ORIGINAL ARTICLE

Risks factors associated with child stunting in a district of Kinshasa, Democratic Republic of the Congo

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ABSTRACT

Background: Stunting is a major public health problem in the Democratic Republic of the Congo. The prevalence has constantly remained high in the past 10 years, affecting almost one child in two aged below 5 years. **Objective:** The aim of this study was to determine the risk factors of stunting in children under 5 years. **Methods:** A cross-sectional anthropometric study based on height for age index was conducted among children under 5 years in Kikimi Health Zone, located in the outskirt of Kinshasa. Stunting was defined as height for age less than minus two *Z*-score according to the WHO cutoff points. Sociodemographic characteristics of households and also maternal nutritional status were used to investigate the risk factor of stunting. Maternal nutritional status was measured by body mass index with malnutrition below 18.5 height for m^2. EPI-DATA version 3.1 was used for data entry and SPSS for Windows version 21for analysis. Logistic regression was used to identify risk factors at $P < 0.05$. **Results:** The study showed that 56 children (11.2%) were stunted. Among severely demographic characteristics, the main risks factors associated with stunting were the low mother's height and the low level of mother's education ($P < 0.0001$, odds ratio = 1.04, 95% confidence interval). **Conclusion:** In this district, the environmental risk factors were found associated with child stunting. They were the low mother's height. A particular attention should be paid to these groups of mothers and their infants.

Key words: Stunting, Children Under Five, Mothers, Sociodemographic Status, Democratic Republic of the Congo, Kinshasa

1. INTRODUCTION

A study in South Asia indicates that poor diets within the first years of life, poor nutrition status of women before and during pregnancy, and the prevailing poor sanitation practices in households and communities are important drivers of growth retardation in children (1). Other studies conducted in Ethiopia reported that high family size, number of under-5 children in the household, maternal occupation outside the household, short duration of exclusive breastfeeding, poor method of feeding complementary food (2) as well as markers of child health (fever and diarrhea), mother's poor nutrition, mother's low educational level, and poor environmental hygiene are independently associated with stunting (3).

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Childhood stunting is often seen as the best overall indicator of children's well-being and an accurate reflection of social inequalities. Not only it is associated with increased morbidity and mortality but also with loss of physical potential, reduced neurodevelopmental and cognitive function and an elevated risk of chronic diseases in adulthood. The severe irreversible physical and neurocognitive damages are likely to compromise child economic performance and maternal reproductive outcomes late in life (4-6). This evidence has contributed to the growing scientific consensus that tackling childhood stunting is a high priority for reducing the global burden of disease and for fostering economic development (5,6). Prendergast et al., examining malnutrition in developing countries, observed that stunting is a cyclical process such that women who were themselves stunted in childhood tend to have stunted offspring, creating an intergenerational cycle of poverty and reduced human capital (6,7).

Stunting is an alarming public health priority in the Democratic Republic of the Congo (DRC), where consistently almost every other child aged below 60 months is stunted. The 2007 Demographic and Health Surveys (DHS) (8) and the 2014 DHS (9) reported an estimate of stunting in children aged 0-59 months as 46% and 435, respectively. Yet, the factors producing these challenges are not fully understood.

The purpose of this study was to assess environmental risk factors associated with stunting among children aged below 60 months in a health district of Kinshasa, in DRC.

2. METHODS

This was a cross-sectional study that consecutively enrolled 504 children attending growth-monitoring services from 01 June to 31 August 2014.

Kikimi Health Zone (KHZ), one of the 35 health zones of Kinshasa was the study site. It is located in the outskirt of Kinshasa. There are eight health areas in KHZ, out of which four were randomly chosen (Lobiko, Maréchal, Bosembo, Mfumu-Nkento).

Stunting was determined using the height for age index, setting the cutoff point at minus two Z-score. It was defined based on the 2006 WHO standards (10).

Sociodemographic characteristics of the households were collected using a standardized questionnaire administered to the mother. The characteristics included family size, parents' occupation and educational level, housing conditions, economic status. Each child's age, gender, weight, and height were measured in growth monitoring services at health centers. In addition, birth weight was obtained through mother's interview. Child's age was classified in three groups: Under 6 months, 6-12 months, more than 12 months. Mother's nutritional status was measured by body mass index computed as the individual weight divided by height (kg/m^2). Parents' education was categorized into three groups: Low, medium and high.

All data were entered in Epi-data and analyzed using SPSS version 21. Child anthropometric indices were computed using WHO Anthro software 3.2.2. The prevalence of stunting was calculated. The Chi-square test was used in bivariate analysis. Logistic regression analysis was used to identify the predictors of stunting. The significance level was set at $P \leq 0.05$.

The study was authorized by the Kinshasa School of Medicine. All mothers who took part in the study gave their informed consent. Children found sick were referred for appropriate care in the corresponding health center.

3. RESULTS

3.1. Study population and risk factors analyses

A total of 504 infant-mother pairs were investigated. Among 504 infants, there were 262 girls (52%) and 242 boys (48%). Descriptive statistics reported by the anthropometric indices height for age for the children are shown in Table 1.

It can be shown from Table 1 that 56 (11.2%) children were stunted and 33 (6%) others had a height more than median of WHO chart.

Socio-demographic variables included father education level, mother education level, head of household, socioeconomic status. The association of stunting with age, gender, mother' height, mother's body mass index (BMI), socio-demographic variables was shown in Table 2, where only mother's height is identified as a risk factor associated with stunting. Results of bivariate and multivariate analyses are shown in Tables 3 and 4, respectively.

In the study, 56 infants were stunted. Comparisons of univariate and multivariate analysis of stunting between children and other characteristic had shown that: (i) Boys were more stunted at any age, (ii) infant aged under 6 months were less stunted, and (iii) the rate of stunting increases with age. Stunting was shown to be significantly associated wit`h mother's height (P = 0.032) with significance of 5%. Maternal height is therefore a predictor factor of stunting with high odds ratio (OR) before and after adjustment. Mothers undernutrition and those who suffered obesity were not significant predictor of stunting in multivariate analysis. However, a mother who was undernourished increase four time the risk of stunting (ORadjustment = 4.3, 95% confidence interval [CI]: 1.60-11.5); on the other hand,

Table 1: Description characteristics of children (n=504)

Indices	Frequency (%)
T/A	
Under height	56 (11.2)
Normal height for age	415 (82.8)
Over height	33 (6.0)

Table 2: Association between stunting and age, gender, mother's height, mother's BMI, sociodemographic variables

Characteristics	T/A (>2 *Z*-score) (*n*=448)	T/A (<2 *Z*-score) (*n*=56)	Total (*n*=504)	*P*
Sex				0.160
Boys	212 (47.3)	31 (55.4)	243 (48.2)	
Girls	235 (52.7)	25 (44.6)	261 (51.8)	
Age				0.311
1-6 months	300 (66.8)	33 (58.9)	333 (65.9)	
7-12 months	69 (15.4)	13 (23.2)	82 (16.2)	
>12 months	80 (17.8)	10 (17.9)	90 (17.8)	
Father education level				0.638
No level	22 (5.3)	1 (1.8)	23 (4.9)	
Level 2	306 (73.2)	40 (72.7)	346 (73.2)	
Level3	77 (18.4)	12 (21.8)	89 (18.8)	
Mother education level				0.751
No level	18 (4.0)	1 (1.8)	19 (3.8)	
Level 1	64 (14.3)	6 (10.9)	70 (13.9)	
Level 2	350 (78.3)	46 (83.6)	396 (78.9)	
Level 3	15 (3.4)	2 (3.6)	17 (3.4)	
Head of household				
Grand parents	76 (16.9)	10 (17.9)	86 (17.0)	0.492
Mother	19 (4.2)	2 (3.6)	21 (4.2)	0.582
Father	350 (78.0)	44 (78.6)	394 (78.0)	0.536
Mother's height				0.032
<1.45	3 (0.7)	0 (0.0)	3 (0.6)	
1.45-1.49	15 (3.4)	7 (12.5)	22 (4.4)	
1.50-1.54	45 (10.1)	6 (10.7)	51 (10.2)	
1.55-1.59	102 (22.9)	15 (26.8)	117 (23.3)	
≥1.60	281 (63.0)	28 (50.0)	309 (61.6)	
Mother's nutritional status (BMI)				0.332
BMI (<18.5) underweight	65 (14.6)	10 (17.9)	75 (14.9)	
Normal BMI	299 (67.0)	40 (71.4)	339 (67.5)	
BMI>25 overweight	82 (18.4)	6 (10.7)	88 (17.5)	
Socioeconomic status				0.387
Poor	131 (29.2)	19 (33.9)	150 (29.7)	
Mean	311 (69.3)	35 (62.5)	346 (68.5)	
Height	7 (1.6)	2 (3.6)	9 (1.8)	

BMI: Body mass index

the mother who suffered obesity increases twice the risk of stunting (ORadjustment = 2.04, 95% CI: 0.818-5.08), but there were no significance in either child age, the mother's head of household, the jobless status of the head of household.

In addition, multivariate regression logistic analysis also showed a low education level as a risk factor for stunting $P < 0.0001$(ORadjustment = 1.04, 95% CI: 1.02-1.061).

4. DISCUSSION

Findings from this study showed that 11.6% of infants were stunted. The main risk factor was the mother's height. In this study, boys were more stunted than girls but without significance at $P \leq 0.05$ in this area. In previous research in Africa, it was shown almost the same findings (10,11). Poverty, low economic status of household, as well as the

Table 3: Association stunting and sociodemographic factors: Multivariate analysis

Characteristics	*P*	OR (95% CI)	*P (après ajustement)*	OR (95% CI)
Gender	0.258	1.4 (0.79-2.41)	0.473	1.2 (0.69-2.22)
Age	0.875	1.02 (0.98-1.23)	0.659	1.01 (0.98-1.03)
Father's education level	0.288	1.3 (0.81-2.07)	0.273	1.3 (0.80-2.20)
Mother's education level	0.295	1.4 (0.77-2.41)	0.397	1.3 (0.71-2.36)
Head of household grand father	0.861	1.1 (0.52-2.21)	0.984	1.01 (0.44-2.31)
Head of household jobless	0.900	1.1 (0.57-1.9)	0.825	1.1 (0.565-2.05)
Size of household	0.401	1.2 (0.77-1.9)	0.456	1.2 (0.73-1.99)
Mother's height	0.003	4.1 (1.61-10.63)	0.004	4.3 (1.60-11.5)
Mother's undernutrition	0.503	1.3 (0.62-2.67)	0.989	1.01 (0.44-2.32)
Mother's obesity	0.166	1.9 (0.77-4.59)	0.126	2.04 (0.818-5.08)

CI: Confidence interval, OR: Odds ratio

Table 4: Association stunting and sociodemographic factor: Comparison of bivariate and multivariate analysis

Characteristics	Univariate analysis		Multivariate analysis	
	P	OR (95% CI)	*P*	OR adjustment (95% CI)
Gender	0.067	1.8 (0.959-3.5)	0.125	0.614 (0.329-1.144)
Age	0.0001	1.039 (1.021-1.057)	0.070	1.971 (0.945-4.111)
Mother's level education	0.674	1.119 (0.663-1.887)	<0.0001	1.04 (1.02-1.061)
Grandparent head of household	0.622	1.253 (0.511-3.07)	0.207	1.48 (0.805-2.73)
Mother's head of household	0.080	2.762 (0.885-8.621)	0.381	4.8 (0.144-16.78)
Father's head of household	0.492	1.288 (0.625-2.653)	0.763	1.74 (0.047-64.88)
Jobless's head of household	0.500	1.256 (0.648-2.433)	0.375	4.65 (0.156-13.88)
Mother's height<1.50	0.003	4.656 (1.717-12.629)	0.366	1.41 (0.669-2.978)
Under nourished mother	0.131	2.917 (0.727-11.705)	0.007	4.8 (1.55-14.9)
Obesity mother	0.089	2.852 (0.851-9.555)	0.267	3.276 (0.73-14.75)

CI: Confidence interval, OR: Odds ratio

infectious illness were commonly identified previously as risk factors (12-14). Place of residence was found in a previous research in Ethiopia where children were more stunted in rural area than in urban, and also in valley the risk of stunting was higher than in mountain, with both children belonging in poor households without farms (15,16).

The people who had bad feeding practices and big size of household – more than six children, had a high risk of stunting among these children, of which boys had increased risk – almost three times higher risk of stunting (17-29). The epidemic which led to a reduction for meat consumption likely increased the rate of stunting; this was the case of grippe aviaire (swine flu) in Egypt where the risk increased almost to 87,5%, mainly with smaller infants for age being at higher risk of becoming stunted (30-32). Others risks factors were also found: Mother's stress levels and tobacco smoking (33-36).

Findings of this study could have been affected because of the small sample size, with participants limited in one health district only. It would be desirable to make other surveys with larger sample sizes and include more study participants (37-40).

The results of this study have implications to reduce stunting among children aged under 5 years in our country by helping physicians and pediatricians to improve the preschool consultations. Stunting is a big challenge for health-care providers. Taking more attention to a mother with low height and low education level, we could help them prevent the consequences associated with their future children (41-47).

It is important for health providers to educate mothers and children about a long-term health conditions and measuring child height during preschool consultations at each occasion.

5. CONCLUSION

Stunting begins earlier and increases with age. Low mother's height and education level were among the risks factors in our study. An expanded survey that will include other health districts with larger sample size is warranted in making appropriate recommendations.

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