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Influence of Maternal Education on Child Stunting in SNNPR, Ethiopia

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Abstract: Stunting indicates a failure to achieve one's genetic potential for height and thought to be the result of chronic under nutrition originating from infancy. Objective of study to assess magnitude of stunting among children less than five years of age and to explore its association with maternal education in SNNPR, Ethiopia. Based on data from Alive and Thrive initiative end line evaluation study in Ethiopia conducted in SNNPR from August 01 - September 05,2014. Pre-tested standardized questionnaire and trained data collectors were used. Across sectional with internal comparison study design was used. Double data entry was done by independent data clerks. Descriptive, binary and multiple logistic regression analyses were performed using statistical package for social sciences (SPSS) version 20.0 (SPSS Illinois, Chicago). The prevalence of child stunting was 39.1% in SNNPR. Child age, maternal educations, household wealth index, maternal autonomy, maternal BMI, mother's height were independent predicators of child stunting. Mother who completed secondary and above schooling were 52% less likely to have stunted child than mothers who had never attended any formal schooling (AOR=0.48;95%CI:0.252,0.914). Child stunting still goes public health problem of the region. Consequently women empowerments, promotion of maternal education, multi sector approach were recommended.

Keywords: Stunting, Under-Five Children, Maternal Education,
Southern Nations Nationalities and People's Regional State(SNNPR), Ethiopia

1. Introduction

Stunting indicates a failure to achieve one's genetic potential for height and thought to be the result of chronic under nutrition originating in infancy [1, 2]. It is the outcome of inadequate nutrition during this critical developmental phase of life. Because this phase does not reoccur later in life, reversing or treating the developmental consequences of early childhood under nutrition later in childhood is almost impossible [3]. Stunted children do not reach their full growth potential and become stunted adolescents and adults [4].

Stunting associated with adverse functional consequences including poor cognition and educational performance, lost productivity, low adult wages and when accompanied by excessive weight gain later in childhood increased risk of nutrition-related chronic diseases [5]. Main causes of stunting include intrauterine growth retardation, inadequate nutrition

and frequent infections during early life [6]. Stunting and its consequences should be prevented by ensuring access to appropriate nutrition during the first 1,000 days of life [3].

Worldwide, one in four children, one-third of children under 5 in low-income and middle-income countries, and also in Ethiopia, more than 2 out of every 5 children are estimated to be stunted [7–9]. Ethiopia is the second-most populated country in Africa with 15.4% under five children [10]. These children suffer disproportionately from the poor health and nutritional situation in the country. Malnutrition is the underlying cause of 57% of child death in Ethiopia [11] with some of the highest rate of stunting and underweight in World. According to document, Cost of Hunger in Ethiopia reports that 16% of all grade repetitions in primary school are associated to the higher incidence of repetition that is experienced by stunted children. In addition to this 67% of the working age population in Ethiopia is currently stunted with on average, lower school levels than those who did not experience growth retardation by 1.1 years of lower

schooling. As industries continue to develop increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population [9].

Maternal education improves the mother's knowledge about child health and enable to provide appropriate care for their children, which is an important determinant of children's growth and development [12, 13]. In addition to this mothers who are educated are more likely to make decisions that will improve nutrition and health of their children [14]. Educated women's children suffer less from malnutrition which manifests as underweight, wasting and stunting [15]. If all mothers had secondary education, it can reduce 26% of stunting in low income countries. Empowerment and the position of women in the household and particularly the literacy of mothers are important for reducing the risk of children being stunted [16, 17].

EMDHS (2014) shows educational attainment among women in Ethiopia is low. Women age 15-49 about half have no formal education and less educated than males. Mother's level of education has an inverse relationship with stunting levels. For example, children of mothers with more than secondary education are the least likely to be stunted (11%), while children whose mothers have no education are the most likely to be stunted (42%). Regionally in SNNPR women from 2011to 2014 some secondary or higher education increased from 2.5% to2.7%, while those without formal education decreased from 51.4% to 50%. On other handprevalence of child stunting in the region is 44% from 2011to 2014 [18].

2. Literature Review

Overview of stunting

Prevalence of Stunting globally decreased from an estimated, 40% in 1990 to 26% in 2011. At regional level, there was very little decline in Africa (from 42% to 36%) compared to Asia (from 48% to 27%). Eastern, Western Africa and South-central Asia have the highest prevalence estimated (42% in East Africa and 36% in both West Africa and South-central Asia) (19). Similarly, in Ethiopia stunting level shows decline from 57.8% in 2000 to 40% in 2014 (18, 20).

Magnitude of stunting

A cross sectional study conducted in Nghean, Vietnam prevalence of stunting was 44.3% [21]. In Nairobi, Kenya The prevalence of stunting among children age 6-59 months was 47% [22]. In the study of malnutrition among children under the age of five in Democratic Republic of Congo (DRC) shows prevalence of stunting was 37.2%. Moreover, national studies conducted in Wondo Genet Woreda Sidama zone, Southern Ethiopiaprevalence of Stunting was 50.3%[23] and also study done in Hawassa Zuria District, Southern Ethiopia prevalence of stunting, was 45.8 [24]. Study done in West Gojam Zone showed prevalence of stunting was 43.2% [25]. Study done in Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia prevalence of stunting was 47.3% [26].

Pathway of Maternal Education with child stunting

Linkage of maternal education with children's health still not well understood (27). Hence, this study focused on Child's demographic and Maternal Characteristic, Socio-economic status, and maternal autonomy.

Maternal Education:-is pathway through which women's education impact child health outcomes including child nutritional status. Welfare of children in developing countries is the importance of having literate parents particularly having a literate mother [28]. In the study of malnutrition among children under the age of five in Democratic Republic of Congo (DRC) showed stunting was linearly associated with maternal education (higher among children from non educated mother, followed by children from mothers with primary education but lower among children from mothers with secondary or higher education: 49.8, 47.0 versus 35.2 percent) [29]. In addition to this in Malawi's 2010 DHS, Tanzania's 2009-10 DHS, Zimbabwe's 2005-06 DHS, and Cambodia's 2005 DHS showed multivariate specifications that control for socioeconomic status, maternal education was inversely related to child stunting, and only significant at high levels of education (secondary education and above) [30, 31]. Where as in study done in rural districts of the Eastern Cape and KwaZulu-Natal provinces, South Africa maternal education was not associated with child stunting [32].

A cross sectional study conducted in Tigray, Northern Ethiopia, children from mothers attending high school were less likely stunted as compared with children, their mother illiterate [AOR= 0.75, (CI 95% 1.10, 12.85)] [33]. Study done in Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia Children with highly educated mothers were less likely to be stunted 14 (1.7%) than children of those with mothers who had a primary education 104 (12.3%) and those mothers with no education 215 (25.5%) [25].

Maternal age and marital status;- Study done in Bolivia (1998) found negative association between maternal age and child stunting. study done in Egypt Children born to mothers aged < 19 years and ≥ 35 years showed a higher prevalence of stunting than children born to mothers in other age groups, 19.53% and 21.35% respectively [34].

Study done in Nairobi, designated that mothers' marital status are independently associated to child stunting [35]. The odds of stunting for children born to mothers who were never married are 56% higher relative to those who are currently in union (p<0.05). Stunting is more common among children born to single mothers and older mothers, with 45% and 46%, respectively.

Head of household;-Study in Democratic Republic of Congo (DRC) there were no statistically significant association observed between the prevalence of stunting and gender of the household's head, mother's marital status and preceding birth interval of the child [29]. A study done in the Dominican Republic found children to be significantly less stunted in female-headed vs. male-headed households (36). Whereas study done rural villages of north Wollo, Ethiopia

The prevalence of stunting was higher in female-headed (55.6%) when compared with the male-headed households (43.2%) [37].

Maternal BMI:-Mother's BMI was found to be one of the most important determinants related to nutritional status of children. Study done Colombian schoolchildren Stunting was more than two times more prevalent in children whose mothers had a BMI < 18.5 than in those whose mother's BMI was adequate (p =.001), whereas the prevalence of stunting was 46% lower in children of obese mothers (p =.05) maternal BMI inversely associated with child stunting [38].

Maternal Height:-Decreased maternal stature is also associated with an increased risk stunting among offspring. In analysis of DHS in 54 countries, found that a 1-cm decrease in height was associated with an increased risk of underweight and stunting. Compared with the tallest mothers (160cm), each lower-height category had a substantially higher risk of underweight and stunting among children, with the highest risk for mothers shorter than 145 cm. The association between maternal height and stunting was statistically significant in 52 of 54 countries (96%) analyzed [39]. Similarly study done Mexican children Stunting in children was associated with the height of the mother (as a continuous variable), with an OR of 0.92 (95% CI: 0.91 ± 0.94) [40].

Child's demographic characteristic

Study done in Vietnam indicated that the highest risk of stunting was among children aged 12-23 months and children in the youngest age group, 6-11 months had a significantly lower risk of being stunting than children in the older age groups [41]. Other study in Vietnam also showed that the risk of malnutrition increases with age and a higher prevalence of malnutrition were observed in boys than girls [42]. Study done in democratic republic of Congo showed, the prevalence of stunting was higher among boys (46.1%) compared to girls (41.7%)[43].

Study done in Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia Children aged 11-24 months were about 2.3 times morelikely to be affected by stunting compared to children age 6-11 months [26]. Study done in West Gojam Zone showed that the highest proportion of stunted children was observed in age group 13-24 months (51%) followed by age group25-36 months (45%); while child stunting was lowest among infants in the youngest age group of 0-6 months (16.7%). A higher percentage (47.8%) of male children were stunted compared to 38.7 percent of female children (p<0.01) and male children were 1.5 times more likely to be stunted as female children[25].

Socioeconomic factors are the most important pathways linking education and child nutritional status [44]. Maternal education is a proxy for socioeconomic status at the individual and household levels [45]. As cross-sectional survey conducted in Quetzaltenango, Guatemala (2005) prevalence of stunting in children of low SES is about four-fold the prevalence of stunting in the children of high SES [46]. In the study Malnutrition among children under the age of five in Democratic Republic of Congo (DRC) showed

Stunting is linearly associated with socio-economic status of the household (higher among children from the poorest household, followed by children from poor, middle or rich households but lower among children from richest households: 49.8, 48.0,45.5, 43.9 versus 28.7 percent) [29].

National Survey (2011) EDHS showed higher proportion of children in the lowest household wealth quintile were stunted (49%) than children in the highest wealth quintile (30%)(10). Study done in Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia Children age 6-59 months those family had middle wealth quintile were 0.53% times less likely to be affected by stunting than children whose family had lowest wealth quintile (AOR=0.53; (95%CI: 0.34-0.82). Similarly children from families who had highest wealth quintile were 0.5 times less likely to be affected by stunting compared to children from lowest wealth quintile families (AOR=0.50; (95%CI: 0.33-0.75) [26].

Maternal autonomy decision-making power reflecting whether the woman is allowed to act without asking permission from her husband (to sell crops, to spend household money, attend meetings like women's groups, buy medication for herself or her children, attend a health institution for health education or for medical examination. Study done in Chad, caregiver's decision-making ability, a component of maternal autonomy, was associated withchild stunting after controlling for household structure, income generating activities and social support [47].

Rationale/justification for thestudy

Stunting is one of the main health problems in SNNPR and also EMDHS 2014 report shows prevalence of stunting higher than the national average. Most of previous studies on child nutritional status in Ethiopia focused on identifying the determinants of malnutrition or without sufficient consideration of the impact of maternal education in various contexts.

This study specifically discusses the relationship between Stunting and Maternal Education in SNNPR in two ways. First assess burden of stunting among child less than five years age in SNNPR. Then, it analyzes the association of maternal education with stunting on child nutritional status.

Conceptual Framework

Objectives

General objective: -To assess magnitude of stunting among children less than five years age and to explore its association with maternal education in SNNPR, Ethiopia

Specific objectives:

1. To determine prevalence of stunting among child less than five years age in SNNPR, Ethiopia

2. To indentify the association between maternal education and child Stunting under five years age in SNNPR, Ethiopia

3. Methodology

Study Setting: - The Southern Nations, Nationalities and People's Region (SNNPR) is located in the Southern and South-Western part of Ethiopia. Astronomically, it roughly

lies between 4 o.43 - 8 o.58 North latitude and 34 o.88- 39 o.14 East longitude. It is bordered with Kenya in South, the Sudan in South West, Gambella region in North West and surrounded by Oromiya region in North West, North and East directions. The total area of the region estimated to be 110,931.9 Sq.Km which is 10% of the country. The mid-2008 population is estimated at nearly 16,000,000; almost a fifth of the country's population [48].

Study design; - Cross sectional with internal comparison

Study population: -All 54 woredas where IFHP operates in SNNPR were included in the sampling frame. No distinctions were made while selecting the woredas with regards to the presence of other nutrition or child health-related programs, especially Community-based Nutrition (CBN), which is a government endeavor to improve nutritional status of children supported by the United Nations Children's Fund (UNICEF) and the World Bank. This study used All children under five years of age in all selected woredas.

Inclusion criteria; - Allchildren under fiveyears
Exclusive criteria;-Children above five years age
Sample size

Objective 1 The sample size was estimated using sample size determination formula for single population proportion using the following assumptions data taken from nutritional status among under-five children in Hawassa Zuria District Southern Ethiopia.

Prevalence of physical inactivity of 45.8%
- Confidence interval of 5%
- Confidence level of 95% (Zα/2 = 1.96)
Since secondary data non response rate not include n=762

Objective 2 Sample size for this study has been calculated using STATCAL of EPI info 7 software unmatched case control. data take from different previous study taking significant level of 95% and Power of 80% Ratio of cases to control1: 1
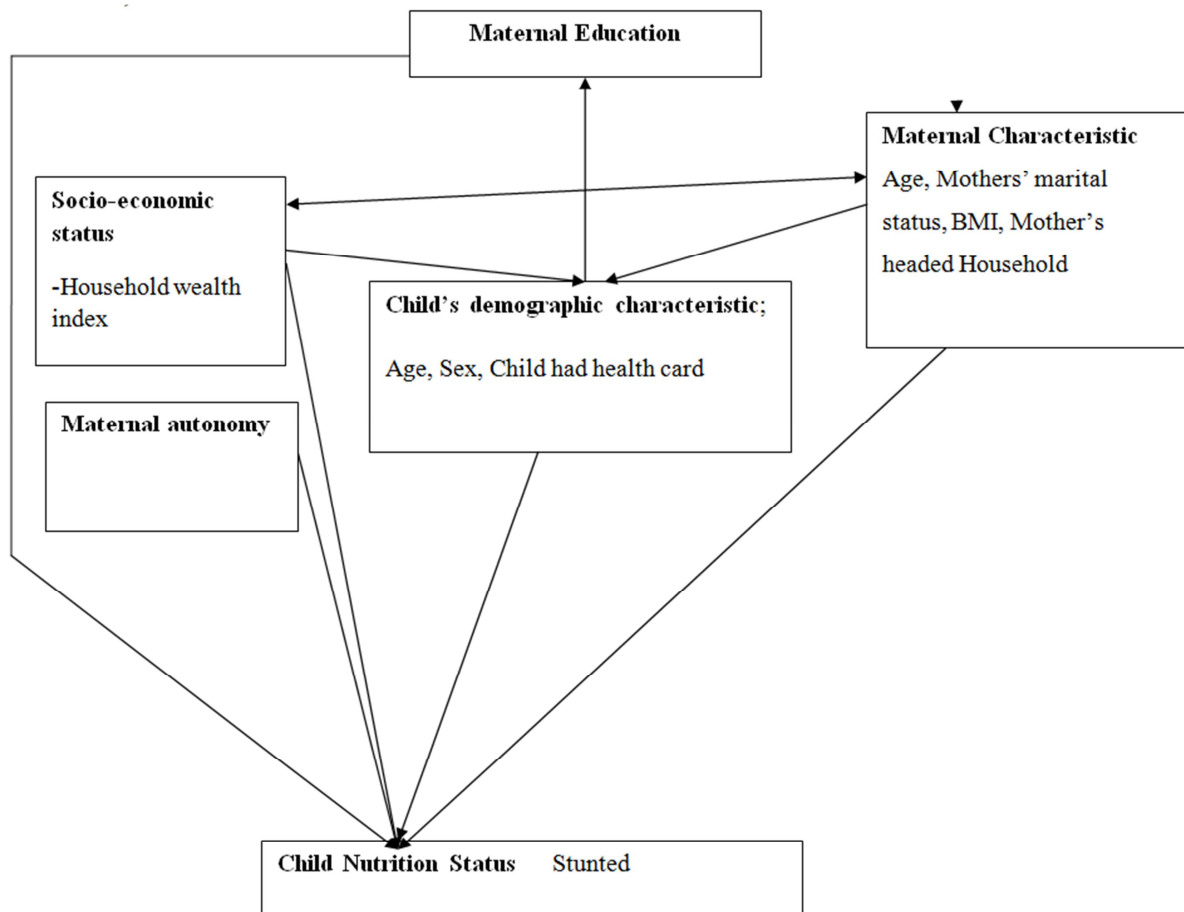

Figure 1. Maternal education and child nutritional status, analytical framework (adapted from UNICEF, 20).

Table 1. Variable for sample size calculation.

Variable	Stunted		odds ratio	Case (stunted)	control (not stunted)	Total	citation
	Yes (%)	No (%)					
Mothers education							
literate	72.9%	66.3%	1.367	792	792	1584	(33)
Primary school	38%	45%	0.749	805	805	1610	(49)
Secondary school	26%	34.5	0.66	477	477	954	(49)
above Secondary (collage)	2.4%	6.1%	0.378	519	519	1038	(33)

So assuming the largest sample size have chance to cover the others, sample with largest calculated sample size should be taken 1610 children.

4. Sampling Procedure

A total of 3,000 children between 0 to 59.9 months were selected using two-stage cluster sampling.

The primary sampling unit (PSU) or the first cluster is the rural enumeration areas (EA) from the IFHP woredasin the selected two regions. The EAs were selected using probability proportion to size (PPS) sampling in relation to the population of the EAs after listing all the EAs in the 89 woredas. The Central Statistical Authority (CSA) is the formal authority that maintains the list and the maps of all EAs in the country. Using the program that the CSA uses for the Demographic Health Survey (DHS), 75 EAs were selected from the targeted woredas. A total of 56 woredas (19 from Tigray and 37 from SNNPR) were covered through 75 EAs.

In the second stage, a complete household listing with the number of children residing in each household in each selected cluster was developed. This listing was followed by identification of all the eligible candidates for the survey (mothers of those children under 60 months of age) that helped in forming three sampling frames: children aged 0–5.9 months, 6–23.9 months, and 24–59.9 months.

From each sampling frame, study subjects were selected using systematic random sampling (SRS). Households selected to participate for one age category were not included in the other sampling frames, even if they had eligible children in the other desired age groups

Finally, SNNPR data were used for study

5. Data Collection Tools &Procedures

Data Source;-Based on data from Alive and Thrive in collaboration with Addis Continental Institute of Public Health (ACIPH)end line nutrition surveyconducted in Tigray and SNNPR from August 01 - September 05,2014. A total of 3000 households were selected from 56 woredas (19 in Tigray and 37 in SNNPR) for inclusion in the household survey.

Data Quality; -For effective and quality data collection, a three weeks intensivetraining was given to the selected enumerators and supervisors. Data collecting tools were pre-tested in 5 rural kebeles of Alalttu town, Oromia Region, located 55 km away from Addis Ababa which was not included in the survey. Findings were discussed among panel of experts at ACIPH level and finalized data collection instruments.

The data collection tool was first adopted in English and then translated in to Amharic then back to English to maintain the consistency of each question. A total of 70 data collectors and 15 supervisors, many of whom were involved in the baseline survey and/ or process evaluation and ample

experience in nutrition related surveys with ACIPH or other organizations(30% females and 70% males).

Anthropometric measurements were also taken for all children aged 0-59 months to assess their nutritional status; Length of the child aged 0-23 months was measured in a recumbent position to the nearest 0.1 cm using a board with an upright wooden base and a movable headpiece. Height of children (24-59 months of age) was measured in a standing-up position to the nearest 0.1 cm using vertical board with a detachable sliding headpiece which was designed by UNICEF.

In addition to the child anthropometric measurement the survey also address weight and height of the mother or care giver to calculate BMI. The nutritional status of children was assessed using the indicators height-for-age, according to WHO reference standard by taking –2SD as the cut-off point indicating malnutrition in terms of stunting.

During data collection Supervisors ensured completeness of all questionnaires and randomly spot checked and compared results. In addition to this on spot strict supervision of the data collecting team by ACIPH expert supervisors

Data management unit at ACIPH reviewed the completed questionnaire. The data entry template format was approved before commencement of data entryDouble data entry was done by independent data clerks. Data verification and cleaning whenever there is a mismatch between the two data sets the raw data were retrieved and referred for the correct response. Finally, a cleaned data set was prepared in SPSS.

Variables

Dependent Variable

Child Nutrition Status;-Stunted

Independent Variable

I. Maternal Characteristic;-Age, Mothers' marital status, BMI, Maternal Education, Mother's headed Household, number of under five children, Mother's height.

II. Socio-economic status; - Household wealth index

III. Maternal autonomy

IV. Child's demographic characteristic; Age, Sex, Child had health card

6. Operational Definition

Anthropometry; - Measurement of the variation of physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition by weight for-age, height-for-age and weight-for-height (WHO, 2000).

Stunting :-A child was defined as stunted if the height for age index was found to be below -2 SD of the median of the WHO Standard [50].

Education is measured by three categories

Non educated who had no formal education,

Primary education 1-8 Grade,

Secondary education and above >9 Grade

Women's autonomy was measured by the composite index of the three constructs of women's autonomy: control over

finance, decision-making power and extent of freedom of movement. A composite measure for each construct was created using the sum of equal weighted binary (1 = responses contributed for higher degree of autonomy versus 0 = otherwise) and three input variables (2 = for women who were able to decide independently, 1 = for joint decision and 0 = otherwise). Based on these values the overall score is found to be 47. Therefore, those women who scored half of the total score i.e. 23.5 and above were considered as highly autonomous while those who scored less than 23.5 were less autonomous.

7. Data Analysis and Management

Data checked for completeness and cleaned using SPSS statistics version 20.0 (SPSS Illinois, Chicago) by visualizing, calculating frequencies and sorting. Finally, Errors identified were corrected after revising the original questionnaire.

Descriptive, binary and multiple logistic regression analyses were performed using statistical package for social sciences (SPSS) version 20.0 (SPSS Illinois, Chicago). Weight, height and age data was be used to calculate Height-for-Age based on the WHO Anthro reference using WHO Antro 2007software (version 3.0.1). Children with height for age index below -2 SD of the median of the WHO Standard consider as stunted. The Household wealth index household asset data analyzed by principal components analysis.

Logistic regression analysis was carried out at two levels. Firstly, a bivariate analysis was performed to determine the differentials of children age 0-59 months stunting by explanatory variables. Secondly, those predictor variables which were significantly associated with the outcome variable at 0.25 and less level of significance from the bivariate analyses were entered into the multivariate logistic regression model. P-value < 0.05 was considered as statistical significant and Odds ratio with 95%CI to see important association. The model fitting for multivariate analysis was checked with Hosmer and Leme show goodness of fit. Adjustment of variables using logistic regression was made for predicting variables that were associated with stunting.

8. Ethical Consideration

Ethical approval was received from Addis Continental Institute of Public Health's Institutional Review Board (ACIPH IRB). Data (End line nutrition Survey 2014) was obtained from Addis Continental Institute of Public Health (ACIPH). Confidentiality of information was secured.

9. Dissemination of Results

Publication of the paper through pioneer Journal of public health i.e. Ethiopian Journal of Health Development by which the relevant decision makers can have easily accessed is also planned.

10. Results

Socio-demographic characteristics of under five children in relation to nutrition status.

A total of 1610 under five children were included in study, boys 49.6%, and girls 50.4%. Majority, 31.9%of children were in the age group 24-35. More than half of the mothers 52.6% have never attended any formal education, 57.2% were in the age of between 25-34 years,96% of mother are married.

The prevalence of child stunting were 39.1% (95%CI; 36.8, 41.5) in SNNPR. Boys 326(52.2%) were more stunted than girls 299(47.8%). Child age 24-35 months 253(40.5%) were higher stunted. Female headed household 34(5.4%) less stunted than male headed 590(94.6%). children whose mother with high maternal autonomy 110(18.3%) were less stunted than low maternal autonomy 490(81.7%).

The level of stunting decrease as the mother's educational status increases. Prevalence of stunting decreases from 361(58.7%) for children whose mother non educated to 18(2.9%) for those whose mother has attended secondary and above. Child stunting were higher among lowest wealth quintile 150(26.2%) and lowest among highest wealth quintile 90(15.7%).

Table 2. Socio demographic correlates of stunting under five children in SNNPR, Ethiopia.

	Not stunted	stunted(<-2SD)
	Number (%)	Number (%)
Under five children	972(60.9%)	625(39.1%)
Child's demographic characteristics		
Sex of Child(n=1610)	505(52.0%)	299(47.8%)
Female	467(48.0%)	326(52.2%)
Male		
Child age(month) (n=1610)		
0-5	238(24.5%)	17(2.7%)
6-11	116(11.9%)	36(5.8%)
12-23	131(13.5%)	104(16.6%)
24-35	260(26.7%)	253(40.5%)
36-47	144(14.8%)	140(22.4%)
48-59	83(8.5%)	75(12.0%)
Child had health card (n=1610)		
No	183(18.9%)	83(13.3%)
Yes	787(81.1%)	540(86.7%)

	Not stunted	stunted(<-2SD)
	Number (%)	Number (%)
Maternal Characteristic		
Mother's age(year)(n=1604)		
15-24	241(24.9%)	129(20.7%)
25-34	541(55.9%)	367(58.9%)
35-44	181(18.7%)	115(18.5%)
>44	5 (0.5%)	12(1.9%)
Marital Status(n=1599)		
single	9(0.9%)	3(0.5%)
Married	924(95.8%)	598(96.3)
Windowed	13(1.3%)	12(1.9%)
Divorced	19(2.0%)	8(1.3%)
Mother height(n=1604)		
< 145 cm	20(2.1%)	24(3.9%)
≥145cm	951(97.9%)	597(96.1%)
Body Mass Index(BMI)(n=1603)		
<18.5	150(15.5%)	150(24.2%)
18.5-24.9	765(78.9%)	446(71.8%)
≥ 25.0	55(5.7%)	25(4.0%)
Number of under-five children(n=1603)		
1-2	927(95.9%)	607(97.4%)
>=3	40(4.1%)	16(2.6%)
Head of household(n=1606)		
Female	50(5.2%)	34(5.4%)
Male	919(94.8%)	590(94.6%)
Maternal Education(n=1583)		
No school	465(48.7%)	361(58.7%)
Primary	425(44.5%)	236(38.4%)
Secondary and above	65(6.8%)	18(2.9%)
Maternal Autonomy(n=1554)		
Low	739(78.5%)	490(81.7%)
high	203(21.5%)	110(18.3%)
Socioeconomic Status		
Household wealth index (n=1497)		
Lowest	145(15.9%)	150(26.2%)
Second	186(20.4%)	111(19.4%)
Middle	178(19.5%)	123(21.5%)
Fourth	198(21.7%)	99(17.3%)
Highest	204(22.4%)	90(15.7%)

Bivariate analysis

Bivariate logistic regression analysis was carried out to see effect of independent variables on dependent variables (Stunting) which is dichotonomous by using the variables to be protective for adequate practice treated as reference group.

Crude analysis determinants of child stuntingon binary logistic regression showed that child age, maternal education, Child had health card, Mother's height, Maternal age, Body Mass Index (BMI), household wealth index were all significantly associated with child stunting. On the other hand, Sex of Child, maternal autonomy, marital status, and Head of household of the respondents did not show statistical association with stunting.

Independat variables which were significantly associated with the outcome variable at 0.25 and less level of significance from the bivariate analyses were entered into the multivariate logistic regression model. P-value < 0.05 was considered as statistical significant and Odds ratio with 95%CI to see important association. The model fitting for multivariate analysis was checked with Hosmer and Lemeshow goodness of fit. Adjustment of variables using logistic regression was made for predicting variables that

were associated with stunting.

Factors associated with Stunting

The analysis showed Children age 36-47 months were about 12.78 times more likely to be stunted than children age 0-5 months (AOR=12.78;95%CI:7.080,23.742). Children age 12-23 months were about 9.52 times more likely to be stunted than children age 0-5 months (AOR=9.52; 95%CI: 5.190-17.449). Similarly children age 24-35 months were about 12 times more likely to be stunted than children age 0-5 months (AOR=12;95%CI: 6.796,21.129).

Mother's height less than 145cm were more 2.1 times likely stunted compared to mother's height greater than 145cm (AOR=2.1; 95%CI: 1.043,4.290) and associated significantly at p<0.05. Mother's with high maternal autonomy were 0.67 times lesslikely to have stunted child than mother's with low maternal autonomy (AOR=0.677; 95%CI: 0.503,910) and significantly associated at p<0.05. Mothers BMI <18.5 were 1.5times more likely to have stunted child than mothers BMI 18.5-24.9 (AOR=1.5; 95%CI: 1.138, 2.049) and associated significantly at p<0.01.

Mother's completed secondary and above schooling were 52% less likely to have stuntedchild than mother's had never

attended any formal schooling (AOR=0.48; 95%CI:0.252,0.914) and associated significantly at p<0.05.

Families who had a middle wealth quintile were about 40%less likely to have stunted child than families who had lowest wealth quintile (AOR=0.608;95%CI: 0.421, 0.877)

and significant at p<0.01. Similarly Families who had highest wealth quintile were about 64% less likely to have stunted child than children from families who had lowest wealth quintile (AOR=0.366;95%CI: 0.249,0.538) and significant at p<0.01.

Table 3. *Logistic regression analysis for the determinants of stunting among children (0-59 months) in SNNPR, Ethiopia.*

Variables	Stunted		Child Stunting	
	Yes	No	Crude Odds(95%CI)	Adjusted Odds(95%CI)
Child's demographic characteristics				
Sex of Child				
Female	505	299	1	1
Male	467	326	0.179(0.964,1.442)	1.26(0.991,1.59)
Child age(month)				
0-5	238	17	1	1
6-11	116	36	4.345**(2.342, 8.061)	3.46**(1.763, 6.781)
12-23	131	104	11.1**(6.379, 19.367)	9.52**(5.190, 17.449)
24-35	260	253	13.6**(8.086, 22.951)	12**(6.796, 21.129)
36-47	144	140	13.6**(7.898, 23.457)	12.78**(7.080, 23.742)
48-59	83	75	12.6**(7.064, 22.657)	12.636**(6.725, 23.742)
Child had health card				
No	183	83	1	1
Yes	787	540	1.513(1.142, 2.005)**	0.978(0.688, 1.391)
MaternalCharacteristic				
Mother's age(year)				
15-24	241	129	1	1
25-34	541	367	1.3(0.985, 1.630)	0.982(0.717,1.345)
35-44	181	115	1.2(0.865, 1.629)	0.846(0.569,1.259)
>44	5	12	4.5(1.546, 13.006)**	2.440(0.627,9.497)
Marital Status				
single	9	3	1	
Married	924	598	1.942(0.524, 7.201)	
Windowed	13	12	2.769(0.603, 12.714)	
Divorced	19	8	1.263(0.269, 5.927)	
Mother height				
< 145 cm	20	24	1.9(1.047,3.491)*	2.1(1.043,4.290)*
≥145cm	951	597	1	1
Body Mass Index(BMI)				
18.5-24.9	150	150	1	1
<18.5	765	446	1.7(1.330, 2.213)**	1.5(1.138,2.049)**
≥ 25.0	55	25	0.780(0.0479, 1.269)	0.733(0.408,1.319)
Number of under-five children				
1-2	927	607	1	1
>=3	40	16	0.611(0.339,1.101)	1.165(0.560,2.422)
Head o fhousehold				
Male	50	34	1	
Female	919	590	1.059(0.677, 1.657)	
Maternal Education				
No school	465	361	1	1
Primary	425	236	0.715(0.580,0.883)**	0.886(0.685, 1.147)
Secondary and above	65	18	0.357(0.208,0.612)**	0.48(0.252, 0.914)*
Maternal Autonomy				
Low	739	490	1	1
high	203	110	0.817(0.631,1.058)	0.677(0.503,910)*
Household wealth index (Wealth quintile)				
Lowest	145	150	1	1
Second	186	111	0.577(0.416,0.801)**	0.543(0.374, 0.787)**
Middle	178	123	0.67(0.483,0.923)*	0.608*(0.421, 0.877)**
Fourth	198	99	0.483(0.347,0.674)**	0.462(0.318,0.672)**
Highest	204	90	0.426(0.304,0.597)**	0.366*(0.249,0.538)**

Note: Level of significance ** p<0.01; and * p<0.05.

11. Discussion

In the study child age, maternal education, household wealth index, maternal autonomy, maternal BMI, mother's height were all significantly associated with child stunting at p<0.05 whereas, sex of child,, marital status, mother's age, child had health card, number of five children and Head of household of the respondents not independent variable.

The prevalence of stunting in this study was 39.1%. This result was almost similar to 2014 national figure 40% [18] while it is lower when compared with 2011 regional figure 44%, Vietnam children age 6-59 months was 44.3% [21], Kenya 47% [22], Sidama Zone 50.3% [23], Hawassa Zuria District 45.8 [24] and Lalibela Town 47.3% [26]. This difference may be from differential nutritional intake, difference in environment, socio-economic, and farming mechanisms and cultural differences rather than differences in their genetic potential to achieve maximum height [25]. Despite little improvements in the prevalence of stunting, the current magnitude is still high and public health problem of the region.

Child age was important demographic variables and was the primary basis of demographic classification in surveys. Current study result showed that highest proportion of stunted children was observed in age group 24-35 months (40.5%). Unlikely with Study conducted in Vietnam indicated that the highest risk of stunting was among children aged 12-23 months and children in the youngest age group,6-11months had a significantly lower risk of being stunting than children in the older age groups [41]. and also unlike with study done in West Gojam Zone showed that the highest proportion of stunted children was observed in age group 13-24 months (51%) followed by age group 25-36 months (45%) [25]. This may due to two year of age children being to receive less intensive care, freely principal care takers (mostly mothers) for economic activity outside household therefore vulnerability of children to malnutrition during the weaning transitions is high.

Decreased maternal stature is also associated with an increased risk of stunting among offspring. Consistent with study done Mexican children Stunting in children was associated with the height of the mother(as a continuous variable),with an OR of 0.92 (95% CI: 0.91 ± 0.94) [40]. This may due to maternal stunting can restrict uterine blood flow and growth of the uterus, placenta and fetus. Intrauterine growth restriction (IUGR) is associated with many adverse fetal and neonatal outcomes [51]. Infants with IUGR often suffer from delayed neurological and intellectual development, and their deficit in height generally persists to adulthood[52].

Mothers BMI <18.5 were 1.5times more likely to have stunted child than mothers 18.5-24.9. consistence with study done Colombian schoolchildren Stunting was more than two times more prevalent in children whose mothers had a BMI < 18.5 under weigh tthan in those whose mother's BMI was adequate (p =.001). This may due to underweight women gaining the same amount of weight as normal-weight women tend to deliver smaller infants and to retain more of the weight gained during pregnancy at the expense of fetal growth[53].

Mother with high maternal autonomy were 33% times lesslikely to have stunted child than mother's with low maternal autonomy. Study done in Chad, caregiver's decision-making ability, a component of maternal autonomy, was associated with child stunting after controlling for household structure, income generating activities and social support [47]. This may due to ability of women to make decision on what to do for their own and children's healthcare need.

Mother's education is closely linked to nutritional status of children. In current study children whose mother had completed secondary and above schooling were 0.48 times less likely to stunted than those whose mother had never attended any formal schooling (AOR=0.48;95%CI:0.252,0.914)and associated significantly at p<0.05. Consistence with study done Democratic Republic of Congo (DRC) [29], In Malawi's 2010 DHS, Tanzania's 2009-10 DHS, Zimbabwe's 2005-06 DHS, Cambodia's 2005 DHS 2014 [30] [31] Tigray (Northern Ethiopia) [33], Lalibela Town Administration, and North Wollo Zone, Anrs, Northern Ethiopia [25]. In contrastin study done in rural districts of the Eastern Cape and KwaZulu-Natal provinces, South Africa maternal education was not associated with child stunting [32]. This might be due to as the level of education of the mother increases, so do her finances and her contribution to the total family income. This places the family at a higher social class and, therefore, better nutritional status. In addition, mothers who are educated are more likely to make decisions that will improve nutrition and health of their children [14] in addition to this the fact that educational status has a direct impact on practicing of prevention aspect of disease as well as lower fertility and more child-centered caring practices.

In presented study child stunting significantly associated with household wealth index (P<0.001). Children from families who had a middle wealth quintile were about 40% times less likely to bestunting than children from families who had lowest wealth quintile. Similarly Children from families who had highest wealth quintile were about 64%times less likely to be stunting than children from families who had lowest wealth quintile (AOR=0.366 ;95%CI: 0.249,0.538). This finding consistence with Study done in Lalibela Town Administration, Northern Ethiopia Children age 6-59 months those family had middle wealth quintile were 47% times less likely to be stunted than children whose family had lowest wealth quintile (AOR=0.53; (95%CI: 0.34-0.82). Similarly children from families who had highest wealth quintile were 0.5 times less likely to be stunted compared to children from lowest wealth quintile families (AOR=0.50; (95%CI: 0.33-0.75) [26]. In addition to this National Survey Ethiopia (2011) EDHS showed higher proportion of children in the lowest household wealth quintile were stunted (49%) than children in the highest wealth quintile (30%) [10]. This may indicate the influence of wealth status in accessing nutritious food and purchasing power.

12. Limitation and Strength of the Study

Strength
- End line survey data was collected community based
- For effective and quality data a three weeks intensive training was given to the selected enumerators and supervisors
- randomly spot check was done

Limitation
- The study design (cross-sectional) which measure the exposure and out come at the same time, which cannot measure the cause and effect relation ship

Conclusion

Based on the findings of the study, the following conclusions are made
- Stuntingis public health problem of the region
- Stunting is less common among children from educated mothers.

Recommendations
- When seeing children for medical care, health care providers should assess children under five for signs of stunting.
- Health workers, experts & local authorities must pay special emphasis to improve maternal education status and Nutritional counseling.
- A child from non educated mothers was more likely to be stunted compared to whose mother has attended secondary and above. Being the vital tool for holistic development of the society, education has to be accessed and accelerated so as to bring good health seeking behavior by giving priority improving educational status of mothers.

Acknowledgements

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