POSTNATAL GROWTH OF HIV EXPOSED AND UNEXPOSED CHILDREN IN A RESOURCE-POOR PERI-URBAN COMMUNITY

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BACKGROUND

The postnatal growth of HIV-exposed and -unexposed children has been studied but few data are available on growth in the context of COVID-19 pandemic. We studied postnatal children growth by maternal HIV exposure status in a pregnancy cohort study that took place in a resource-poor community prior and during the COVID-19 pandemic.

METHODS

Mother-child pairs were recruited during antenatal clinic visits and followed in a community-based cohort study conducted in a low-resourced peri-urban township. Maternal and child data (including self-reported HIV) were obtained using a semi-structured interview and anthropometric measures taken using standardised methods. Mean z-scores were calculated for length-for-agea (LAZ), weight-for-age (WAZ) and weight-for-length (WLZ) using 2006 WHO growth standards. Mean Z-scores were compared by maternal HIV exposure status using t-test and mixed effects regression. Frequencies were compared using chi2test.

RESULTS

471 recruited mother-child pairs were followed-up at the 3-6week (n=453), 6 months (n=453), 1-year (n=367) and 2-years (n=339) visits between March 2016 - March 2020 (prior COVID pandemic), while 258 were interviewed at 3-year visit from October 2021-March 2023 (during COVID pandemic) (Figure 1). The sample included 4 HIV-infected (HIV+), 167 HIV-exposed uninfected (HEU) and 300 HIV-unexposed (HUU) children. Most (90.64%) mothers living with HIV were on antiretroviral treatment. There was no difference in the proportion of children who had small and vulnerable phenotypes (including preterm, low birth weight, small-for-gestational age) between the comparison groups (Table 1). HEU children had significantly lower mean LAZ (95%CI) than HUU children [-0.41(-0.62; -0.20)] in the crude model (P<0.001) (Table 2). This effect was slightly attenuated in the model adjusting for low birth weight [-0.39 (-0.60; -0.18)], which was strongly associated with lower mean LAZ (-1.10 (-1.45; -0.76)) (p<0.001). Similar results were observed for mean WAZ. No differences in mean WLZ were observed between the exposure groups. There was no difference in mean Z-scores between the comparison groups before and during the COVID-19 pandemic. However, the overall mean LAZ and WLZ showed an increase and decrease respectively during the COVID-19 pandemic period (Figures 2-4).

DISCUSSION

Our results reaffirm current literature on the association between perinatal maternal HIV exposure and poorer children postnatal growth. Despite high maternal antiretroviral treatment coverage HEU children had lower mean WAZ and LAZ than HUU children, and this was observed at birth and throughout the first 36 months of life. Although HEU and HUU children had similar rates of low birth weight, HEU children born with low birthweight had the poorest growth compared to their counterparts. These observations were also seen during the COVID-19 pandemic period. Further research is required to understand the poor growth of HEU children, particularly those who live in resource-constrained settings where poor health is not only due to clinical factors but is also driven by adverse social determinants, such as poverty and food security.
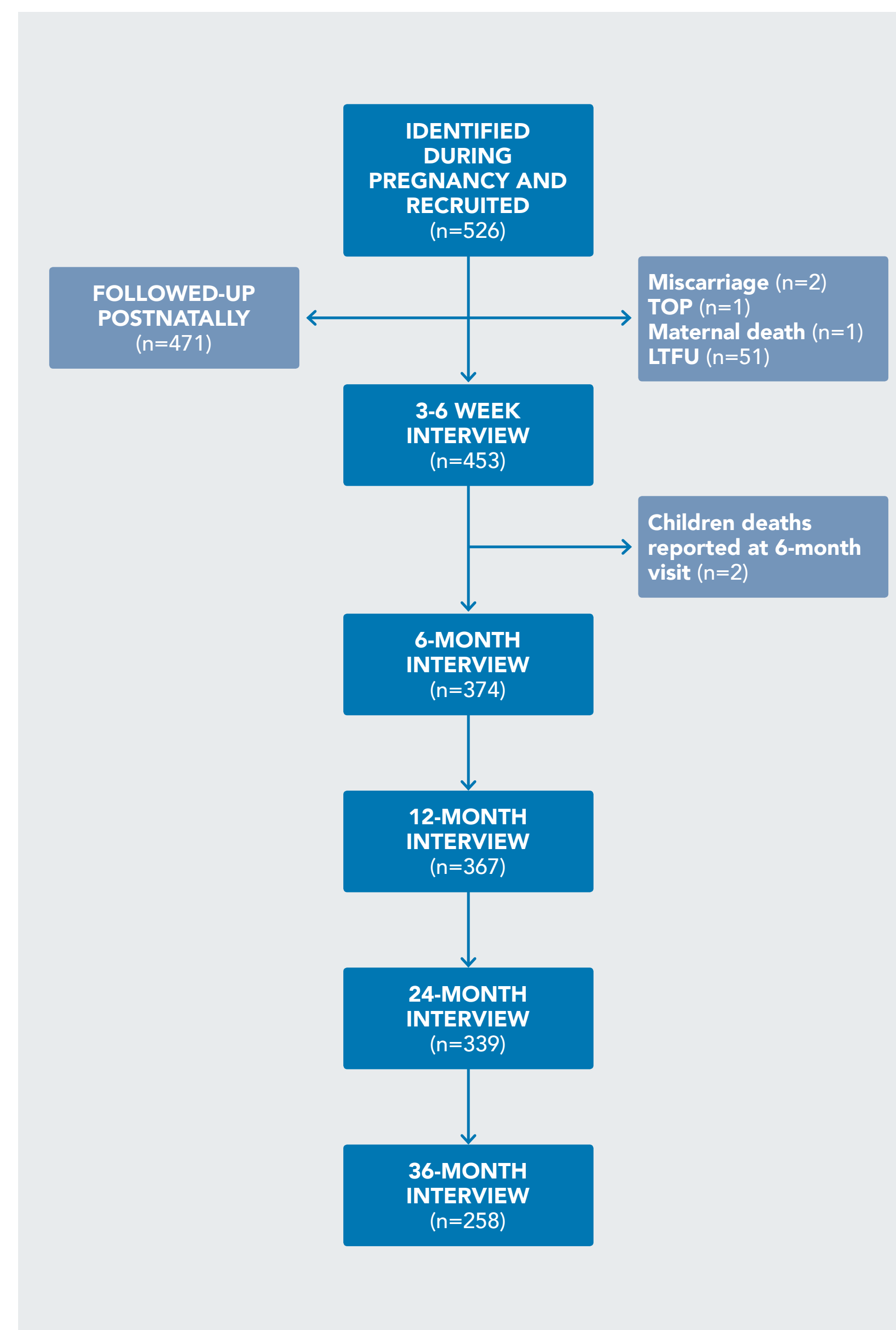

Figure 1: Cohort flow chat

Table 1: Demographic characteristics at baseline for HIV exposed uninfected, HIV infected and HIV unexposed children

Characteristics	Total (n=471)*	HIV unexposed (n=300)	HIV exposed uninfected (n=167)	HIV+ (n=4)
MATERNAL	n(%)	n(%)	n(%)	n(%)
Maternal age n, median (IQR)	471, 27 (23-31)	300, 26 (22-29)	167, 30 (25-33)	4, 32 (28-35)
Maternal education				
None	1 (0.21)	0	1 (0.60)	0
Primary	12 (2.55)	3 (1.00)	9 (5.39)	0
Secondary	419 (88.96)	267 (89.00)	148 (88.62)	4 (100)
Tertiary	39 (8.28)	30 (10.00)	9 (5.39)	0
Marital status				
Single	281 (59.66)	179 (59.67)	100 (59.88)	281 (59.66)
Married	112 (23.78)	77 (25.67)	34 (20.36)	112 (23.78)
Co-habiting	74 (15.71)	43 (14.33)	30 (17.96)	74 (15.71)
Widowed	1 (0.21)	0	1 (0.60)	1 (0.21)
Divorced	1 (0.21)	0	1 (0.60)	1 (0.21)
Separated	2 (0.42)	1 (0.33)	1 (0.60)	2 (0.42)
Number of ANC visits n, median (IQR)	466, 4 (3-6)	279, 4 (3-6)	163, 4 (3-6)	4, 4.5 (3-5.5)
Mother's employment				
Yes	124 (31.79)	81 (30.80)	41 (33.33)	2 (50.00)
No	266 (68.21)	182 (69.20)	82 (66.67)	2 (50.00)
Mother's income n, median (IQR)	124, 2550 (1350-3450)	80, 2800 (1640-3500)	42, 2250 (1350-3000)	2, 1730 (460-3000)
HH income (Rands) n, median (IQR)	384, 3075 (1943-4390)	237, 3200 (2000-4500)	143, 3000 (1420-4300)	4, 3250 (2420-3600)
HH size n, median (IQR)				
Maternal BMI				
Underweight	1 (0.21)	0	1 (0.60)	0
Health weight	56 (11.94)	36 (12.08)	20 (11.98)	0
Overweight	128 (27.29)	81 (27.18)	45 (26.95)	2 (50.00)
Obese	284 (60.55)	181 (60.74)	101 (60.48)	2 (50.00)
Missing	2	2	0	0
CHILDREN				
Sex				
Girl	226 (47.98)	140 (46.67)	85 (50.90)	1 (25.00)
Boy	239 (50.74)	158 (52.67)	78 (46.71)	3 (75.00)
Missing	77	45	32	0
Low birth weight				
Yes	42 (9.31)	26 (9.03)	15 (9.43)	1 (25.00)
No	409 (90.96)	262 (90.97)	144 (90.57)	1 (75.00)
Missing	20	12	8	0
Preterm birth				
Yes	31 (7.87)	18 (7.06)	13 (9.63)	0
No	363 (92.13)	237 (92.94)	122 (90.37)	4 (100)
Missing	77	45	32	0
Gestational age				
SGA	49 (12.44)	32 (12.55)	16 (11.85)	1 (25.00)
APA	309[ǂ] (78.43)	200 (78.43)	106 (78.52)	3 (75.00)
LGA	36 (9.14)	23 (9.02)	13 (9.63)	0
Missing	77	45	32	0

Table 2: Summary table of children anthropometry by children HIV status

Time point	Total	HIV exposed uninfected	HIV+	HIV unexposed
	N, mean (SD)	n, mean (SD)	n, mean (SD)	n, mean (SD)
	WAZ			
3-6 week	418, -0.14 (1.12)	267, -0.02 (1.04)	4, -1.21 (0.88)	147, -0.33 (1.22)
6 months	372, 0.58 (1.34)	234, 0.71 (1.30)	4, -1.05 (1.45)	134, 0.41 (1.38)
12 months	367, 0.71 (1.41)	235, 0.80 (1.42)	3, -1.01 (1.10)	129, 0.60 (1.37)
24 months	336, 0.53 (1.34)	218, 0.59 (1.33)	3, -1.12 (1.26)	115, 0.47 (1.34)
36 months	173, 0.31 (1.14)	61, 0.26 (1.05)	3, -0.9 (1.98)	109, 0.37 (1.18)
	LAZ			
3-6 week	417, -0.21 (1.55)	265, -0.05 (1.48)	4, -1.47 (0.91)	148, -0.46 (1.65)
6 months	373, 0.48 (1.47)	234, 0.66 (1.43)	4, -0.08 (1.24)	135, 0.18 (1.50)
12 months	366, -0.08 (1.32)	235, 0.06 (1.26)	3, -1.10 (1.20)	128, -0.32 (1.38)
24 months	336, -0.38 (1.25)	217, -0.29 (1.21)	3, -1.13 (0.55)	116, -0.54 (1.32)
36 months	172, -0.20 (1.11)	61, -0.41 (1.10)	3, -0.83 (0.56)	108, -0.06 (1.11)
	WLZ			
3-6 week	415, -0.07 (1.55)	264, -0.09 (1.55)	4, 0.09 (0.53)	147, -0.04 (1.59)
6 months	372, 0.54 (1.38)	234, 0.57 (1.35)	4, -1.30 (2.01)	134, 0.53 (1.38)
12 months	366, 1.01 (1.40)	235, 1.03 (1.46)	3, -0.64 (0.95)	128, 1.00 (1.32)
24 months	335, 0.99 (1.34)	217, 0.99 (1.32)	3, -0.74 (1.33)	115, 1.01 (1.37)
36 months	171, 0.62 (1,29)	61, 0.74 (1.12)	3, -0.62 (1.03)	107, 0.58 (1.37)

Table 3: Summary of children feeding patterns by children HIV status

| Children feeding	Total (N=471)	HIV unexposed (n=300)	HIV exposed uninfected (n=167)	HIV+ (n=4)	*P-value
	EXCLUSIVE BREASTFED AT 3 DAYS				
Yes	286 (63.41)	41 (25.79)	245 (85.07)	0 (0)	<0.001
No	165 (36.59)	43 (14.93)	118 (74.21)	4 (100)	
Missing	20	12	8	0	
	EXCLUSIVE BREASTFED AT 3-6 WEEKS				
Yes	175 (41.57)	106 (39.55)	66 (44.30)	3 (75.00)	0.25
No	246 (58.43)	162 (60.45)	83 (55.70)	1 (25.00)	
Missing	50	32	18	0	
	BREASTFED AT 6 MONTHS				
Yes	155 (41.55)	124 (52.99)	29 (21.48)	2 (50.00)	<0.001
No	218 (58.45)	110 (47.01)	106 (78.52)	2 (50.00)	
Missing	98	66	32	0	

*Note: P-value derived from chi2test
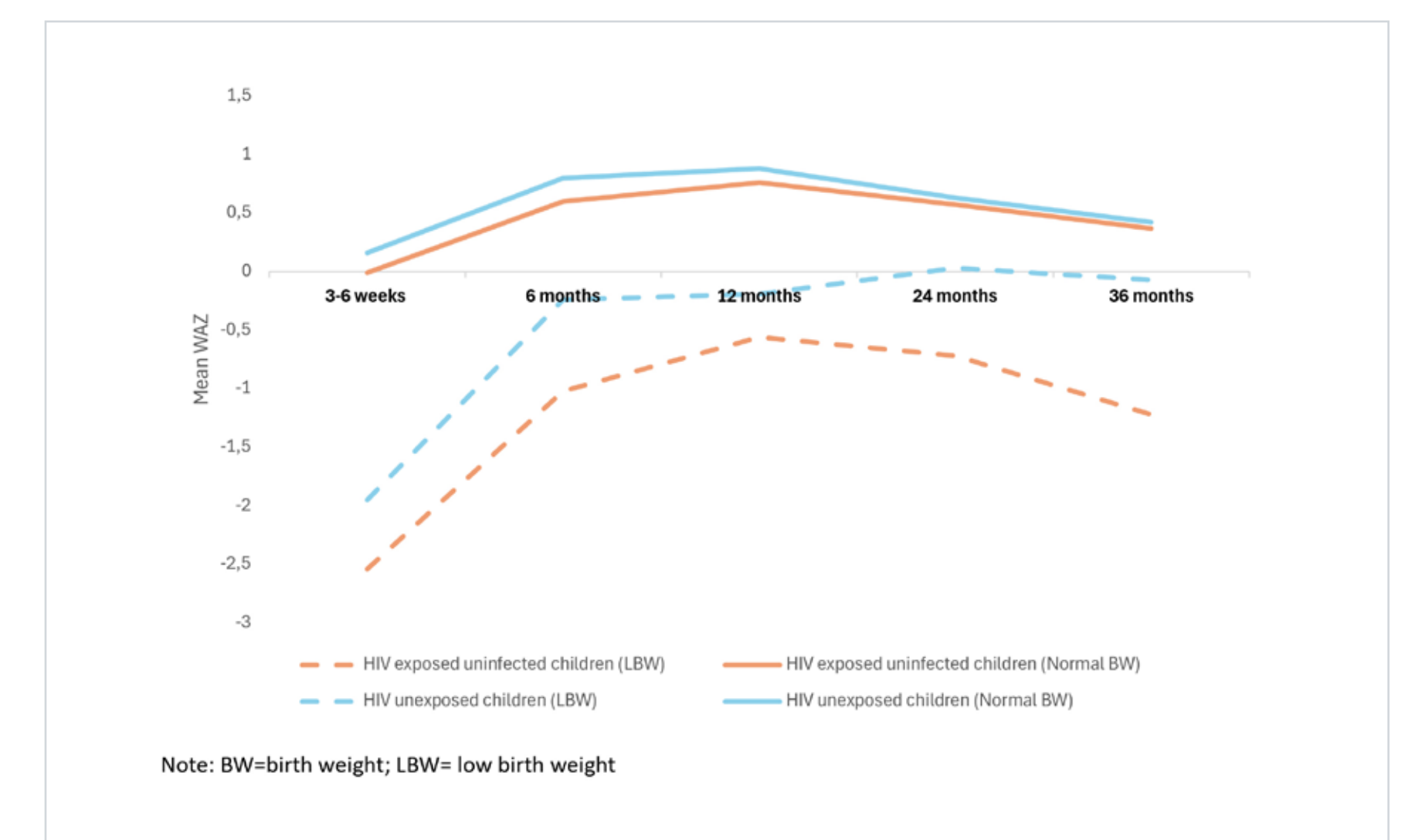
Figure 2: Mean weight-for-age Z-score (WAZ) by children HIV exposure and birth weight status
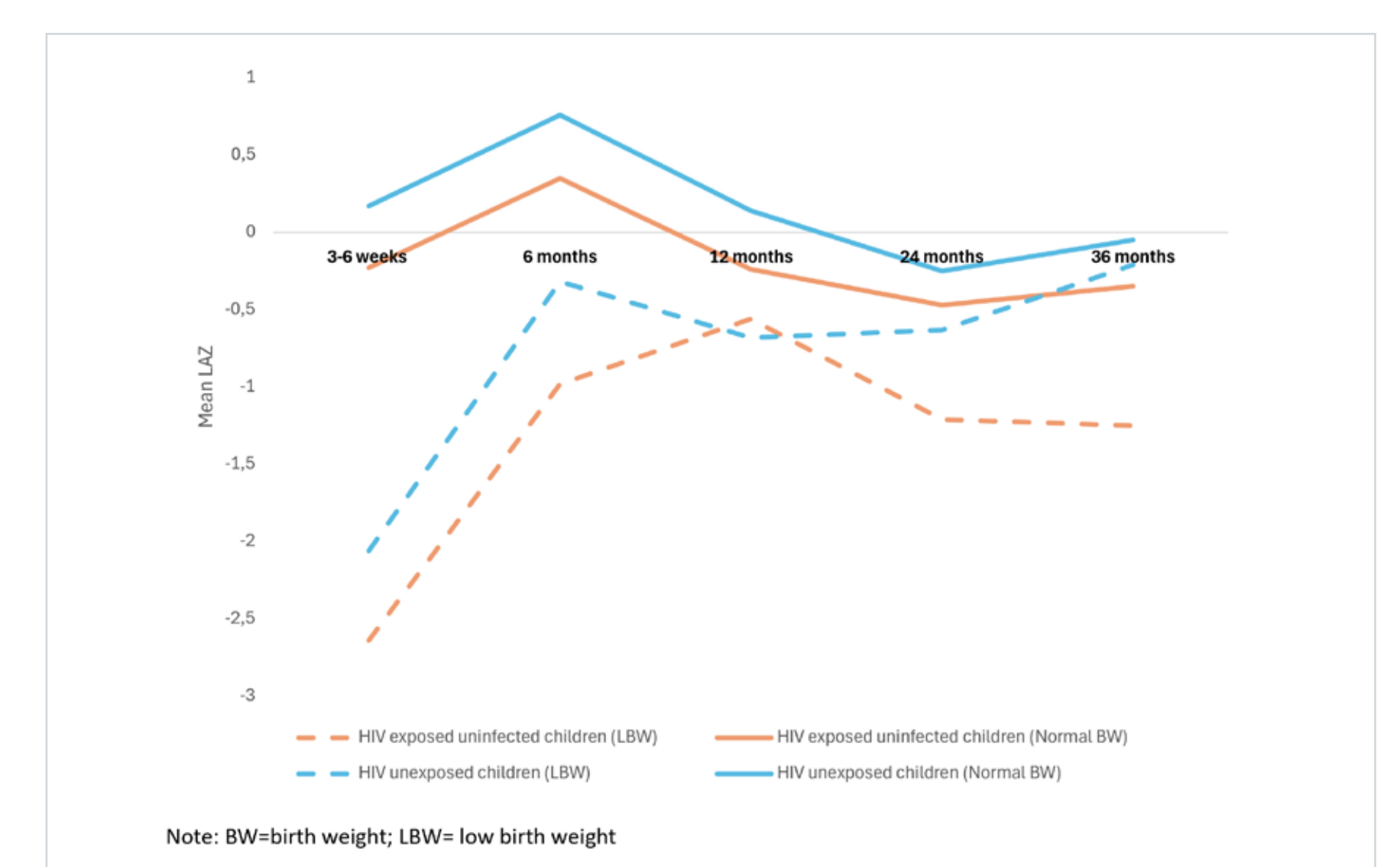

Figure 3: Mean length-for-age Z-score (LAZ) by children HIV exposure and birth weight status ow chat
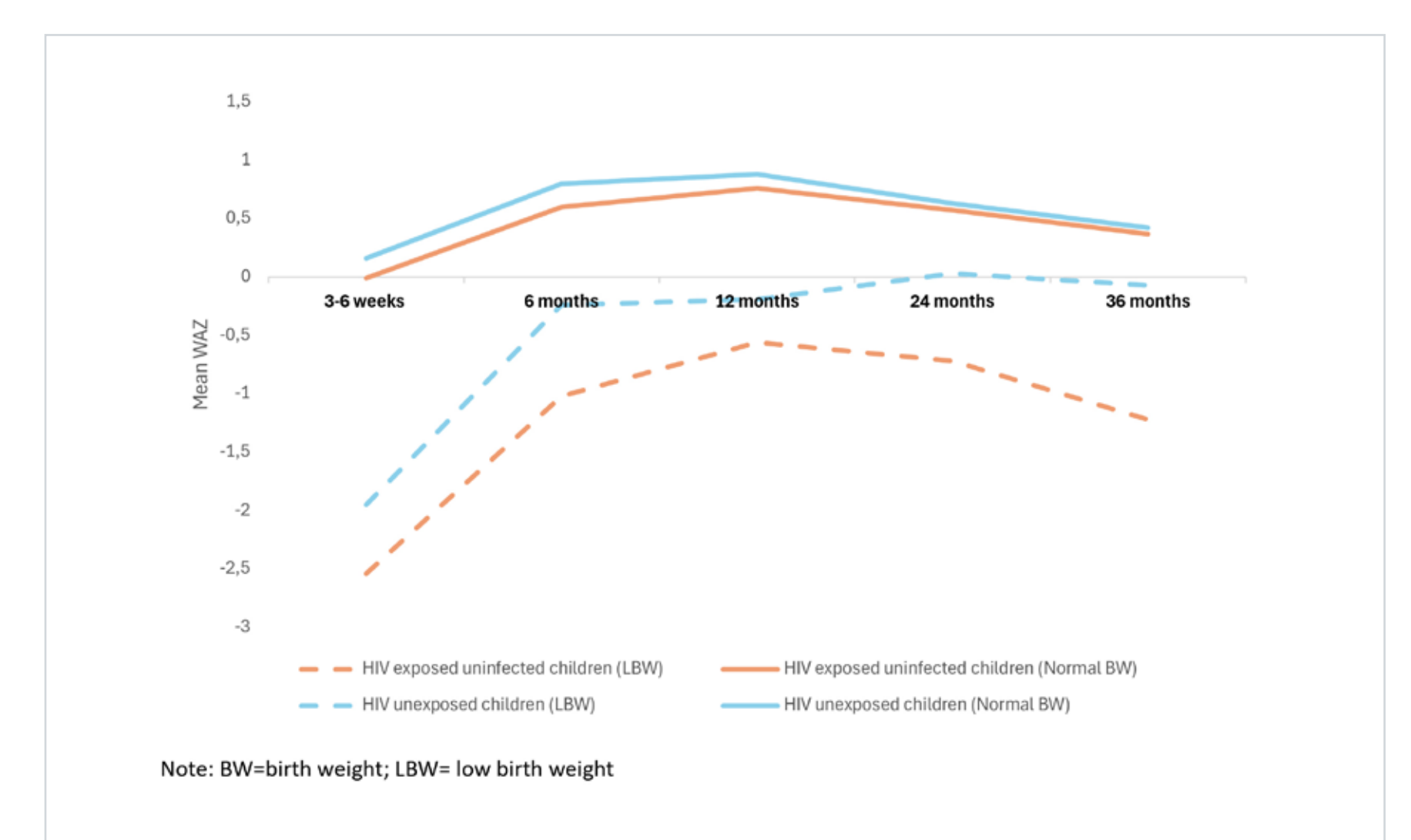

Figure 4: Mean weight-for-length Z-score (WLZ) by children HIV exposure status