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Research Article

Demographic-Socioeconomic Determinants of Nutritional Status among Children Ages 6-59 months from Female Headed Households in Luapula Valley, Zambia

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Abstract

Children with good nutrition status live beyond the age of five, their growth is less affected, and they gain in height and weight. The objective of the study was to determine demographic and socioeconomic determinants of nutritional status among children ages 6-59 months from female headed households (FHHs) in Luapula Valley. Cross-sectional analytical study design was used with sample size of 228 children ages 6-59 months. Questionnaires were used to collect data on demographic and socio-economic characteristics of the studied FHHs. Children's nutritional status was determined through measurements of weight, height/length and Mid Upper Arm Circumference, and also examination for the presence/absence of edema. Measurements were then used to compute nutritional status by use of ENA for SMART software, 2011. Results showed that 45.2% children were Stunted, 20.6% underweight, 6.6% wasted and 1.3% overweight. Wasting was 4.8% by MUAC and 5 children had oedema. Binary logistic regression analysis showed that the predictors of children's nutritional status were social cash transfer, Age of household head, size of the household and distance to the market. Therefore, it is recommended to foster programs that improve demographic and socio-economic status of female headed households and by implication children's nutritional status.

Keywords: Luapula Valley; Female Headed Households; Nutritional Status; Children; Socioeconomic

Abbreviations

CI: Confidence Interval; ENA: Emergency Nutrition Assessment; FGD: Focus Group Discussion; FHH: Female Headed Household; HFA: Height for Age z-scores; KII: Key Informant Interviews; KNBS: Kenya National Bureau of Statistics; MoA : Ministry of Agriculture; MUAC: Mid Upper Arm Circumference; NFNC: National Food and Nutrition Commission; SMART: Standardized Monitoring and Assessment of Relief and Transition; SPSS: Statistical Package for Social Sciences; UNICEF: United Nations Children Emergency Fund; WFA: Weight for Age z-Scores; WFH: Wight for Height z-Scores; WFP: World Food Program; WHO: World Health Organization

Introduction

Good nutrition status for children results in a number of positive outcomes for their growth and development [1]. Many children with good nutrition status live beyond the age of five, their growth is less affected, and they gain in height and weight [2]. However, children's poor nutritional status hinders their growth and development, and adversely affects general health, production, economic ability, and increases mortality [3]. Globally, 21.9% children less than 59 months old were stunted, too thin for height, 16% were underweight (too thin for age), and 6.7% were wasted (too thin for height) and overweight children were 5.7% in 2019 [4,5]. In Sub-Sahara Africa, stunting prevalence has decreased from 34.5% (2012) to 31.1% (2019), 18.5% were underweight and 7.1% were wasted in 2015 [2,3].

Zambia is among countries in Sub-Sahara Africa which has experienced also reduction of malnutrition in different forms from 2013 to 2018. In 2013, stunting prevalence was 40% while in 2018 it reduced to 35% [6]. Though stunting is still above the acceptable level. Equally, other forms of malnutrition such as underweight and wasting reduced from 23% to 12% for underweight children and wasting from 6% to 4% while overweight increased from 1% to 5%

[6]. Luapula province is one of the ten provinces in Zambia where stunting prevalence has not decreased but rather increased from 43% in 2013 to 44.9% in 2018 yet other forms of malnutrition like underweight and wasting have decreased from 21% to 15.3% and 13% to 6.3%, respectively [6]. Luapula province consist of the plateau and Luapula valley. This study was conducted in Luapula valley which covers four districts of 12 total districts in the province. According to Zambia Demographic Health Survey conducted in 2018, Luapula province is ranked second highest with high number of children who are malnourished.

Households headed by females are on increase worldwide, Zimbabwe has highest (45%) number of households headed by females in the world followed by Haiti with 40%; while Comoros, Kenya, and Gabon have between 30% and 39%. Female Headed Households in Zambia stood at 26.6% [7,8]. While Luapula Valley in rural part of Luapula province has 23.5% Female headed households [9].

Female Headed households [FHH] in developing countries are confronted with challenges of lacking key livelihood assets and poor nutritional status of children [10,11]. This is because they are characterized by having female heads with lower education, earn lower incomes, limited access to land, labor, credit and insurance markets [12-15]. Studies conducted in Tanzania established that FHHs had lower level of assets, owned small pieces of land and few domestic animals [14]. Similarly, a study conducted in rural areas of Zambia found that FHHs owned assets of low value such as mattresses, hoes, axes and jiko/breezier [16].

Asset ownership significantly correlated with sources of income [16]. Households with fewer assets were associated with lower incomes and lower education attained by household head [9]. Lower incomes were associated with high levels of children's stunting [17]. Low education attained by most female heads in rural areas was associated with subsistence farming as main occupation [16,18]. However, data is limited on demographic and socioeconomic factors of female headed households that affected the nutritional status of children ages 6-59 months in Luapula Valley. Therefore, this study aimed to address the gap.

The purpose of the study was to determine the demographic and socioeconomic determinants of nutritional status among children ages 6-59 months from female headed households in Luapula Valley, Zambia. The specific objectives were; to determine demographic and socioeconomic characteristics of female headed households who have children ages 6-59 months in Luapula Valley, to determine the nutritional status of children ages 6-59 months from female headed households in Luapula Valley and, to determine the relationship between demographic and socioeconomic characteristics and nutritional status of children ages 6-59 months from female headed households in Luapula Valley.

Materials and Methods

Research design, period and location

The study adopted a cross-sectional analytical design [19]. The design was suitable as it allowed to gather information at one point in time and to establish associations between nutritional status among children ages 6-59 months and demo-socioeconomic characteristics of female headed households in Luapula Valley. The study was conducted from August to October 2018.

This study was conducted in Luapula Valley which is in Luapula Province, Zambia. It is made up of four districts: Mwense, Mwansabombwe, Nchelenge and Chienge. It has an average human population of 432,167 [12]. It borders with Chipili and Kawambwa in the North East, Mansa in the South, Kaputa in the North and Democratic Republic of Congo in the West (Luapula River as a natural boundary). The valley experiences warm to hot temperatures at a minimum of 26 degrees Celsius during the night time and maximum of 37 degrees Celsius during the day, and it lies in a region with high rainfall pattern of 800 mm to 1200 mm [20].

Agriculture and fishing are the main economic activities. Common crops grown include cassava, finger millet, maize, sweet potatoes, beans and groundnuts. Fishing is on the decline in terms of amounts, species and quality due to an increase in the human population in the area and indiscriminate fishing practices. Livestock production in the area includes goats, chicken, duck, pig and cattle. The latter two involve limited numbers and ownership [9,12].

Study population

The study targeted children ages 6-59 months from Female headed households who resided in Luapula Valley for at least for 6 months prior to the study. Where the female was the primary care giver and consented to participate in the study. Children ages 6-59 months from female headed households with documented chronic illnesses were excluded. Female headed households were the man was away though giving financial and other support to the family were also excluded from the study. Female heads on separation with their spouses were included if they were on separation on last 6 months or more months, prior to the time of this study.

Sampling techniques and sample size

Luapula Valley was purposively sampled because it has the largest rural human population in Luapula province [12]. In Luapula Valley and other rural parts of Luapula Province, 23.5% households were headed by females and subsistence farming was the main occupation. Households headed by subsistence farmers were classified to be living in extreme poverty [9].

The sample size was calculated on the basis of stunting national prevalence rate of 50.3% for rural areas [9]. Using Cochran formulae, 228 children ages 6-59 months was the sample size [21]. Sample size was proportioned according to the number of children aged below 5 years in each of the four districts in Luapula Valley through the use of Housing and Human Population census information [12]. Number of children ages 6-59 months sampled in each district determined the number of Female headed households that would be sampled. Sampling framework for female headed households was generated from the combined registers of Ministry of Agriculture, Ministry of Gender-district women associations and traditional leaders. Then simple random sampling was done and also at households which had more than one child ages 6-59 months.

Research instruments

Researcher administered questionnaires were used to collect data on demographic and socioeconomic characteristics. Anthropometric data used to determine nutritional status was collected using salter scale, height/length board, MUAC tape and physical pressing of thumb on study children to check for presence/absence of bilateral pitting oedema.

Validity and reliability of research instruments

Validity was established by use of recommended instruments such Salter scale (UNICEF Salter Model 235-6S) and its Weighing pants, Length/height board (UNICEF S0114530 -height measuring board), MUAC tape (WHO S0145620). These instruments were used to take anthropometric data of the study children for nutritional status determination. Questions used to collect the demographic and socioeconomic characteristics were adopted from the Zambia Demographic and Health Survey [7]. Questions on Focus Group Discussion guide and Key Informant Interviews were examined by the supervisors as to align them to the objectives of the study.

Reliability of the instruments

Pre-testing of the instruments was carried out in non-sampled female headed households that had similar characteristics as the study population were sampled. Eighteen female headed households were sampled for pre-test. However, they were not included in the main study. The pre-test was done twice and at 3 days interval. This was done as to determine the reliability of the instruments. A reliability coefficient of 0.81(CI: 0.72-0.89) was considered adequate [22].

Data collection procedure

Courtesy calls were made to Luapula provincial administration and all four districts in Luapula Valley. They were briefed on the research and the objectives. One time face- to -face interviews were conducted with mothers/or caregivers at household level as to collect information on demographic and socioeconomic characteristics of female headed households in Luapula Valley. Responses were recorded as they were obtained in the questionnaires.

Data used to determine nutritional status among study children was collected on; date of birth, height/length, weight, Mid-Upper Arm Circumference measurements and presence/absence of bilateral pitting oedema. Each child's date of birth was obtained from the mother/or caregiver and validated from under five health card and was written in completed months. The length of a child ages 6-23 months was measured twice lying flat and on center of the measuring board which was placed on a hard flat surface on the ground. The length was read to the nearest 0.1cm. The height of children ages 24-59 months was measured twice (close to 0.1cm) while standing straight on measuring board placed on hard flat surface beside a wall with line of sight perpendicular to the flat surface. Weight measurement, the child was put in the weighing pants and let down slowly on the standardized Salter scale with the strap of the pant in front. The scale was hooked up from a secured position. The weight was read close to 0.1kg after the scale needle stabilizes and was done twice. The Middle Upper Arm Circumference (MUAC) of the left arm of each study child s was measured twice using arm circumference insertion tape. The mid-point between the elbow and the shoulder was determined on a relaxed and hang down left arm [23]. The MUAC tape was placed on the determined mind point ensuring neither pinches the arm nor was left loose. Measurements were taken twice from the window of the tape and recorded to the nearest 0.1cm. Thumb was pressed on a child's feet for 30 seconds to determine its presence.

Data analysis

Descriptive analysis in Statistical Package for Social Scientists (SPSS) version 20 was used to analyze, demographic and socioeconomic characteristics. Chi-square test was used to examine relationships between socio-economic and demographic characteristics, and children's nutritional status. A p-value of less than 0.05 was used as criterion for statistical significance. Demographic and socio-economic variables that significantly associated with children's nutritional status in Chi square test were used in the Binary logistic regression as to identify the actual determinants of children. The ENA for SMART software was applied to calculate Z-score (weight-for-age, height-for-age and, weight-for-height) in accordance with WHO reference standard, taking -2SD and below as cut-of points for underweight, stunting and wasting [24].

Results

The results are presented in order of study objectives

Demographic and socio-economic characteristics of female headed households in Luapula valley

Household demographic characteristics

Mean household size was 4.8 (± 1.6) and almost a third (30.7%) of the households had family sizes of more than 5 members (Table 1).

Characteristics	n	%
Age Categories of HH members (years) excluding Female heads (N = 989)		
< 5	323	32.7
5-14	457	46.2
15-18	114	11.5
19-25	120	12.1
26-34	77	7.8
35-49	75	7.6
50-59	24	2.4
60 and above	27	2.7
Household size (N = 228)		
2 members	14	6.1
3 members	45	19.7
4 members	50	22.0
5 members	49	21.5
Above 5 members	70	30.7
Mean HH size (SD) 4.8(1.6)		
HHs with under 5s (N = 228)		
1child	146	64.1
2children	71	31.1
3children	8	3.5
4 children and above	3	1.3
Dependent's relationship with Female heads (N = 989)		
Children	763	77.1
Parents	9	0.91
Other relationships	217	21.9

Table 1: Demographic Characteristics of the Households.

Large proportion of household members were in age category of 5 to 14 years (Table 1). Majority of households had more than 5 household members and about sixty-four percent of the households had one child who was below five years old. Most of the household members (77.2%) were related to the female household heads as children.

Socioeconomic characteristics of the households

About a third (33.4%) of household members in these households had informal education and 66.1% of household members were involved in house chores. A portion of about thirty percent (29.5%) of the household members' main occupation was subsistence farming (Table 2).

Characteristics	n	%
Education of Dependents (N = 989)		
Primary	310	31.4
Secondary	173	17.5
Adult education	5	0.5
Informal education	406	41.1
Non schooling children < 5 years	323	32.7
Occupation of Dependents excluding children < 5years old (N=894)		
Salaried workers	2	0.22
Subsistence farmer	264	29.5
Business	22	2.5
Wage laborer	11	1.2
Domestic worker (maid)	4	0.45
House chores	591	66.1
Social Cash Transfer (N = 228)		
Yes receive	29	12.7
Do not receive	199	87.3
Amount received from SCT 9 US Dollars/month		
Household Monthly Income (US Dollar) (N = 228)		
<50	222	97.4
50-90	3	1.3
100-350	3	1.3
Mean monthly income (SD) 17.9 (19.5)		
Household monthly food expenditure (US Dollar) (N = 228)		
<10	186	81.6
10-20	24	10.5
20-50	16	7
>50	2	0.9
Mean amount (SD) 6.4 (5.7)		

Table 2: Socioeconomic Characteristics of the Households.

Ninety-seven percent of households estimated monthly income was less than 50 US dollar and 87.3% households were not recipients of social cash transfer. Households that received social cash transfer were 12.7% with an amount of 9 US Dollars per month which was received bimonthly as 18 US Dollars. The mean month-

ly income of households in this study was 17.9 (± 19.5) US dollar with the maximum monthly earner of 300 US Dollars and lowest monthly earner of 5 US dollars. Majority (81.6%) of the households spent less than 10 US dollars on food per month with a mean food expenditure of 6.4 ± 5.7 US dollars.

Demographic and socioeconomic characteristics of the female heads

Thirty-one-point six percent of female heads in this study were in age group of 35-49 years. The mean age was 35 (± 13.3) years with the eldest female head aged 82 years and youngest female head aged 17 years (Table 3). More than a third of female heads (39.9%) in this study were divorcees while 57% of them attained primary education and subsistence farming was the main occupation for 84.2% of the female heads. This was in agreement with what was revealed at the Focus Group Discussion. "*Many of us who heads households, stopped school at primary school due to pregnancies or lack of finances* (FGD_2, $Female_1$, 2018). *We were married at young age not matured enough to manage the family and ended up in divorce"*. Another woman said, "*What can someone do, who stopped school at primary or who has never been to school? Is to venture into farming*" (FGD_2, $Female_1$, 2018). This was further confirmed in a Key Informant Interview. "*Many of female adults who heads households have low education*" (KII_1, 2018).

Variable	Frequency (N = 228)	%
Age category of Household heads (years)		
15-18	4	1.8
19-25	47	20.6
26-34	68	29.8
35-49	72	31.6
50-59	19	8.3
60 & above	18	7.9
Mean age (SD)	35(13.3)	
Marital status		
Single	48	21.1
Divorced	91	39.9
Widowed	62	27.2
On separation	27	11.8
Education		
Primary	130	57
Junior secondary school	47	20.6
Senior secondary school	12	5.3
Adult education	2	0.9
Informal education	37	16.2
Occupation		
Salaried workers	2	0.9
Subsistence farmer	192	84.2
Business	21	9.2
Wage laborer	9	4.0
Domestic worker (maid)	4	1.8

Table 3: Demographic and Socioeconomic Characteristics of the Female Heads.

Demographic characteristics of the children ages 6-59 months

This study had 51% girls and 49% boys (Figure 1). Twenty nine percent of study children were in age group of 25-36 months with a mean age of 32 ± 14.6 months. The youngest child was aged 6 months and the oldest was 59 months old.

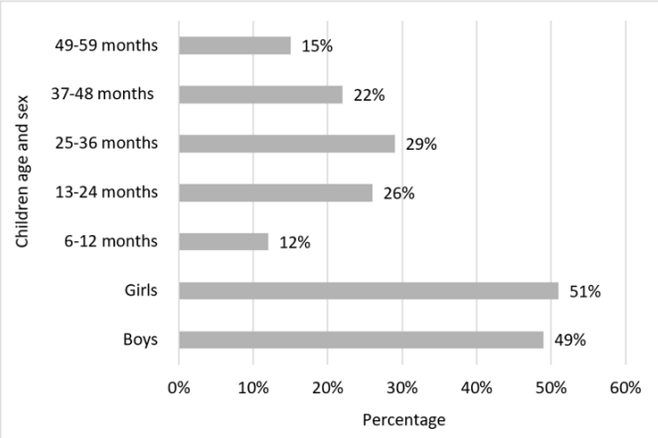

Figure 1: Characteristics of the Children Ages 6-59 months.

Nutritional status of children ages 6-59 months in luapula valley

Nutritional status of children in this study was determined by the z-scores and Mid-Upper Arm Circumference (MUAC). The z-scores categorized children's nutritional status as normal, stunted, underweight, wasted and overweight. The MUAC readings classified children as normal, moderate malnourished and severe malnourished.

Weight for Length/height and MUAC

The WHZ mean was 0.24 ± 1.06, with 93.0% being normal and 6.6% being wasted (<-2 z-score) (Table 4).

Weight for Height z-scores (N = 228)	Sex [n (%)]			Age groups (months) [n (%)]				
	All	Boys	Girls	6-17	18-29	30-41	42-53	54-59
Wasted (-2 to -3 SD)	15 (6.6)	6 (5.3)	9 (7.8)	5 (10.4)	6 (8.6)	0	4 (8.3)	0
Moderate wasted (-3 to <-2 SD)	10 (4.4)	4 (3.5)	6 (5.2)	5 (10.4)	1 (1.4)	0	4 (8.3)	0
Severe wasted (<-3 SD)	5 (2.2)	2 (1.8)	3 (2.6)	0	5 (7.1)	0	0	0
Normal (> -2 to + 2 SD)	212 (93.0)	105 (92.9)	107 (93)	42 (87.5)	64 (91.4)	43 (100)	44 (91.7)	19 (100)
Overweight (>+2 SD)	1(0.4)	1(0.9)	0	1(2.1)	0	0	0	0
Total	228	113	115	48	70	43	48	19
Mean (SD)	0.24 ± 1.06							
Statistical test (WFH z-scores by Sex and Age)	χ^2 = 224.0; p = 0.487			χ^2 = 895.6; p = 0.423				

Table 4: Weight for Height Z-scores by Sex and Age.

Weight for Height/length stand for Wasting.

*Statistical significance at $p < 0.05$.

The different levels of wasting were 4.4% for moderate wasting and 2.2% for severe wasting. Less than one percent (0.4%) of the children were overweight. The prevalence of acute malnutrition was not significantly different among the boys and girls (χ^2 = 224.0; p = 0.487), and across the age groups (χ^2 = 895.6; p = 0.423).

Mid Upper Arm Circumference (MUAC) measurements indicate that acute malnutrition was at 4.8%, with a prevalence of 5.3% among boys and 3.5% among girls (Table 5).

The prevalence of oedema among the children was 2.2% of the children with less than 2% of the children had marasmic-kwashiorkor and 0.4% kwashiorkor. Table 5 indicate also that 2.7% boys and 2.6% girls had with moderate wasted based on MUAC measurements. Severe acute malnutrition was at 2.2% (1.8% among boys and 2.6% among girls). Acute malnutrition was not statistically different by sex (χ^2 = 84.96; p = 0.542). Acute malnutrition was high (7.1%) among children ages 18-29 months though not significantly different across other age groups (χ^2 = 341.4; p = 0.589).

Weight for age by sex and age

The prevalence of underweight was 20.6%; whereby 20.2% children were moderately underweight, 0.5% were severely underweight and 0.9% were overweight (Table 6). Among the boys, 22.7% were underweight as compared to girls (18.6%). The prevalence of underweight on sexes was not significant different (χ^2 = 222.0; p = 0.487). Moderate underweight was highest among children ages 18-29 months with no significant difference across other age groups (χ^2 = 899.4; p = 0.462) (Table 6).

Height/length for age by sex and age

Forty-five percent of the children were stunted (Tables 7). Boys who were stunted were 46.9% and girls were 43.5%. The stunting rate between boys and girls not significantly different (χ^2 = 224.0; p = 0.450). The age group with the highest (58.6%) number of children stunted was 18-29 months and those with the lowest (27.7%) were ages 6-17 months. The stunting was not significantly different among children in the different age groups (χ^2 = 888.3; p = 0.491).

Table 7 indicate that stunting in Luapula Valley was still very high. During a Key Informant Interview it was revealed that stunting mitigation through growth monitoring process during under-five clinics was a challenge. "*To monitor children with height faltering was challenge due to the under-five health cards that had provision only for weight measurements. If height was recorded like the weight is recorded, it is possible to advise the mother or caregiver that the child is not growing well because of the height gain not consistent and then from there something could be done*" (KII_2, 2018).

MUAC readings and Oedema (N = 228)	Sex [n (%)]			Age groups (months) [n (%)]				
	All	Boys	Girls	6-17	18-29	30-41	42-53	54-59
Wasted (<125mm)	11 (4.8)	5 (4.4)	6 (5.2)	2 (4.5)	8 (10.4)	1 (2.3)	0	0
Moderate wasted (>= 115 mm to < 125 mm)	6 (2.6)	3 (2.7)	3 (2.6)	3 (6.8)	3 (3.9)	1 (2.3)	0	0
Severe wasted (< 115 mm)	5 (2.2)	2 (1.8)	3 (2.6)	2 (4.5)	3 (3.9)	0	0	0
Normal (> = 125 mm)	212 (95.2)	105 (92.9)	107 (93.0)	42 (95.5)	64 (83.1)	43 (97.7)	44 (100)	19 (100)
Oedema	5(2.2)	2(1.8)	3(2.6)	0	5(6.5)	0	0	0
Marasmic- kwashiorkor	1 (0.4)	0	0	0	1 (1.3)	0	0	0
Kwashiorkor	4 (1.8)	0	0	0	4(5.2)	0	0	0
Total	228	113	115	44	77	44	44	19
Mean (SD)	147.3(24.03)							
Statistical test (MUAC readings by Sex and Age)	$\chi^2 = 84.96$; p = 0.542			$\chi^2 = 341.4$; p = 0.589				

Table 5: MUAC and Edema by Sex and Age.

*Statistical significance at $p < 0.05$.

Weight for Age z-scores (N = 223)	Sex [n (%)]			Age groups (months) [n (%)]				
	All	Boys	Girls	6-17	18-29	30-41	42-53	54-59
Underweight (-2 to -3 SD)	46 (20.6)	25 (22.7)	21 (18.6)	6 (12.5)	17 (26.6)	10 (21.7)	11 (24.4)	2 (10.0)
Moderate underweight (-3 to <-2 SD)	45 (20.2)	24 (21.8)	21 (18.6)	6 (12.5)	16 (25.0)	10 (21.7)	11(24.4)	2 (10.0)
Severe underweight (<-3 SD)	1(0.5)	1(0.9)	0	0	1(1.6)	0	0	0
Normal (> -2 to + 2 SD)	175 (78.5)	84 (76.4)	91 (80.5)	41 (85.4)	47 (73.4)	35 (76.1)	34 (75.6)	18 (90.0)
Overweight (>+2 SD)	2(0.9)	0	2(1.8)	1(2.1)	0	1(2.2)	0	0
Total	223	110	113	48	64	46	45	20
Mean (SD)	-0.76 ± 0.93							
Statistical test (WFA z-scores by Sex and Age)	$\chi^2 = 222.0$; p = 0.487			$\chi^2 = 899.4$; p = 0.462				

Table 6: Weight-for-Age z-scores by Sex and Age.

Weight for Age stand for Underweight/Overweight. *Statistical significance at $p < 0.05$.

Height/length for Age z-scores (N = 228)	Sex [n (%)]			Age groups (months) [n (%)]				
	All	Boys	Girls	6-17	18-29	30-41	42-53	54-59
Stunted (-2 to -3 SD)	103 (45.2)	53 (46.9)	50 (43.5)	13 (27.7)	41 (58.6)	22 (47.8)	21 (46.7)	6 (30)
Moderate stunted (-3 to <-2 SD)	79 (34.7)	39 (34.5)	40 (34.8)	12 (25.5)	29 (41.4)	15 (32.6)	19 (42.2)	4 (20)
Severe stunted (<-3 SD)	24 (10.5)	14 (12.4)	10 (8.7)	1 (2.1)	12 (17.1)	7 (15.2)	2 (4.4)	2 (10)
Normal (> -2 to + 2 SD)	119 (52.2)	56 (49.6)	63 (54.8)	34 (72.3)	27 (38.6)	24 (52.2)	23 (51.1)	11 (55)
Very tall (>+2 SD)	6(2.6)	4(3.5)	2(1.7)	0	2(2.9)	0	1(2.2)	3(15)
Total	228	113	115	47	70	46	45	20
Mean (SD)	-1.69 ± 1.14							
Statistical test (HFA z-score by Sex and Age)	χ^2 = 224.0; p = 0.450			χ^2 = 888.3; p = 0.491				

Table 7: Height/length for Age by Sex and Age.

Height/length for Age stand for Stunting.

*Statistical significance at $p < 0.05$.

The z-scores for five children were not available because they had oedema (Table 8).

During Key Informant Interview was revealed that malnutrition mitigation in the study area was challenged by late identification. "*Mothers or caregivers here bring their children to clinic when they are in critical conditions. They first administer herbs to the child and after several attempts of healing the child have failed, it is when the child is brought to the clinic. Some parents also do not bring their children to under five clinics were children who are underweight can easily be identified and treated*" (KII_1, 2018).

Relationship between children's nutritional status and demographic characteristics

Nutritional status among children ages 6-59 months from female headed households in Luapula Valley had positive significant association with age of the household head (χ^2 = 5182.9; p = 0.001), number of children in age category of 6-59 months present in a household (χ^2 = 297.3; p = 0.046), household size (χ^2 = 870.0; p = 0.001) and marital status of the household head (single, divorcee, widow or on separation; χ^2 = 167.4; p = 0.002.) (Table 9). In contrast, children's age (χ^2 = 17625.0; p = 0.685) and number of rooms used for sleeping χ^2 = 155.2; p = 0.817) were not associated with children's nutritional status in this study.

Indicator	N	Mean z-scores ± SD	Design Effect (z-score < -2)	Z-scores not available*	Z-scores out of range
Weight-for-Height	223		1.00	5	0
Weight-for-Age	223	-0.76 ± 0.93	1.00	5	0
Height-for-Age	228	-1.69 ± 1.14	1.00	0	0

Table 8: Nutritional status of Children with Oedema.

*WHZ and WAZ the children with edema.

Demographic Characteristics	Nutritional Status Indicators			
	WFH	HFA	WFA	MUAC
	χ^2(P value)	χ^2(P value)	χ^2(P value)	χ^2(P value)
Household head Age	11798.0(0.571)	11872.4(0.518)	12034.1(0.382)	5182.9(0.001*)
Children's age	45256.5(0.317)	45595.5(0.180)	45878.0(0.314)	17625.0(0.685)
Marital status	655.1(0.514)	653.2(0.568)	664.7(0.506)	167.4(0.002*)
# of under 5s	675.6(0.299)	670.8(0.377)	658.3(0.577)	297.3(0.046*)
Household size	1764.8(0.410)	1770.6(0.425)	1787.6(0.418)	870.0(0.001*)
Sleeping rooms	436.4(0.512)	440.9(0.478)	442.7(0.508)	155.2(0.817)

Table 9: Children's nutritional status and demographic characteristics.

HFA: Height for Age; WFA: Weight for Age; WFH: Weight for Height; z-scores.

*: significant at $p < 0.05$. Marital status mean divorced, widowed, single or on-separation.

Relationship between children's nutritional status and socio-economic characteristics

Socio-economic characteristics that were positive significantly associated with the nutritional status among the children were education level attained by the household head (χ^2 = 416.4; p = 0.004) and house occupied ownership during the study (χ^2 = 303.0; p = 0.028) (Table 10). Main source of light used by household (χ^2 = 403.7; p = 0.015), type of toilet used by the household (χ^2 = 389.2; p = 0.04), distance covered to the main markets (χ^2 = 5224.5; p = 0.001), receiving of social cash transfer (χ^2 = 596.0; p = 0.005) and total amount of money spent on food monthly (χ^2 = 471.15; p = 0.043) (Table 10) were also positively significant associated with children's nutritional status.

Socio-economic Characteristics	Nutritional Status Indicators			
	WFH	HFA	WFA	MUAC
	x^2 (P value)	x^2 (P value)	x^2 (P value)	x^2 (P value)
Head Education	879.2 (0.463)	900.7 (0.306)	897.5 (0.405)	416.4 (0.004*)
Head main occupation	1123.8 (0.267)	1110.6 (0.405)	1103.7 (0.548)	301.9 (0.999)
Monthly income	9160.1 (0.089)	8959.2 (0.637)	8999.9 (0.775)	3481.6 (0.700)
Social Cash Transfer	221.4 (0.442)	216.8 (0.549)	226.0 (0.413)	596.0 (0.005*)
Assets ownership	1321.5 (0.437)	1335.0 (0.381)	1322.0 (0.572)	446.8 (0.987)
Livestock ownership	663.2 (0.425)	663.6 (0.453)	671.2 (0.436)	238.8 (0.798)
Land ownership	223.5 (0.403)	223.5 (0.422)	223.5 (0.459)	88.3 (0.410)
House ownership	660.2 (0.457)	663.8 (0.451)	670.9 (0.440)	303.0 (0.028*)
Light main source	878.5 (0.470)	900.6 (0.307)	895.8 (0.421)	403.7 (0.015*)
Cooking fuel	439.8 (0.467)	445.3 (0.420)	445.6 (0.469)	187.4 (0.200)
Food sources	657.5 (0.487)	647.9 (0.625)	663.3 (0.522)	213.1 (0.981)
Toilet accessibility	440.1 (0.543)	446.1 (0.411)	440.1 (0.462)	389.2 (0.04*)
Source of water	1109.1 (0.377)	1095.6 (0.532)	1114.8 (0.454)	418.9 (0.640)
Market distance	12254.6 (0.089)	12121.7 (0.443)	12119.0 (0.719)	5224.5 (0.001*)
Money spent on food	6580.8 (0.460)	6742.4 (0.108)	6489.1 (0.932)	471.15 (0.043*)

Table 10: Children's Nutritional Status versus Socio-economic factors.

HFA: Height for Age; WFA: Weight for Age; WFH: Weight for Height; z-scores. *: significant at p < 0.05.

Binary logistic regression results

The identified factors that from table 9 and 10 on association with children's nutritional status were further analyzed using bi-nary logistic regression as to identify the actual demographic and socioeconomic determinants. Table 11 show the results of the final analysis.

Variables	Stunting			Underweight			Wasting			MUAC		
	OR	95% CI	p	OR	95% CI	*p*	OR	95% CI	p	OR	95% CI	P
Household Head's age	1.00	0.98-1.02	0.983	1.00	0.96-1.05	0.987	0.98	0.93-1.03	0.431	0.86	0.76-0.99	0.029*
Marital status	1.23	0.90-1.68	0.188	1.46	0.84-2.56	0.181	1.33	0.74-2.39	0.341	0.85	0.43-1.69	0.854
Household size												
2-3 members	1.10	0.46-2.65	0.826	1.81	0.34-9.67	0.489	0.65	0.42-1.01	0.039*	3.53	0.23-54.3	0.366
4-5 members	1.31	0.64-2.68	0.467	0.73	0.14-3.85	0.712	0.40	0.03-6.63	0.059	3.59	0.26-49.6	0.340
6 members and above		-			-			-			-	
# of under 5s	1.25	0.80-1.97	0.330	1.21	0.45-3.26	0.706	1.23	0.47-3.22	0.677	1.88	0.59-5.99	0.283
House ownership	0.87	0.62-1.23	0.433	1.39	0.70-2.75	0.345	1.09	0.46-2.56	0.843	0.69	0.34-1.42	0.311
Head's education	1.16	0.89-1.51	0.288	1.42	0.82-2.47	0.208	1.14	0.68-1.92	0.617	1.24	0.64-2.41	0.523
Social cash transfer												
HHs receiving	0.35	0.14-0.91	0.032*	0.89	0.14-5.82	0.899	0.93	0.48-1.80	0.819	0.97	0.09-10.8	0.978
HHs not receiving		-			-			-			-	
Light main source	0.87	0.68-1.11	0.257	1.42	0.81-2.48	0.220	0.71	0.46-1.10	0.122	1.82	0.92-3.61	0.085
Food expenditure	1.00	0.99-1.0	0.663	1.00	0.99-1.01	0.601	1.00	0.98-1.01	0.460	1.00	0.99-1.01	0.082
Market distance	1.01	0.92-1.11	0.881	0.80	0.63-1.02	0.077	0.96	0.80-1.16	0.689	0.30	0.10-0.87	0.027*

Table 11: Summary of Binary regression statistics for the predictors of Children's nutritional status.

Marital status referred to been single, never married, divorced, widowed, or on separation. *: significant at p < 0.05.

Discussion

Demographic and socio-economic characteristics of female headed households in luapula valley

The demographic and socioeconomic characteristics of households influence food accessibility and availability and thereby affects children's food consumption patterns, dietary diversity, nutrient intake and consequently, nutritional status. The mean household size was 4.8 ± 1.6 slightly above the female households at provincial and national average size of 4.0 and 4.3, respectively [9,12]. According to Zambia Central Statistics Office [9] large household size was associated with inadequate access to livelihood supplies. Whereas, small household size had advantage of efficient use of available money and time resource necessary for child well-being and, children were likely not to be stunted [9,25].

Age of the household head influence the decisions made in a household and has great impact on the nutritional status of children. A study in Ahafo Ano North District in Ghana found that age of mothers in the category of 15-25 years was associated with children malnutrition [26]. The young mothers might be inexperience on handling children and the older ones maybe incapable of providing sufficient support to children. However, the mean age of the female heads was 35(± 13.3) and majority were aged between 35-49 years and were falling in what is considered as reproductive and productive age group.

Sources of income determines the total household monthly income and they influence the nutritional intake of household members [27]. Majority of studied households depended on farming as their main source of income while less than 1% were salaried workers. A few households received supplement income in form of social cash transfer though the figure received was relatively small. The amount of social cash transfer was too small to have a noticeable effect on the very poor populations targeted in Nepal, Kenya and Zambia [28].

Therefore, the current status quo of demographic and socioeconomic characteristics of female headed households in Luapula Valley is a barrier in achieving good nutritional status of children's in Luapula Valley and the country at large.

Nutritional status among children ages 6-59 months from female headed households in luapula valley

Forty-five percent of the current study children were found to be stunted, 20.6% underweight, 6.6% wasted and 1.3% were overweight. At national level, stunted children were 35%, 12% underweight, 4.0% wasted and 5% were overweight in 2018 [6]. About 44.9% children were stunted, 15.3% underweight and 6.5% were wasted at provincial level in Luapula province in 2018 [6]. The living conditions monitoring survey in Zambia found that stunted children were 57.1%, 33.3% underweight and 6.7% wasted in Luapula province [7]. High malnutrition level observed in this study are in agreement with another study conducted on female headed households in Malawi which established that stunted children were 56.7%, underweight 33.3% and wasted children were 6.7% [29].

In this study, stunting was found to be high among the boys than girls though statistically the difference was not significant. Stunting reflects chronic food insecurity and periodical morbidity among the children. Majority of the stunted children were in age category of 18-29 months which was similarly found in Kenya and seconded by age group of 24-35 months [30]. Additionally, another study found that Stunting was at its peak usually around 24 months of Age [31].

Underweight children were 20.2% in this study higher as compared to 12% at national and 15.3% at provincial as established by Zambia Demographic Health Survey and Central Statistical Office respectively [6]. Underweight reflects both chronic and acute food insecurity. The higher prevalence in the current study could be attributed to seasonality. Acute malnutrition was 6.7% lower compared to 8.8% as established by Zambia living conditions monitoring survey but slightly above 4.0% as reported by Zambia Demographic Health survey [6]. The difference could be attributed to seasonality also. This study was conducted during the harvest period which could have mitigated the extreme food shortages among the female headed households.

The study established that boys were more likely to be stunted and underweight as compared to girls. This finding was in agreement with the findings Zambia Demographic Health Survey [6]. It was also established that girls were more likely to be wasted as compared to the boys. The findings on girls being more wasted than boys was found also in a study conducted in India [32]. However, recent studies conducted in Ghana and rural India indicate that stunting, underweight and wasting are high among boys than girls [33-34].

The level of malnutrition established in this study, both acute (wasting) and chronic (underweight and stunting), reflect the possible causes were not only recent food shocks but long-term nutrient deprivation. Normal growth, particularly among under-five children, occurs if various body organs and tissues receive adequate nutrients. Households were deprived of food due to poor food production and poor economic status. According to literature,

malnutrition in children leads to short stature in adulthood and undermines individual economic potential [2]. Therefore, the current nutritional status of the children in Luapula Valley imply that children were not growing and developing well, both physically and mentally which is required of them to live a healthy and productive life.

Relationship between children's nutritional status and demographic socio-economic characteristics of female headed households

The study found positive significant relationships existed between children's nutritional status and some demographic and socio-economic characteristics. The age of the female head was associated with children's nutritional status. This could imply that the older the household head, the more experience she had to handle the children while too young heads could be inexperience on knowing what is required for children well-being. This was confirmed by the study in Pakistan who found that the risk of stunting, underweight and wasting was greater among the teenage mothers (15-17 years) than older mothers [35]. Similarly, in Zambia established a significant association existed between mother's age and children stunting [36].

Children's nutritional status was significantly associated with number of under five years old children present in the household and total household size. A possible explanation was that households with large family size may have experienced competition over limited resources available. Therefore, children from such households were likely to be stunted. The study was in agreement that household size correlated with poverty; the larger household size, the higher the likelihood of poverty would be [9]. Poverty affects household ability on food supplies and thereby children mostly would be stunted. Similar findings were established that large household size was found to increase the risk of stunting in sub-Sahara African countries [37]. Households with more than one under five years old children, their children may have experience inadequate care and feeding practices. Youngest children may receive proper care while those older less care and thereby subjecting them to malnutrition. The study findings were in agreement with the study done in Tete province in Mozambique that found a similar link of children's nutritional status and number of children less than five years present in a household [38].

The only socioeconomic factor which has been established in this study regarding the association with children's nutritional status in Luapula Valley was the social cash transfer. Female headed households that received social cash transfer where better off as compared to households that were not receiving. The study findings were in agreement with several studies that showed that social cash transfer was associated with reduction of stunting among the children in Mexico, Columbia, Malawi and South Africa [39-42]. Stunting which is due to chronic food insecurity, a study in Malawi, demonstrated that social cash transfer had made an improvement in food security to households that had participate in the program over a year [43]. Therefore, social cash transfer in Luapula valley to households that benefit from the program could be contributing in improving their household security and consequently, contributed to reduction of stunting among children.

The above found demographic and socioeconomic characteristics associated with children's nutritional status in Luapula Valley if not addressed, children's nutritional status shall remain poor and, children morbidity and mortality shall not reduce in the area.

Conclusion

In conclusion, the demographic characteristics of female heads and their households that had positive significant association with children's nutritional status were Household head age, household size, distance to the market. While socioeconomic characteristics significantly associated with children's nutritional status was social cash transfer. Therefore, this study recommends that interventions implemented in Luapula valley should have provisions reserved for households headed by females as to improve their socio-economic status and by implication children's nutritional status.

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Ethical Approval and Consent to Participate

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Availability of Data and Materials

Data will be available on request from the correspondence author.

Authors' Contributions

- **CZ:** Principal investigator, study design, data collection, statistical analyses, and writing.
- **DM:** Main supervisor of the study, research coordinator and writing.
- **IO:** Co supervisor of the study and writing.

All authors read and approved the final manuscript.

Competing Interests

The authors declare that they have no competing interest.

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