Prevalence of Stunting among 6-59 Months Children and its Association with Water, Sanitation and Hygiene Practice in Urban Slums of Kathmandu, Nepal

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ABSTRACT

Introduction

Childhood malnutrition is a critical public health concern in Nepal. Slums are supposed to have poor water, sanitation and hygiene practices. This study has aimed to examine association between water, sanitation and hygiene (WASH) variables and stunting among 6 to 59 months children of slums of Kathmandu metropolitan city.

Methods

Descriptive cross-sectional study design was employed where 335 households were included in the study. Data were collected using standard questionnaire and observation checklist. Weight and height of children were taken using seca digital weighing scale and wooden height board of UNICEF respectively. Anthropometric analysis was done using WHO Anthro version 3.2.2 software and other statistical analysis was conducted using SPSSversion 22 software.

Results

The prevalence of stunting was 23%. Four out of five household (80%) in slum used to drink water from unimproved source. Absence of handwashing station (AOR=2.109, 95% CI:1.05-3.27) and absence of water storage covering (AOR=2.46, 95% CI: 1.16–5.23) were found to be significantly contributing to stunting status.

Conclusion

This study highlights the importance of good WASH practices, and the potential of WASH interventions, to contribute for the improved childhood stunting living in urban slums in Nepal. Also, the findings recommend the need of strategies on purification of water, improvement of toilets, behaviour change and awareness related activities to improve the stunting among children.

Keywords

Hygiene, sanitation, slum, stunting, water

INTRODUCTION

The burden of malnutrition across the world is unacceptably high with 155 million stunted globally[1] and 1 in 3 children (36%) under age 5 is stunted in Nepal.[2] World Health Organization (WHO) report says that half of under-nutrition is associated with disease caused by poor water, sanitation and hygiene situation of household and environment.[1] Access to safe drinking water and sanitation service is a basic element of healthy communities and has an important positive impact on nutrition. Achieving the six global nutrition target 2025, as well as global goal for health and water, sanitation and hygiene (WASH) require greater investments in Nutrition and WASH.[3]

According to Nepal Demographic Health Survey (NDHS), about 14 million (37%) people wash their hands with water and 12% (3.4 million) with soap during critical times in Nepal. Nearly four out of five families (77%) in Nepal drink water without appropriate water treatment practice prior to drinking. Overall, three in five (62%) of households (63% in rural areas and 61% in urban areas) use improved toilet facilities.[2]

Nepal has seen an impressive gain in health and nutritional status despite being in a state of political, economic and demographic transition[4], however, in marginalized groups like slums, nutritional status, particularly in relation to the possible risk of morbidity and mortality in children has been less valued as a field of concern. Slum communities usually have low socio-economic status, lower land ownership, high rates of childbirth at home, and childhood illnesses, which might be accounted for the prevalence of under-nutritional status of the under 5 children.[5] Children from poor households like slums have limited access to food and health services, making them susceptible to growth failures.[6]

However, water supply, sanitation condition of housing and hygiene behavior in slum settlement and nutritional status of children is a poorly researched area and because of the knowledge gap, WASH part is mostly ignored while addressing child undernutrition.

Therefore, this study was conducted to identify the nutritional status of 6 to 59 months children and its association with water sanitation and hygiene practice in slums of Kathmandu metropolitan city.

METHODS

The study was conducted in slum settlements of Kathmandu metropolitan city. There were a total of 26 slum settlements in the city. This was a cross-sectional descriptive study applying quantitative approach to assess stunting in 6-59 months children and its association with WASH practices. The study duration was from December 2019 to July 2020.

A sample size of 475 was determined by using a formula[7], where z= 1.96 for 95% confidence interval, p= 0.29 (2) with allowable error (d) = 0.05, design effect=1.5 non-response rate 5% and the sample size was 498. Applying finite population correction, the final sample size was 335. Two stage cluster random sampling was applied as sampling method. Sampling frame of 1023 children in 26 slums was obtained from albendazole and vitamin A target population of Kathmandu metropolitan city. Average children (6-59 months children) per cluster were 1023/26 or 39.34. In first stage, required 9 clusters (335/39.34=8.52) were selected randomly. In second stage, 39 study populations were selected by using simple random sampling method from each of 9 clusters.

Data was collected through individual face to face interview using structured questionnaires with the mothers of the children and completing an observation checklist. The research tool was prepared by the researcher himself with reference to NDHS 2016. The tool was pretested in 5% of sample in Lalitpur district. If there were more than one eligible child than one child was selected by lottery method. After the interview, anthropometric assessment (length, weight and height) of children aged 6 to 59 months was conducted. Height of children was measured using a height board of UNICEF to nearest 0.1 cm for the precision of the results. The weight of children was measured by Seca digital weighing machine to the nearest 100 grams or 0.1kg.

The bacteriological contamination in drinking water assessed by collecting drinking water samples from the household drinking water container at point of use. The sample was collected directly into H2S or PA Vials, filled upto the mark level and incubated for 48 hours. Change in color of water sample after incubation into dark blue marked the presence of contamination.

As classified by WHO Child Growth Standards 2006, children whose height for age (HAZ) was below minus two standard deviations (-2 SD) from the median of the reference population were considered short for their age (stunted) or chronically undernourished.[8]

The collected data was coded and entered in EpiData 3.1 computer software with check file and unique identifier. An anthropometric calculation was done by using WHO Anthro version 3.2.2 software. All data was exported to Statistical Package for Social Science (SPSS) version 22 software for further analysis. Univariate and multivariate analysis were carried out to know the association of stunting with WASH and socio-demographic characteristics. The statistical significance was considered at p< 0.05 for 95% confidence interval of the Odds ratio.

Ethical approval was taken from both Institutional Review Board of Institute of Medicine and National Health Research Council. Written informed consent was taken from mother or care-taker.

RESULTS

The average age of the mothers participating in the study was 27.34 ± 5.70 years while that of children was 29.49 ± 15.31 months. Seven respondents (2.1%) were care takers. More than half (57%) of the children selected for the study were male. Almost half (49.3%) of the mothers had only one child, where one-third mothers had 2 children. The average age at first birth was 21.35 ± 3.95 years.

Table 2 represents the health status of the child participating in the study. When asked to recall any illness on child in 2 weeks prior to the study, more than half (51.6%) of the total children had illnesses 2 weeks prior to the study. One in two mothers sought for treatment of their ill child at health facility, while 46.2 percent took medicines from pharmacies. Among those who visited health facility for the treatment, more than half ill children (50.1%) were diagnosed with diarrhea.

Table 3 reveals the information about the water, sanitation and hygiene related characteristics of the households involved in study.

Table 1. Socio-demographic characteristics of respondents

Characteristics	Number (%)
Age of the mother	
15 – 19	12 (3.6)
20 – 24	100 (29.9)
25 – 29	115 (34.3)
30+	108 (32.2)
Age of the child (months)	
≤- 11	48 (14.3)
12 – 23	85 (25.4)
24 – 35	81 (24.2)
36 – 47	59 (17.6)
48 - ≥	62 (18.5)
Caste of the family	
Janajati	184 (54.9)
Dalit	75 (22.4)
Brahmin and Chettri	53 (15.8)
Other (Madeshi and Muslim)	23 (6.9)
Sex of the child	
Male	191 (57.0)
Female	144 (43.0)
Parity	
1	165 (49.3)
2	121 (36.1)
≥3	49 (14.6)

Table 2. Health status of the children

Characteristics	Number (%)
Recall illness in last 2 weeks	173 (51.6)
Place for treatment (n=173)	
Visited health facility	83 (48.0)
Medicine taken from medical	80 (46.2)
Treated at home	10 (5.8)
Diagnosed disease(n=83)	
Diarrhoea	42 (50.1)
Amoebic dysentery	11 (13.2)
Common cold	20 (24.1)
Others	10 (12.6)

Most of the households (81.8%) had unprotected source of water, while less than half (41.5%) of the households didn't use any methods of purification before drinking or using the water for cooking purposes. Only 11.3% had not covered their water storage. The water quality test showed that nearly two-third (62.1%) of the household had contaminated drinking water.

Most of the households (94.6%) had toilet, of which eighty three percent (83%) of those were of improved type. More than half of the households (52.5%) had handwashing station in their houses. Only one third (35%) of the households segregated the solid waste. Solid waste from 53% households was collected by municipal vehicle while around one-fifth (21.5%) of the households just threw the waste in open place. As per findings from observation checklist, more than fifty percent (55.8 %) toilets were found clean. The prevalence of stunting was 23% (95% CI:18.63%–27.91%) in the slums.

Table 4 shows the multivariate analysis for stunting. On multivariate analysis, availability of handwashing station and covering of water storage container were found significantly associated with stunting. Having handwashing station decreased the odds of being stunted by 0.47 times (AOR = 0.47, 95% CI: 0.30 – 0.95), while covering the water storage decreased the odds of being stunted by 0.41 times (AOR=0.40, 95% CI: 0.19-0.86). The Nagelkerke R square value of 0.12 indicates that 12.2% change in the dependent variable (stunting) was explained by the independent variables.

All of the study variables included in regression analysis had variance inflation factor (VIF) < 10. Based on the above findings, the logistic regression equation for predicting stunting status from the independent variables can be derived as follows:

$$\log (p/1{-}p) = -1.77 - 0.75\, x_1 - 0.91\, x_2,$$

where,

x_1 = availability of handwashing station, x_2 = availability of coverage in water storage container and p = prevalence of stunting.

Table 3. Characteristics related to water, sanitation and hygiene practice (n=335)

Characteristics	Number (%)
Source of drinking water	
Unprotected	274 (81.8)
Protected	61 (18.2)
Purification methods	
Boiling	126 (37.6)
Use of filter	51 (15.2)
Others	19 (5.7)
No Purification	139 (41.5)
Water storage	
Covered	297 (88.7)
Not covered	38 (11.3)
Drinking water quality test	
Safe	127 (37.9)
Contaminated	208 (62.1)
Presence of toilet	
Yes	317 (94.6)
Type of toilet	
Improved	263 (83.0)
Unimproved	54 (17.0)
Handwashing station	
Yes	175 (52.5)
Segregation of solid waste	
Yes	117 (34.9)
Solid waste disposal	
Collected by municipal vehicle	178 (53.1)
Burnt	85 (25.4)
Thrown in open place	72 (21.5)

DISCUSSION

Our study showed significant negative association between stunting and presence of handwashing station and covering water storage. The prevalence of stunting (23%) as obtained in this study was relatively lower than the national surveys conducted.[2,9] NDHS 2016 has reported 36 percent of children under age 5 to be stunted.[2] However, the stunting prevalence are consistent with findings from NMICS 2019 which shows 22.9 prevalence of stunting in Bagmati province.[9] Overall, a higher risk of stunting among children was seen in the families with no handwashing station, and not covering the water storage container.

Mother's age was significantly associated with stunting and with increasing age there was increase in odds of child being stunted; however, it was not seen in multivariate analysis. These findings were similar to the NDHS findings as well as surveys done in Pakistan.[10,11] However, with increasing age at marriage of the mother, there was decrease in odds of child having under-nutritional deficiencies. This suggests that young women are still at developmental phase and they still need time for their own growth. Also, the children from young mothers are at risk of not being properly breastfed due to low milk supply.[12,13]

In this study, children aged 24 to 35 months were more likely to be stunted than the children of other ages. These findings are consistent with the studies done in Nepal[11,14], Laos[15], Kenya[16], Pakistan[10]. Nepali context has tradition of mothers giving less attention to their children after they reach 2 years of age, thus transferring responsibility of caregiver to elder siblings and other members of the family,

Table 4. Association of significant characteristics with stunting status

Characteristics	Stunting		p-value
	COR (95% CI)	AOR (95% CI)	
Age of the mother	1.05(1.07-1.09)	1.04(0.99-1.10)	0.09
No. of children	1.26(1.012-1.57	1.00 (0.77-1.30)	0.97
Age of child	1.01(1.00-1.04)	1.01 (0.99-1.03)	0.17
Handwashing station			
No	1	1	
Yes	0.43 (0.25-0.73)	0.47 (0.305 – 0.95)	0.008*
Management of solid waste			
By municipal vehicle	1	1	
Burn	0.66 (0.33-1.27)	0.78 (0.36-1.55)	0.45
Throw in open place	2.02 (1.14-3.74)	1.63 (0.86-3.07)	0.13
Covering of water storage			
No	1	1	
Yes	0.45 (0.19-0.81)	0.45 (0.11-0.82)	0.02*

* statistically significant (p < 0.05) at 95% Confidence Interval, COR =Crude Odds Ratio, AOR=Adjusted Odds Ratio, 1=Reference category

which leads to poor feeding and hygiene practices, thus increasing the chances of child having under nutritional deficiencies.[14]

The availability of improved toilet, protected water source, purification of water, availability of handwashing station and similar health and hygiene behaviors have positive consequences on the nutritional status of the children.[17] Poor hygiene and sanitation lead to diarrhoeal disease. A case control study conducted in Nepal found that having diarrhea in children one or more times in past two months was 7.46 times higher risk of stunting as compared to normal children.[18] This supports the finding of this study that absence of handwashing station at home means there might be less handwashing practice among caregivers, thus increase the risk of childhood stunting. This also supports the fact that hands are carriers of various pathogens which cause diarrhoea and not keeping them clean contributes to illness in their children. Studies suggest that cleaning the hands interrupt the transmission close to zero, only through rubbing and rinsing action.[19] Being an international agenda influencing the hygiene behavior in underdeveloped and developing countries like Nepal, handwashing is clearly influencing the childhood nutritional status.[20]

Thus, the study shows that improved sanitation and hygiene practices can contribute to the reduction in prevalence of stunting. Standard living conditions such as having improved toilets, having handwashing station, proper purification of water, and so on, can contribute to decrease the burden of under nutritional status of the under 5-year-old children. This study has some limitations. Some of the information was obtained through questionnaires and relied on mother's or care taker's self-report. This implies that respondent's views may be subjected to recall bias. Birth certificate of children was observed to find exact date of childbirth that helped to reduce some recall bias. This study has considered only WASH behaviors with childhood stunting however, stunting is influenced by many other factors. As this study was restricted to Kathmandu urban slums based on small sample size, the findings of this study should be generalized cautiously in other slum areas.

CONCLUSION

Around 23% of the children living in slum of Kathmandu metropolitan city are found stunted. Around four out of five families in slum use to drink water from unprotected sources. Poor WASH conditions are found to be significantly contributing to increase the stunting. Maternal and socio-demographic characteristics such as early marriage, increasing number of family members, age of the child, no. of children also contribute to increasing prevalence of the stunting in the slums. In order to

reduce the burden of early stunting, the strategies which are focused on accessibility of clean drinking water, improvement of toilets, management of waste and awareness related to handwashing are needed.

CONFLICT OF INTEREST

None declared.

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