Original Article

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Influence of Household Remittance on Childhood Stunting in Nepal

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ABSTRACT

Background: Migration is a livelihood strategy for many poor households in Nepal. About 56% of the households receive remittances, the country also has high rates of undernutrition as 36% of children under five years of age are stunted. Remittance are known to increase household income, potentially contributing to improvements in health and nutrition of children, but few studies have examined it in the Nepalese context.

Methods: We used data of 2,498 children under 5 years of age from the Nepal Living Standard Survey 2010/11 to investigate associations between childhood stunting and household remittances. Multiple logistic regression was used to evaluate the odds of child stunting by remittances received by the families in the 12 months preceding the survey. Guided by a conceptual framework, the model was adjusted for variables representing child, maternal and household level characteristics.

Results: Our investigation showed that the odds of a child being stunted decreased with increased levels of remittance received by households, 67% (OR: 0.33, 95% CI: 0.16, 0.67) lower for households receiving more than Nrs.60,000 remittance per year. However, there was no difference in the risk of stunting by gender of the household head and income categories.

Conclusions: An increased household income could potentially reduce the burden of chronic undernutrition in poor families in Nepal, which in turn paves a path for the expansion of cash transfer programs. Further research is indicated to understand the threshold of remittance or cash transfer needed to estimate nutritional outcomes.

Keywords: Income; nutrition; remittance; stunting

INTRODUCTION

Globally, 22% (151 million) of children under five years of age are stunted.[1] In Nepal 36% of children under five years of age are stunted[1] with higher rate in lower wealth strata.[2] Stunting before 2-3 years of age has a moderate to large association on children's cognitive and educational attainment compared to non-stunted children.[3,4] Increased income from remittances, money sent by migrants to their families, are believed to have a positive impact on the short-term nutritional indicators such as weight for height and weight for age,[5] but long-term improvements occur only in cases where mothers were highly educated and if households were receiving money for a longer period of time.[6] In this article we demonstrate how the risk of stunting among children varies with households receiving or not receiving remittances, with the aim to provide evidence to expand cash transfer programs to improve child nutritional status in Nepal.

METHODS

We analyzed data from the Nepal Living Standard Survey 2010/11 (NLSS III). The NLSS III collected anthropometric data from approximately 2,515 preschool children under 60 months of age. The final data set for analysis included 2,498 children. The data sets from different modules of the NLSS III were merged to prepare the data for analysis. The 2,498 children came from 1,892 households which indicates that 606 children were from the same households. Cluster command in Stata was used to avoid collinearity due to the inclusion of more than one child from the same household.

Stunting or low height for age (HAZ), a measure of chronic undernutrition is our outcome variable. Children falling two standard deviations below the median height for age compared to World Health Organization (WHO) recommended reference population from 2006 are considered stunted.[7] The Stata zanthro program was

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used to calculate HAZ. Those children with the z scores of more +6 and less than – 6 were excluded because such values are considered implausible by the WHO standards.[8]

The main exposure variable is remittance: The NLSS III data has information on the reported amount of remittance received by the families in the 12 months preceding the survey. To understand what threshold of remittances is needed to have positive impact on stunting the remittance amount received by the families was categorized into four groups: no remittance, less than or equal to Nrs.15,000[1], Nrs.15,001 to 60,000 and more than Nrs.60,000. To understand the source of the remittance, a categorical variable was created for households; not receiving remittance, received from migrants within Nepal, received from migrants outside Nepal, and received from migrants within and outside Nepal.

Location Variables related to the location (urban and rural) and the region (mountains, hill and terai) of the residence were used because prior evidence suggests that geography is related to variability in child nutritional status in Nepal.[2]

Age of the child: Age of the child as reported by the respondent was recorded in months. For our analysis age was centered by adding the mean age of the child to each observation. Centered age and centered age squared were used in the model. Age squared was included because the effect of child age showed a non-linear relationship with remittance.

Sex of the child: The sex variable was used as a dummy variable: boys coded "1" and girls "0".

Ethnicity The caste and ethnicity of the family was categorized into three groups, Upper Caste (Brahmin, Chettri and Madhesi higher caste), Janajati (Janajati and Madheshi others) and minority groups (Dalits and Muslims).

Birth order: The birth order of the child as reported by the respondent was used in the model; for example, the birth order of the first child is 1, second child is 2 and so on.

Immunization: Based on required immunizations for age of the child an ordinal immunization variable was created as never immunized, partially immunized, and fully immunized.

Antenatal visit If the mother reported to have gone for any antenatal visit while pregnant with the child it was coded as 1 and if not 0.

Child Health: If the child had suffered from any health problems (for example, diarrhea, respiratory problems, fever etc.) in the past 30 days preceding the survey it was coded as 1 and 0 otherwise.

Maternal age: The age of mother at the time of the survey was recorded in years and used as a continuous variable.

Maternal education: A categorical variable for the mother's education was derived from three questions asked in the survey, the highest grade completed, grade currently attended, and if she can read. If the mother could not read or she had attended kindergarten or less she was categorized as illiterate, otherwise if she had attended or was currently attending: grade 1-5, grade 6 -10, school leaving certificate (high school graduate), Intermediate (some college) and Bachelor and above.

Head of household: If the mother of the child was the head of the household, it was coded as 1 and if she was not it was coded as 0.

Household size: Two continuous variables for household size was included in the model, the total number of people in the household including children and a separate variable for the number of children less than 5 years in the household.

Household Income: The annual total household income was calculated adding income from all sources other than remittances. Incomes from home production, livestock and farming, rent, jobs and social protection were included. Income was categorized into four categories less than Nrs.30,000, Nrs.30,001 to 80,000, Nrs.80,001 to 200,000 and more than Nrs.200,000.

Sanitation: The household toilet facility was categorized into three groups: no toilet, unimproved toilet and improved or flush toilet. Similarly, household access to safe water was categorized as piped, covered or tube well, and otherwise.

Dietary Intake: The household respondent in the survey was asked to report the number of food groups (out of 8) they consumed over a reference period of seven days before the survey.[9] Depending on the response, the dietary intake variable could have values from 0 to 8 (8 reflecting the consumption of all 8 food groups and 0 as not consuming any of the 8 food groups).

Participation in nutrition programs: The NLSS III collected information on the household's participation in nutrition education and nutrition related cash transfer programs. A variable was created to indicate the household's participation in any such program as affirmative (1) or

otherwise (0).

All data analysis was done using Stata, version 12.0 (College Station, Texas). Descriptive and bivariate analysis were carried out and followed by simple and multivariate logistic regression analysis. For logistic regression models, the cluster command was used to account for more than one sample from the same household. We performed diagnostics using residuals plots and reviewed goodness of fit parameters for the models. These tests showed that a multiple logistic regression model was able to predict 69% of the cases correctly and there was no discrepancy between the observed and fitted model. Models were adjusted hierarchically. First, we performed logistic regression with stunting as an outcome and remittances (categorical) as a predictor without controlling for hypothesized confounders and effect modifiers. In the next stage, the second remittance source variable (foreign/domestic/both) was added into the model. In the third stage the remaining variables discussed above were added into the model. Next we explored interaction effect; an interaction term between household income and remittance was added into the model to see if household income modifies the association between remittance and stunting. Similarly, we then included an interaction term for mother as head of the household and remittance to see if there is difference in the risk of stunting with mother being the head of the household or not. To test interaction, we performed both the Wald and Likelihood Ratio Test. The Wald test was done for the logistic regression models that adjusted for household (i.e. used cluster command) while the Likelihood Ratio Test was done for the models not using the cluster command. Total N and percentages, mean and standard deviation (SD) are presented for descriptive analysis. Odds ratios and 95% confidence intervals are reported for logistic regression models.

RESULTS

Table 1 presents the characteristics of the children in the study by remittance categories. The mean age of the children in the study was 30 months. A significantly higher proportion of children belonging to household that received remittances reported being unwell in the month prior to survey, with the highest proportion (38.2%) among those receiving remittances of less than Nrs.15,000 per year.

Maternal and household level characteristics of the children by remittance categories are presented in Table 2. The average age of the mother was higher (28 years) in households not receiving remittances. Households with annual income of more than Nrs. 80,000 were more likely not to receive remittance or receive less than Nrs.15,000, while households with the lowest income were more likely to receive remittances higher than Nrs.15,000. This suggests that remittance is a major source of household income for those receiving it.

Table 1. Characteristics of children in study by remittance categories (N = 2498).

Characteristics	No Remittance (n=1134)	<=15,000 (n = 547)	15,001 - 60,000 (n = 344)	> 60,000 (n = 473)	
	Mean (SD)or n(%)	Mean (SD)or n(%)	Mean (SD) or n(%)	Mean (SD) or n(%)	P value
Age of child in months	30.3 (17.2)	30.6 (16.9)	29.8 (16.5)	30.6 (16.6)	0.389
Sex of the child					
Male	603 (53.2%)	275 (50.3%)	183 (53.2%)	232 (49.0%)	0.381
Female	531 (46.8%)	272(49.7%)	161 (46.8%)	241 (51.0%)	
Caste/ethnicity					
Upper caste	377 (33.2%)	158 (28.9%)	106 (30.8%)	148 (31.3%)	
Janajati	527 (46.5%)	259 (47.4%)	161 (46.8%)	226 (47.8%)	0.575
Minority groups	230 (20.3%)	130 (23.8%)	77 (22.4%)	99 (20.9%)	
Birth Order*	2.8 (1.8)	2.6 (1.7)	2.5 (1.8)	2.2 (1.4)	0.001
Child unwell in past 30 days					
Yes	341 (30.1%)	209 (38.2%)	121 (35.2%)	177 (37.4%)	0.002
No	793 (69.9%)	338 (61.8%)	223 (64.8%)	296 (62.6%)	
Immunization status					
Never Immunized	49 (4.3%)	13 (2.4%)	10 (2.9%)	10 (2.1%)	0.157
Partially Immunized	759 (66.9%)	390 (71.3%)	241(70.1%)	331 (70.0%)	
Fully Immunized	326 (28.7%)	144 (26.3%)	93 (27.1%)	132 (27.9%)	
Any ANC visit while pregnant with child*					

Yes	580 (70.6%)	324 (80.0%)	205 (83.3%)	292 (86.4%)	0.001
No	242 (29.4%)	81 (20.0%)	41 (16.8%)	46 (13.6%)	

Few observations missing

Table 2. Maternal and household characteristics by remittance categories (N = 2498).

Characteristics	No Remittance (n=1134)	<= Nrs. 15,000 (n = 547)	Nrs. 15,001 - 60,000 (n = 344)	> Nrs. 60,000 (n = 473)	
	Mean (SD) or n(%)	Mean (SD) or n(%)	Mean (SD) or n(%)	Mean (SD) or n(%)	P value
Mother's Age (years)*	28 (6.3)	27 (6.5)	27 (5.8)	26 (6.0)	0.002
Mother household head*					
Yes	70 (6.3%)	57(10.5%)	105 (31.6%)	135 (29.1%)	0.001
No	1046 (93.7%)	486 (89.5%)	227 (68.4%)	329 (70.9%)	
Mother's education *					
Illiterate	565 (52.9%)	277 (52.5%)	144 (46.7%)	164 (36.1%)	
Grade 1 to 5	168 (15.8%)	99 (18.7%)	64 (20.8%)	81(17.8%)	0.001
Grade 6 to 10	184 (17.2%)	92(17.4%)	55(17.9%)	142(31.3%)	
SLC	52 (4.9%)	37 (7.0%)	20 (6.5%)	33 (7.3%)	
Intermediate	49 (4.6%)	12 (2.3%)	13 (4.2%)	22 (4.8%)	
Bachelor and above	49 (4.6%)	11 (2.1%)	12 (3.9%)	12 (2.6%)	
Location					
Urban	319(28.1%)	108 (19.7%)	73(21.2%)	93 (19.7%)	0.001
Rural	815(71.9%)	439 (80.3%)	271(78.8%)	380 (80.3%)	
Regions					
Mountain	115 (10.1%)	45 (8.2%)	21 (6.1%)	14 (3.0%)	
Hill	683 (60.2%)	174 (31.8%)	151 (43.9%)	195 (41.2%)	0.001
Terai	336 (29.6%)	328 (60.0%)	172 (50.0%)	264 (55.8%)	
Average household size	6.4 (2.4)	7.1 (3.3)	6.3 (2.7)	6.7 (3.4)	0.001
Type of Toilet					
Improved	340 (30.0%)	133 (24.3%)	103 (29.9%)	188(39.7%)	
Unimproved	243 (21.4%)	92 (16.8%)	65 (18.9%)	74 (15.6%)	0.001
No toilet	551 (48.6%)	322 (58.9%)	176 (51.2%)	188 (39.7%)	
Source of Drinking water					
Safe	848 (74.8%)	459 (83.9%)	277 (80.5%)	423 (89.4%)	0.001
Unsafe	286 (25.2%)	88 (16.1%)	67 (19.5%)	50(10.6%)	
Annual household income					
Less than Nr. 30,000	131 (11.6%)	66 (12.1%)	103 (29.9%)	130 (27.5%)	
Nrs. 30,001 to 80,000	320 (28.2%)	148 (27.0%)	101 (29.4%)	153 (32.4%)	0.001
Nrs. 80,0001 to 200,000	412 (36.3%)	204 (37.3%)	91 (26.5%)	126 (26.6%)	
More than Nrs.200,000	271 (23.9%)	129 (23.6%)	49 (14.2%)	64 (13.5%)	
Household Diet diversity score (range)	6.7 (0 to 8)	6.9 (3 to 8)	6.9 (3 to 8)	7.1 (4 to 8)	0.001
Household participation in nutrition program					
Yes	178 (15.7%)	49 (9.0%)	28 (8.1%)	22 (4.6%)	0.001
No	956 (84.3%)	498 (91.0%)	316 (91.9%)	451 (95.4%)	
Height for Age (HAZ)					
Average Z score	-1.6 (1.6)	-1.5 (1.6)	-1.5 (1.5)	-1.3 (1.5)	0.013

A few observations are missing

Those receiving more than Nrs.60,000 consumed the most diverse diet consisting of food from 7 or more food groups out of 8. Stunting among children under five were significantly associated with remittance categories. The average Z score for HAZ was lowest for those not receiving remittance and highest for those receiving more than Nrs.60,000 (-1.6 vs -1.3).

Relationships between the child level characteristics and stunting are presented in Table 3. Compared to normal children stunted children were less likely to be fully immunized (30.8% vs 23.5%) and their mothers less likely to have gone for at least one ANC visit while pregnant with the child (81.1% vs 71.2%).

Maternal and household level characteristics by stunting categories are presented in Table IV. Mothers of the stunted children were more likely to be head of the households (14.1% vs 16.3%) and less likely to be literate (60.2% vs 41.1%). Stunted children were more likely to live in rural areas (84.7% vs 70.6%) and mountain regions (10.8% vs 5.8%) compared to normal children.

Households' access to safe water and toilet differed significantly between stunting categories: stunted children were less likely to have toilets (43.0% vs. 59.3%) and less likely to have access to safe drinking water (77.6% vs. 82.2%). Households with stunted children were more likely to participate in nutrition programs in the community (14.3% vs. 9.0%). Stunted children mostly belonged to poorer households with a lower proportion in higher income range categories (15.9% vs. 23.6%) among those earning more than Nrs.200,000 per year.

Table V provides the results of the multiple logistic regression including all variables hypothesized to affect the association between stunting and remittance. The odds of child stunting decreased with increases in the amount of remittances received by households, 46%, 60% and 67% lower for households receiving remittances less than Nrs.15,000, Nrs.15,000 to 60,000 and more than Nrs.60,000 remittance per year, respectively. Also, child's age, maternal education, household size, region and location where the child lived had significant associations with stunting. On the other hand, household income, toilet type, water source, birth order, diet diversity score and ANC visit by the mother while pregnant were not significantly associated with stunting in multivariate models although they were significantly related to both stunting and remittance in bivariate analyses.

Table 3. Characteristic of the children by stunting categories (N = 2498) n (%) / Mean (SD).

Characteristics	Normal (n = 1496)	Stunted (n=1002)	P value
Age of the child in months	27 (17.6)	35 (14.6)	0.001
Sex of the child			
Male	796 (53.2%)	497 (49.6%)	0.077
Female	700 (46.8%)	505 (50.4%)	
Caste/ethnicity			
Upper caste	512 (34.2%)	277 (27.6%)	0.001
Janajati	690 (46.1%)	483 (48.2%)	
Minority groups	294 (19.7%)	242 (24.2%)	
Average Birth Order of child*	2.4 (1.6)	2.9 (1.8)	0.001
Child was unwell in past 30 days			
Yes	527 (35.2%)	321 (32.0%)	0.099
No	969 (64.8%)	681 (67.9%)	
Immunization Status			
Never Immunized	47 (3.1%)	35 (3.5%)	0.001
Partially Immunized	989 (66.1%)	732 (73.1%)	
Fully Immunized	460 (30.8%)	235 (23.5%)	
Any ANC while pregnant with child*			
Yes	908 (81.1%)	493 (71.2%)	0.001
No	211 (18.9%)	199 (28.8%)	

**Missing data*

Table 4. Maternal and household characteristics by stunting categories (N = 2498).

Characteristics	Normal (n = 1496)	Stunted (n=1002)	
	Mean (SD) or n (%)	Mean (SD) or n (%)	P value
Mother's Age (years)*	27 (6.0)	28 (6.5)	0.001
Mother household head*			
Yes	207 (14.1%)	160 (16.3%)	0.013
No	1265 (85.9%)	823 (83.7%)	
Mother's education *			
Illiterate	579 (41.1%)	571 (60.2%)	
Grade 1 to 5	246 (17.5%)	166 (17.5%)	
Grade 6 to 10	320 (22.7%)	153 (16.1%)	0.001
SLC	110 (7.8%)	32 (3.4%)	
Intermediate	79 (5.6%)	17 (1.8%)	
Bachelor and above	75 (5.3%)	9 (1.0%)	
Location			
Urban	440 (29.4%)	153 (15.3%)	0.001
Rural	1056 (70.6%)	849 (84.7%)	
Region			
Mountain	87 (5.8%)	108 (10.8%)	
Hill	725 (48.5%)	478 (47.7%)	0.001
Terai	684 (45.7%)	416 (42.5%)	
Average household size	6.5 (2.9)	6.7 (2.8)	0.210
Type of toilet			
Improved	587 (39.2%)	200 (20.0%)	0.001
Unimproved	266 (17.8%)	208 (20.8%)	
No toilet	643 (43.0%)	594 (59.3%)	
Source of drinking water			
Safe	1229 (82.2%)	778 (77.6%)	0.005
Unsafe	267 (17.9%)	224 (22.4%)	
Household Diet diversity score (range)	7.0 (3 to 8)	6.7 (0 to 8)	0.001
Household participation in nutrition program			
Yes	134 (9.0%)	143 (14.3%)	0.001
No	1,362 (91.0%)	859 (85.7%)	
Annual household income			
Less than Nrs. 30,000	242 (16.2%)	188 (18.8%)	0.001
Nrs. 30,001 to 80,000	387 (25.9%)	335 (33.4%)	
Nrs. 80,0001 to 200,000	523 (34.3%)	320 (31.9%)	
More than Nrs.200,000	354 (23.6%)	159 (15.9%)	

**Few observation missing*

Table 5. Association of covariates in the multiple logistic regression model with stunting (N = 1748).

Independent variables	OR	95% CI of OR	P value
Remittance			
No Remittance (referent)	1.00		
Nrs. 1 to 15,000	0.55	0.31, 0.97	0.038*
Nrs. 15,001 to 60,000	0.40	0.20, 0.81	0.011*
More than Nrs.60,000	0.33	0.16, 0.67	0.002*
Child age	1.04	1.03, 1.05	0.001*
Child age square	1.00	1.00, 1.00	0.001*
Male	0.95	0.76, 1.18	0.629
Ethnicity	1.12	0.94, 1.34	0.199
Birth Order	1.09	0.98, 1.21	0.100
Child suffered illness	1.04	0.82, 1.32	0.724
Immunization	0.94	0.75, 1.18	0.580
Ante natal visit	1.17	0.87, 1.58	0.303
Mothers age	0.98	0.95, 1.00	0.118
Education			
Illiterate (referent)	1.00		
Grade 1 to 5	0.71	0.50, 0.99	0.044*
Grade 6 to 10	0.63	0.44, 0.90	0.012*
SLC	0.39	0.21, 0.73	0.003*
Intermediate	0.50	0.24, 1.10	0.077
Bachelor and above	0.18	0.07, 0.52	0.001*
Mother household head	1.07	0.75, 1.55	0.700
Regions			
Mountain (referent)	1.00		
Hill	0.85	0.51, 1.40	0.533
Terai	0.51	0.29, 0.89	0.017*
Rural	1.56	1.11, 2.17	0.011*
Diet diversity	0.95	0.85, 1.06	0.398
Household size	1.06	1.00, 1.11	0.046*
Household size < 5	0.85	0.73, 1.00	0.047*
Annual household income			
<Nrs.30,000 (referent)	1.00		
Nrs.30,001 to 80,000	1.00	0.71, 1.40	0.999
Nrs.80,0001 to 200,000	0.73	0.51, 1.05	0.089
More than Nrs.200,000	0.78	0.50, 1.21	0.266
Toilet type	0.86	0.72, 1.02	0.075
Safe water	1.22	0.89, 1.69	0.210
Nutrition program	1.16	0.79, 1.71	0.437
Remittance source			
No Remittance (referent)	1.00		
Domestic only	1.90	1.05, 3.43	0.034*
Foreign Only	1.83	0.92, 3.70	0.088
Both Domestic and Foreign	2.16	1.06, 4.42	0.035*
Constant	2.92	0.77, 11.10	0.116

** Significant*

We further explored effect modification in the relationship of stunting and remittance by household's income and mother being the head of household using both the Wald and Likelihood Ratio Test. There was no significant difference in the risk of stunting by income categories (P values for Likelihood Ratio: 0.497 & Wald test: 0.526) and mother being the head of the household (P values for Likelihood Ratio 0.199 & Wald test: 0.207).

DISCUSSION

Based on our analysis we report that the household receipt of remittance payments had a positive association on reducing childhood stunting in Nepal. Notably, households receiving remittance had 46-67% reduced odds of stunting among children aged 0-60 months. Some previous studies concur with our results, reporting an inverse association of household remittance with childhood stunting,[6] while others have reported no association.[5] We found stunting significantly related with household diet diversity, annual income, access to toilets and safe drinking water, birth order, child immunization and prenatal care in bivariate analyses, however in contrast to previous studies[10-13] we did not find these variables to be the predictors of stunting in multivariate analysis. It is possible that the proxy used to measure some of these variables were not accurate.[14] In our study a higher proportion of the children from remittance receiving households were unwell (30% vs 37%). It is possible that the remittance was sent to provide health care services for unwell children rather than to buy healthy food. Lack of information on the exact timing of remittance over the period of one year precludes us to test this proposition.

Childhood stunting is caused by several factors interplaying at different levels and for decades the focus has been on the nutrition-specific interventions directly related to health, diet and child caring practices.[15] The Multi-Sectoral Nutrition Plan 2012 endorsed by Nepal has recognized the substantial impact of well-targeted nutrition-sensitive interventions such as agriculture, food security and social safety nets for the child to survive, grow and thrive.[16] Remittances, a personal cash transfer to households while important, have uncertain benefits and often fail to provide aid to the most vulnerable. Just receiving remittance is not enough for improving health and nutrition, therefore robust dose-response studies to examine the remittance threshold needed to have a positive impact on child growth and development are required.

CONCLUSIONS

We found that additional household income from remittances has a positive association on reducing childhood stunting. Households receiving remittance had 46-67% reduced odds of stunting among children aged 0-60 months. Therefore, an additional income from cash transfer programs would relieve financial burdens for poor households and contribute to reducing child undernutrition.

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