision should be institutionalised as the preferred method in tertiary and secondary facilities, reducing reliance on traditional circumcision. Future studies should extend follow-up to 6–8 weeks to capture delayed complications such as meatal stenosis. Antenatal counselling should include targeted health education, particularly for less-educated mothers, given the link found between education and reason for circumcision.

DECLARATIONS

Conflict of Interest: None declared.
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Patients' Consent: Informed written consent was obtained from the mothers of all participants prior to enrolment.

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