# **Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20172587

# Ankyloglossia and its impact on breastfeeding: a prospective observational study

# Rahul R. Holkar, Charusheela S. Korday\*, Sushma Malik

Department of Pediatrics, TNMC, B.Y.L. Nair Hospital, Mumbai, Maharashtra, India

Received: 27 May 2017 Accepted: 01 June 2017

## \*Correspondence:

Dr. Charusheela S. Korday,

E-mail: c\_warke2000@hotmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** Ankyloglossia is due to the short lingual frenulum. It has been associated with an increased incidence of breastfeeding difficulties. The aim of our study was to determine the association between ankyloglossia and breastfeeding difficulties in healthy full term newborns.

**Methods:** We assessed 504 full term newborns admitted in post-natal care ward for presence of ankyloglossia, severity and associated breast feeding difficulties using the Hazelbacker's tool, Kotlow classification and breastfeeding observation form respectively. Mother and baby were observed in postnatal ward for breastfeeding problems during their hospital stay for at-least 48 hours and thereafter till day seven of life in admitted babies and by telephonic contact if discharged earlier. All mothers were counselled regarding breastfeeding.

**Results:** The incidence of AG was found to be 11.71% (59/504) with male predominance (Male: Female- 1.57:1). Breastfeeding difficulties were encountered in 13 (22.03%) neonates with AG. Majority of babies with breastfeeding difficulties had mild (Class I) ankyloglossia (69.2%) and rest had moderate AG. Breastfeeding difficulty was related to mother's position in 38.5%, baby's position in 30.8%, latching difficulty in 100%, suckling difficulty in 84.6% and associated with mother's breast problems in 23.1%. All these feeding problems were observed during 24-48hours, which persisted in 92.3% for 48-72 hours and 76.9% during 72-96 hours of life but were not observed on day of life seven on follow up.

**Conclusions:** Breastfeeding problems associated with mild or moderate ankyloglossia are usually transient and it can be resolved with prompt and appropriate counseling, unless AG is complete or severe type.

**Keywords:** Ankyloglossia, Breastfeeding, Hazelbacker tool, Kotlow classification

### **INTRODUCTION**

Ankyloglossia (AG), also known as tongue-tie is a congenital anomaly characterized by an abnormal short lingual frenulum. It occurs in approximately 3.2% of all newborns and it is associated with an increased incidence of breastfeeding difficulties, ranging from 4.8% to 25%. The role of a short lingual frenulum as a cause of breastfeeding difficulties has been described in multiple studies linking partial ankyloglossia to decreased tongue

mobility and a potential inability to latch on properly.<sup>2</sup> Significant ankyloglossia prevents an infant from anteriorly extending and elevating the tongue and thereby limiting the normal peristaltic motion of the tongue during feeding. This results in nipple trauma and ineffective milk transfer and ultimately affects infant weight gain.<sup>3,4</sup> Short and long-term consequences of ankyloglossia may include feeding and speech difficulties as well as orthodontic, mandibular abnormalities and psychological problems.<sup>5,6</sup> Associations between tongue-

tie, lactation problems, speech disorders and other oral motor disorders and their management has been controversial issue in the medical community. This study was undertaken to know the incidence and severity of ankyloglossia in the newborn babies and its association with breastfeeding difficulties in healthy newborn babies in the post-natal ward of our tertiary care centre with the help of Hazelbacker's descriptive assessment tool for lingual frenulum function and the Kotlow classification.<sup>7,8</sup>

#### **METHODS**

This prospective observational study was carried out in the postnatal care ward of the tertiary care centre of Mumbai, Maharashtra over a period of one year from January 2014 to December 2014 and was initiated after getting approval from the institutional ethics committee. The study population included normal full-term newborn babies in which at least one parent/ guardian provided a written informed consent for enrolment and participation in the study. Newborns having clinically detectable congenital anomaly and babies with risk factors or presence of conditions such as birth asphyxia, septicemia, meningitis, hyperbilirubinemia requiring phototherapy were excluded from the study.

The aim of the study was to determine association between ankyloglossia and its severity with breastfeeding difficulties in newborn babies. Additionally, we determined the association between ankyloglossia, parity of mother and birth order of the baby.

Table 1: Hazelbacker's descriptive assessment tool for lingual frenulum function.

• • • •					
Appearance items and scor	es 0	1	2		
Appearance of tongue when lifted	Heart- or V-shaped	Slight cleft in tip apparent	Round or square		
Elasticity of frenulum	Little or no elasticity	Moderately elastic	Very elastic		
Length of lingual frenulum when tongue lifted	<1 cm	1 cm	>1 cm		
Attachment of lingual frenulum to tongue	Notched tip	At tip	Posterior to tip		
Attachment of lingual frenulum to inferior alveolar ridge	Attached at ridge	Attached just below ridge	Attached to floor of mouth or well below ridge		
Total appearance score					
Function items and scores					
	0	1	2		
Lateralization	None	Body of tongue but not tongue tip	Complete		
Lift of tongue	Tip stays at lower alveolar ridge or rises to	Only edges to mid-mouth	Tip to mid-mouth		
Extension of tongue	Neither of the above, or anterior or mid-tongue humps	Tip over lower gum only	Tip over lower lip		
Spread of anterior tongue	Little or none	Moderate or partial	Complete		
Cupping	Poor or no cup	Side edges only, moderate cup	Entire edge, firm cup		
Peristalsis	None or reverse motion	Partial, originating Complete, anterior to posterior to tip posterior			
Snapback	Frequent or with each suck	Periodic	None		
Total functional score					

The infant's tongue was assessed using the 5 appearance items and the 7-function item. Significant ankyloglossia was diagnosed when appearance score total was 8 or less and/or function score total was 11 or less

The babies were assessed for ankyloglossia using the Hazelbacker's Descriptive Assessment Tool (Table 1) for lingual frenulum function for minimum of 20 minutes on second day of life. The severity of ankyloglossia was

determined according to Kotlow Classification of Ankyloglossia based on the length of 'free tongue'. The term 'free tongue' is defined as the tongue's length from the insertion of the lingual frenulum into the tongue's base to the tongue's tip. Accordingly, the classification of AG was categorized as - Class I: mild ankyloglossia = 12-16 mm, Class II: moderate ankyloglossia =8-11 mm, Class III: severe ankyloglossia =3-7 mm and Class IV: complete ankyloglossia =<3mm. Significant ankyloglossia was diagnosed when appearance score total was 8 or less and/or function score total was 11 or less.

In present study, there was no inter-observer bias as only one person recorded the findings. There were also no drop outs in the study. The inclusion and exclusion criteria were appropriately designed so as to exclude the other factors that may affect successful breastfeeding other than ankyloglossia.

A breastfeeding observation form which included assessment of mother's position, baby's position, and ideal latching of baby, effective suckling and breast and nipple problems was used to confirm the presence of breastfeeding difficulty. All babies were initially assessed at 24-48 hours of life and repeat examination was carried out between 48-72hours and 72-96hours if baby was still admitted in hospital till day seven of life and each time the findings were recorded.

Accordingly, final inference was drawn to comment about the breastfeeding difficulty and mother was counselled regarding breastfeeding. After thorough counseling, only those babies in whom mother was confident about breastfeeding, were discharged. The mother of the babies discharged from the hospital, were contacted on phone for current status of the breastfeeding problem till day of life seven and if the problem existed, they were asked to come back for follow up at the hospital.

#### Statistical analysis

SPSS Version 17 was used for statistical analysis. Qualitative data was represented in form of frequency and percentage. Association between the presence of tongue tie and feeding difficulties was assessed by Chi-Square test with Continuity Correction for all 2 X 2 tables and with or without Continuity Correction in rest. Fisher's exact test was used for all 2 X 2 tables where p-value of Chi-Square test is not valid due to small counts.

Quantitative data was represented using mean, median and IQR (Inter-quartile range). Analysis of Quantitative data between a qualitative variable with two subgroups was done using unpaired t-test if data passes Normality test and by Mann-Whitney test if data fails Normality test.

#### RESULTS

Amongst the 504 full term normal newborns enrolled as per the inclusion criteria over a period of 1year we observed a male preponderance [363(72.02%)] as compared to females [141(27.98%)] (Table 2). Maximum

babies 373 (74%) were of 1st birth order, followed by 104 (20.74%), 23 (4.56%) and 4 (0.8%) of 2nd, 3rd and 4th birth order respectively. Most babies, 444 (88%) were born by normal vaginal delivery and there were 60 cesarean section born babies. The weight wise distribution of our subjects ranged from 2.5 to 4.0 kg with maximum babies 391 (77.57%) weighing between 2.5to 3.0 kg.

Table 2: Demographic profile of the study population and incidence of ankyloglossia.

Distribution of study group	Numbers (Percentage)	Incidence of ankyloglossia (Percentage)				
Distribution according to sex						
Female	141 (27.98)	23 (38.98)				
Male	363 (72.02)	36 (61.02)				
Total	504 (100.00)	59 (100)				
Distribution according to birth order						
1	373 (74)	32 (54.24)				
2	104 (20.64)	21 (35.59)				
3	23 (4.56)	5 (8.47)				
4	4 (0.8)	1 (1.69)				
Total	504 (100.00)	59 (100)				
Distribution according to mode of delivery						
Normal	444 (88)	40 (67.80)				
LSCS	60 (12)	19 (32.20)				
Total	504 (100.00)	59 (100)				
Distribution according to parity						
1	373 (74)	32 (54.24)				
2	104 (20.64)	21 (35.59)				
3	23 (4.56)	5 (8.47)				
4	4 (0.8)	1 (1.69)				
Total	504 (100.00)	59 (100)				
Distribution according to birth weight						
2.5 to 3.0	391 (77.57)	40 (67.80)				
3.01 to 3.5	94 (18.66)	13 (22.03)				
3.51 to 4.0	19 (3.77%)	6 (10.17)				
Total	504 (100.00)	59 (100)				

On screening 504 newborns, as per Hazelbacker's Descriptive Assessment Tool we detected 59 (11.71%) babies with ankyloglossia and amongst these we found a male preponderance (1.57:1) with 36 (61.02%) being males and 23 (38.98%) being females (Table 2). The Hazelbacker's scoring in our study for the appearance score, for the 59 babies, ranged from 5 to 8 and for the functional score it ranged from 8-11.

Out of 59 babies with ankyloglossia, 13 (22.03%) had breastfeeding difficulty. All these 13 neonates of ankyloglossia and breastfeeding difficulty presented during 24 to 48 hours (day of life 2) and it persisted in 12 babies at 48-72 hours (day of life 3) and in 10 babies (76.9%) at 72-96 hours (day of life 4) and the statistical analysis revealed that all these presentations at different time periods were statistically significant by using the

Pearson Chi-Square and Fisher's exact statistical test. Further evaluation revealed that none of the 13 babies

with AG and breastfeeding difficulty had breastfeeding problems at end of 168 hours (day 7) of life on follow up.

Table 3: Association between ankyloglossia with breastfeeding difficulty and Kotlow's class of ankyloglossia.

Kotlow's Class of	Frequency of ankyloglossia	Breastfeeding difficulty (BD)	
ankyloglossia	(AG)	Yes	No
Class 1 (Mild)	55 (93.22%)	9 (69.2% of BD)	46 (100.0%)
Class 2 (Moderate)	04 (6.78%)	4 (30.8% of BD)	0 (0.00%)
Class 3 (Severe)	00 (0.00%)	0 (0.00% of BD)	0 (0.00%)
Class 4 (Complete)	00 (0.00%)	0 (0.00% of BD)	0 (0.00%)
Total	59 (100.00%)	13 (100.00% of BD)	46 (100.0%)

Chi-Square test (Pearson Chi-Square): Value15.183, Df1, P value 0.000, association was found to be statistically significant. Fisher's Exact Test: P value 0.002, association was found to be statistically significant.

On evaluating the relationship of ankyloglossia with parity and birth order, it was observed that maximum babies with ankyloglossia, i.e. 32 (54.24%) were born to primiparous mothers with birth order 1, followed by 21 (35.59%), 5 (8.47%) and 1 (1.69%) babies with ankyloglossia being born to parity 2 mothers with birth order 2, parity 3 mothers with birth order 3 and parity 4 mothers with birth order 4 respectively.

This clearly states the strong association between ankyloglossia and primiparous mothers. In present series, authors found that neonates with ankyloglossia who were having breastfeeding difficulty, maximum babies i.e. 55 (69.2%) were of class 1 severity (mild ankyloglossia) and 4 (30.8%) were of class 2 severity (moderate ankyloglossia) according to Kotlow's classification of ankyloglossia (Table 3).

Table 4: Association between ankyloglossia and factors leading to breastfeeding difficulties.

	Forms of BD	Mother's faulty position	Baby's faulty position	Latching problem	Suckling difficulty	Mother's breast problems
	BD (%)	38.5	30.8	100	84.6	23.1
CST PCT	Value	19.330	15.183	59.000	47.843	11.184
	Df	1	1	1	1	1
	(P value)	0.000 SS*	0.000 SS*	0.000 SS#	0.000 SS#	0.001 SS*
FET	(P value)	0.000 SS	0.002 SS	0.000 SS	0.000 SS	0.009 SS
		BD (%) Value PCT Df (P value)	Forms of BD faulty position  BD (%) 38.5  Value 19.330  PCT Df 1  (P value) 0.000 SS*	Forms of BD faulty position  BD (%) 38.5 30.8  Value 19.330 15.183  PCT Df 1 1  (P value) 0.000 SS* 0.000 SS*	Forms of BD faulty position position problem  BD (%) 38.5 30.8 100  Value 19.330 15.183 59.000  PCT Df 1 1 1 1  (P value) 0.000 SS* 0.000 SS* 0.000 SS#	Forms of BD   faulty   position   problem   Latening   problem   difficulty

CST: Chi- Square test, PCT: Pearson Chi-Square test, FET: Fisher's Exact test, BD: Breastfeeding difficulty, SS: Statistically Significant, all associations in each variable were significant by both PCT and FET. \*2 cells (50.0%) have expected count less than 5, #1 cells (25.0%) have expected count less than 5.

We did not come across any baby with class 3 or class 4 (severe and complete) ankyloglossia. It was also found that only 9 out of 55 babies (16.36%) who had class 1 AG had breastfeeding difficulty whereas all 4 babies (100%) who had class 2 AG had breastfeeding difficulty. This result was found to be statistically significant (Pearson Chi-Square Test-P <0.05).

On analysis of factors leading to breastfeeding difficulties in the 13 neonates, we had 5 babies (38.5%) who had developed breastfeeding problems were related to faulty mother's position, in 4 (30.8%) it was related to faulty baby's position, 13 (100%) had latching problems, 11 babies (84.6%) had suckling difficulty and 3 babies

mother's (23.1%) had breast related problem. All these factors individually were statistically significant (Table 4).

#### **DISCUSSION**

Ankyloglossia is an anatomic variation in which the lingual frenulum is unusually thick, tight, or short. 9,10 Reported incidence in most studies of this condition varies from 1.7% to 4.8% with a male-to-female ratio of 3 to 1.1.2 The incidence of ankyloglossia in our series was 11.71% (59 babies) with male preponderance by using Hazelbacker's scoring system by which the baby's tongue was assessed using appearance and function

items. On reviewing literature, we found that a similar high incidence of AG by Hogan et al who examined 1866 babies and identified 201 tongue tie cases (10.7%) with a male: female ratio of 1.6:1. Out of these 201 tongue tie cases, 44% had problems during breastfeeding. Contrary to our study Messner et al in his case-controlled study examined 1041 newborns and identified 50 cases of tongue tie i.e. 4.8% with a M:F ratio of 2.6:1.Out of these, breastfeeding difficulties were found in 9 cases and 1 control. Ballard et al examined 2763 breastfed inpatient babies and 273 attenders at lactation clinic with a male: female ratio of 1.5:1. He identified tongue tie in 3.2% in-patients and 12.8% in clinic attenders. Also, Ricke et al examined 3490 babies, identified 148 tongue tie cases (4.24%) with a male: female ratio of 2.3:1.

In literature, a number of high-quality studies have demonstrated that tongue-tie significantly affects breastfeeding, though controversy still continues in medical fraternity. Ankyloglossia has been associated with an increased incidence of breastfeeding difficulties: 25% in affected versus 3% in unaffected infants. Although, many infants with AG breastfeed without difficulty, previous studies have shown that the duration of breastfeeding is shorter in infants with tongue-tie compared with those with normal lingual frenulum. The impact of a tight frenulum varies between mother–baby dyads. In present study, out of the total babies included, 2.58% babies had breastfeeding difficulty 97.42% did not have any breastfeeding difficulty.

Out of 59 ankyloglossia babies, 13 babies had breastfeeding difficulty (i.e. 22.03%). Similar to our incidence of breastfeeding difficulties in our series, the large case-controlled study from the USA conducted by Messner et al demonstrated that tongue-tie causes breastfeeding difficulties and nipple pain for mothers. They examined 1041 newborns in their case controlled study and identified 50 (4.8%) tongue tie cases. Out of this, 9 cases and 1 control experienced breast feeding difficulties, which means that 18% babies of the ankyloglossia cases group had breastfeeding difficulty.<sup>12</sup> However, on the contrary, Hogan et al who had identified 201 tongue tie cases (10.7%) encountered breastfeeding difficulty in as many as 44%. 11 Literature search reveals that the restriction of the tongue movements must be quite extreme to interfere with sucking and swallowing. It appears that some mothers may have particular breast/nipple or milk ejection characteristics that allow them to successfully breastfeed an infant with ankyloglossia. 15

Longitudinal studies on association of ankyloglossia associated with breastfeeding difficulty up to 2 months of age are found in literature. Study by Messner et al found that 83% of infants with tongue-tie were breastfed for at least 2 months compared to 92% of the control infants without tongue-tie. They also found that mothers of infants with tongue-tie generally had more difficulty extending for longer than 6 weeks when compared to the

control group.<sup>12</sup> However, this does not apply to our study as we restricted our study up to 7th day of life and we had only mild and moderate cases of ankyloglossia.

In present study, we observed a statistically significant association was found between the class of ankyloglossia and breastfeeding difficulty, indicating that the number of cases with breastfeeding difficulty increased as the severity of ankyloglossia increased. We also found a higher incidence of AG in primiparous mothers which may be because of the relative inexperience of breastfeeding by the primi mothers in the initial delivery. There was also no statistically significant association found between AG and breastfeeding difficulty with other parameters like sex, parity, mode of delivery and birth order.

Association between ankyloglossia and the various factors leading to breastfeeding difficulty which were evaluated as per the breastfeeding observation form was also found to be statistically significant. This clearly indicates that the issues related to position of the mother-baby dyad with respect to each other and latching during breastfeeding are major important causes of concerns regarding breastfeeding difficulty and hence require prompt evaluation, assessment and counseling at the earliest.

Mild and moderate forms of ankyloglossia are usually asymptomatic and the condition may resolve spontaneously or affected individuals may learn to compensate adequately for their decreased lingual mobility. However, in those babies with AG who are having persistent breastfeeding difficulties that lead to poor feeding and failure to thrive, need treatment. Currently recommended treatment is surgical intervention (frenotomy, frenectomy or frenuloplasty) for their tongue-tie which is a low risk, safe and effective minor procedure. <sup>16</sup>

#### **CONCLUSION**

Careful inspection of the tongue and its function should be part of the routine neonatal examination to detect cases of ankyloglossia in the new born period. In present series, we came across a total of 11.7% of AG. Majority of the AG babies were mild to moderate in nature and this lead to only transient breastfeeding problems which were correctable with education and prompt counselling.

#### **ACKNOWLEDGEMENTS**

Authors would like to acknowledge the constant support given during study by Dr. Sandeep Bavdekar, Professor and Head of Department of Pediatrics and Dr. Ramesh Bharmal, Dean, TNMC and B.Y.L Nair Ch. Hospital, Mumbai.

Funding: No funding sources Conflict of interest: None declared Ethical approval: The study was approved by the Institutional Ethics Committee

#### **REFERENCES**

- 1. Messner AH, Lalakea ML. Ankyloglossia: controversies in management. Int J Pediatr Otorhinolaryngol. 2000;54:123-31.
- 2. Ballard JL, Auer CE, KhouryJC. Ankyloglossia: assessment, incidence, and effect of frenuloplasty on the breastfeeding dyad. Pediatrics. 2002;1109(5):e63.
- 3. Siegel SA. Aerophagia Induced reflux in breastfeeding infants with ankyloglossia and shortened maxillary labial frenula (tongue and lip tie). Int J Clin Pediatr. 2016;5(1):6-8.
- 4. Buryk M, Bloom D, Shope T. Efficacy of neonatal release of ankyloglossia: a random trial. Pediatrics. 2011;128(2):280-8.
- Garcia Pola MJ, Gonzalez Garcia M, Garcia Martin JM, Gallas M, SeoaneLeston J. A study of pathology associated with short lingual frenulum. ASDC J Dent Child. 2002;69:59-62,12.
- 6. Messner AH, Lalakea ML. The effect of ankyloglossia on speech in children. Otolaryngol Head Neck Surg. 2002;12:539-45.
- 7. Kotlow LA. Ankyloglossia (tongue-tie): a diagnostic and treatment quandary. Quintessence Int. 1999;30:259-62.
- 8. Amir LH, James JP, Donath SM. Reliability of the hazelbaker assessment tool for lingual frenulum function. Int Breastfeed J. 2006;1(1):3.
- 9. Dezio M, Piras A, Gallottini L, Denotti G. Tonguetie, from embriology to treatment: a literature review. J Pediatr Neonatal Individualized Medicine. 2015;4(1):e040101.

- 10. Hall DMB, Renfrew MJ. Tongue tie: common problem or old wives tale? Arch Dis Child. 2005;90(12):1211-5.
- 11. Hogan M, Westcott C, Griffiths M. Randomized controlled trial of division of tongue-tie in infants with feeding problems. J Paediatr Child Health. 2005;41:246-50.
- 12. Messner AH, Lalakea ML, Aby J, Macmahon J, Bair E. Ankyloglossia: Incidence and associated feeding difficulties. Arch Otolaryngol Head Neck Surg. 2000;126:36-9.
- Ricke LA, Baker NJ, Madlon-Kay DJ, DeFor TA. Newborn tongue-tie: prevalence and effect on breastfeeding. J Am Board Fam Pract. 2005;18(1):1-
- 14. Segal LM, Stephenson R, Dawes M, Feldman P. Prevalence, diagnosis, and treatment of ankyloglossia: methodologic review. Can Fam Physician. 2007;53(6):1027-33.
- Geddes DT, Kent JC, MacClellan HL, Garbin CP, Chadwick LM, Hartmann PE. Sucking characteristics of successfully breastfeeding infants with ankyloglossia: A case series. Acta Paediatr. 2010;9:301-3.
- 16. Rowan-Legg A. Ankyloglossia and breastfeeding. Canadian Paediatric Society Community Paediatrics Committee. 2015;20(4):209-13.

**Cite this article as:** Holkar RR, Korday CS, Malik S. Ankyloglossia and its impact on breastfeeding: a prospective observational study. Int J Contemp Pediatr 2017;4:1296-1301.