




The associations between women's empowerment measures, child growth and dietary diversity: Findings from an analysis of demographic and health surveys of seven countries in Eastern Africa

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Abstract

Evidence on the efficacy of women's empowerment to improve child growth and minimum dietary diversity (MDD) in the Eastern Africa (EA) region is limited. This cross-sectional study used recent Demographic and Health Survey data of mother-child dyads from seven countries in EA to examine the associations between women's empowerment measures, child growth and MDD. Length-for-age z-scores, weight-for-length z-scores and weight-for-age z-scores were used to categorize growth indicators of 6–23 months old children. Multivariable logistic regression was used to identify significant associations. Among all countries, 32%–59% of children experienced growth failure. Children meeting MDD were 18%–45%. Women having self-esteem were associated with lower odds of stunting (adjusted odds ratio [AOR] = 0.62 in Rwanda), wasting (AOR = 0.38 in Uganda), underweight (AORs = 0.60 and 0.57 in Tanzania and Uganda, respectively) and growth failure (AOR = 0.64 in Rwanda). Having health decision control in Burundi was associated with lower odds of stunting (AOR = 0.49) and child growth failure (AOR = 0.52) and higher odds of meeting MDD (AOR = 2.50). Having Legal empowerment among women increased the odds of stunting (AOR = 1.79 in Burundi), underweight (AOR = 1.77 in Uganda) and growth failure (AOR = 1.87 in Burundi). Economic empowerment showed mixed associations with child growth and MDD among some countries. Women's self-esteem and health decision control were associated with better child growth and MDD for some countries in EA. Nutrition-sensitive interventions aimed at improving child growth and MDD should consider local contexts when addressing women's empowerment.

KEYWORDS

child dietary diversity, child growth, Eastern Africa, Women's empowerment

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1 | INTRODUCTION

Globally, children are suffering from undernutrition, overnutrition and micronutrient deficiency, as countries face the triple burden of malnutrition (R. E. Black et al., 2013; UNICEF, 2019). Despite a decline in child stunting and wasting (De Onis et al., 2019), undernutrition rates remain high among children. In 2020, over 149.2 million children under 5 years were estimated to be stunted while another 45.4 million experienced wasting (Russell, 2021; World Health Organization, UNICEF, 2021). Further, in Eastern Africa (EA), stunting among children under 5 years remains unacceptably high at 32.6%, and even though child wasting was low (5.2%) as a region compared to southern Asia (14.1%), 3.5 million EA children were estimated to be wasted in 2020 (World Health Organization, UNICEF, 2021). Child mortality and morbidity rates due to malnutrition remain highly associated with disparities in dietary intake and feeding patterns (Perez-Escamilla et al., 2018). In 2021, the UNICEF reported that about a quarter (24%) of the infants and children (6–23 months of age) in Eastern and Southern Africa had inadequate nutrition quality assessed by failure to consume the minimum five food groups of the recommended eight (World Health Organization, UNICEF, 2021).

Notwithstanding these nutrition challenges, nutrition-specific interventions such as the promotion of infant and young child feeding (IYCF) practices have shown positive outcomes in reducing child mortality; however, financial support for widespread scale-up of effective nutrition programmes is limited (Bhutta et al., 2013). Further, due to the complexity of the causes contributing to malnutrition, other sectoral strategies including those that directly and indirectly address immediate determinants of undernutrition such as livelihoods programmes, WASH, women's empowerment and education may be required in interventions to improve child nutrition (Bhutta et al., 2020; Chipili et al., 2020; Kadiyala et al., 2014; Luby et al., 2018; H. J. L. Malapit et al., 2015; Null et al., 2018; Russell, 2021).

The World Health Organization (WHO) defines women's empowerment as an 'increase in political, social and economic status which enables equal access to resources and guarantees women the right to make strategic decisions over their lives' (World Health Organization [WHO], 2008). Women's empowerment refers to women's freedom and ability to determine life choices as well as generate and control resources (Alsop et al., 2004; Lee-Rife, 2010; United Nations Population Fund [UNFPA], 2014). Previous studies in Ethiopia (Fafchamps et al., 2009), India (Kadiyala et al., 2014) and Nepal (Cunningham et al., 2015; H. J. L. Malapit et al., 2015) highlighted positive associations between women's empowerment and improved child feeding practices and child nutrition. Additionally, women's health and socioeconomic status at the household level positively influenced their children's growth (Bhagowalia et al., 2012). Therefore, interventions focusing on women's empowerment may support efforts toward improving nutrition at the household level that could reduce the intergenerational cycle of

Key messages

- Understanding the associations between women's empowerment, child growth and child dietary diversity is important for most nutrition-sensitive interventions seeking to improve child feeding practices and growth by targeting mothers.
- In this study, for women to have self-esteem and health decision control was consistently beneficial for child growth and minimum dietary diversity (MDD). Mixed associations existed among other women's empowerment measures, child growth and MDD across the seven East African countries investigated.
- For improved child growth and better child dietary diversity, targeting specific women's empowerment measures based on local context may be beneficial in the East African region.

undernutrition (Smith et al., 2013). Agriculture is one of the main socioeconomic activities that influence household nutrition among countries in EA (Issala, 2013). In 2017, the Food and Agricultural Organization (FAO) reported more than half (53.5%) of East African women depended on agriculture as a source of food (United Nations Food and Agriculture Organization [FAO], 2017). However, women engage in various livelihoods including farming, horticulture, selling in the market, and small and large scale businesses which provide a backbone of household earnings and food security for their families (Issala, 2013; Timalisina & Singh, 2020). Nonetheless, gender-based inequity still exists (Azmanova, 2016; Hallward-Driemeier et al., 2013; Huyer, 2016) due to factors such as unequal access to education, employment, health services and financial control.

Recent gender-based studies among African and Asian countries have reported that women's access and control over resources improved child health and growth (Assan, 2013; Bhagowalia et al., 2015; Jones et al., 2019; H. J. L. Malapit et al., 2015; Pratley, 2016; Quisumbing & Smith, 2012). In Ethiopia, intrahousehold welfare was positively associated with female bargaining power, an economic empowerment measure and improved child nutritional status (Fafchamps et al., 2009). In Bangladesh, women's empowerment attributes such as mobility freedom, decision-making power and self-esteem (measured by the attitude toward abuse) were associated with higher length-for-age z-scores and better child dietary diversity (minimum dietary diversity [MDD]) (Bhagowalia et al., 2015). Further, in rural India, a women's empowerment-centred intervention showed that women's ability to make household decisions was positively associated with reduced child wasting and underweight; similarly, in Zambia (Kumar et al., 2018) and Ghana (H. J. L. Malapit & Quisumbing, 2015), nutrition-sensitive interventions targeting women's empowerment improved child growth. However, women's

freedom of mobility was associated with increased child wasting (M. R. Shroff et al., 2011).

Not all measures of women's empowerment are associated with benefits for young children in different contexts. In Kenya, women's autonomy in controlling resources at the household and the societal level was not significantly associated with wasting in children (0–35 months), although there were significant associations for older children (3–10 years) (Brunson et al., 2009). In that study, the variation in child wasting was attributed to severe resource constraints preventing women to influence child feeding practices. Furthermore, a recent cross-sectional study in Benin (Alaofè et al., 2017) reported negative associations between women's economic autonomy and child dietary diversity. These two studies (Alaofè et al., 2017; Brunson et al., 2009) contradict results from a qualitative study in Ghana where economically empowered mothers were more likely to provide a variety of foods to malnourished children than well-nourished children (Davis et al., 2003). Overall, socioeconomic, cultural and population differences among regions may create disparities in associations between women's empowerment measures and child nutrition (Alaofè et al., 2017).

Inconsistencies among studies indicate the need for further investigation of women's empowerment measures and their associations with child dietary diversity and child growth using nationally representative data. Therefore, the purpose of this study was to examine the associations between women's empowerment measures and child nutrition based on seven national surveys from EA. The results may inform future nutrition-focused programmes implemented through women's empowerment as another sectoral strategy

(Bhutta et al., 2020) targeting the improvement of child growth and dietary diversity in EA.

2 | MATERIALS AND METHODS

The associations between women's empowerment measures and child growth and MDD in the EA region were analyzed using Demographic and Health Survey (DHS) data of Burundi 2016–2017, Ethiopia 2016, Kenya 2014, Malawi 2015–2016, Rwanda 2014–2015, Tanzania 2015–2016 and Uganda 2016. Nationally representative data for each country on child feeding practices and child health were acquired through weighted-stratified, cluster probability sampling described elsewhere (Macro International, 2018).

2.1 | Inclusion criteria

All countries conventionally and politically defined in the East African region with recent DHS data sets were included in the study.

Dyads of children (6–23 months) and mothers (15–49 years) who answered either yes or no to feeding their child solid/semisolid foods in the past 24 h were included (Figure 1).

2.2 | Exclusion criteria

Data of mother–child dyads with missing case identification numbers or child anthropometric measures were excluded.

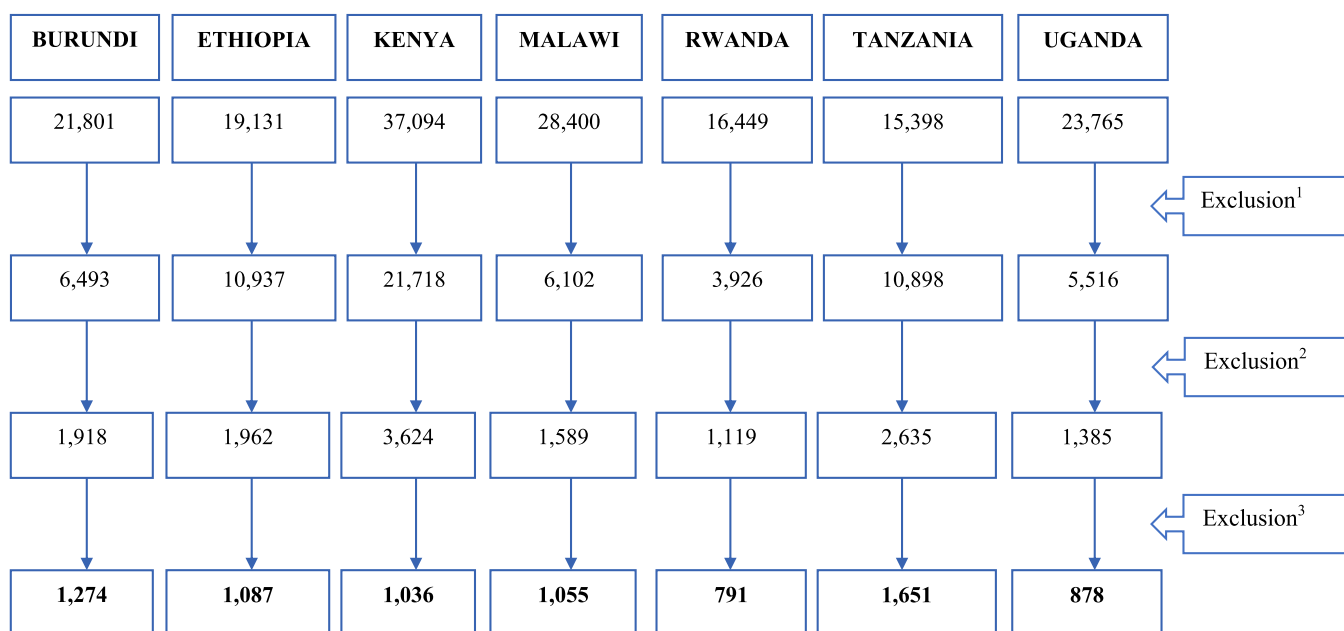


FIGURE 1 Inclusion of participants in the study sample for each country. 1. Excluded case ID missing variables, maternal variables missing and children above 24 months from the data set. 2. Child, mother and household variables were combined. 3. Data sets of children less than 6 months, missing anthropometric measurements and missing information on provision of solid, semisolid foods to children excluded.

2.3 | Women's empowerment measures

Using questions available from the DHS, principal component analysis (PCA) was performed (Anin et al., 2020) to determine the weight of each item as a measure of women's empowerment in each country (detailed data in Supporting Information: Table S6). The Kaiser–Meyer–Olkin was used to test sampling adequacy at a cut-off of >0.60 for the internal consistency of the items to be included in the scale. Bartlett's test of sphericity was statistically significant indicating both sufficient sample size and that those items were significantly correlated among the variables in the data sets (Supporting Information: Table S7). A multiple factor retention method was used to retain measures to assess women's empowerment. Additionally, we considered items with eigenvalues >1, visually examined the scree plot, and further conducted parallel analyses to ascertain the factors to be retained. After the parallel analyses, five measures were retained based on comparison of the initial eigenvalues against the mean scores of the random data eigenvalues in the parallel analysis output. The initial PCA was followed by the Promax rotation for

the five measures that provided the optimum value in obtaining the simplest structure. Items with factor loadings less than 0.3 were suppressed (Field, 2013). The selected items had communality scores that ranged from 0.31 to 0.91 for each measure (Supporting Information: Table S6).

DHS items were selected to form each variable representing different women's empowerment measure as shown in Table 1. Economic empowerment was measured by two items that indicated participation in income generation, decision autonomy was indicated by five items on control or participation in household decisions, self-esteem was measured by four items that focused on the women's perception and experience of intimate physical violence or abuse, health decision empowerment was shown by three items on medical access decisions, and legal empowerment was determined by four items on ownership of property. Women's empowerment measures were developed consistent with previous literature (Allendorf, 2007; Bhagowalia et al., 2015; Golub, 2010; Hallward-Driemeier et al., 2013). Subsequently, binary scores were formed. For decision autonomy,

TABLE 1 Definition of variables

Empowerment measure	Variables representing empowerment	DHS Items considered for variable
Economic empowerment ^a	Participates in income generation	Type of earnings from work, Employed all year or seasonally
Decision autonomy ^b	Controls/participates in decisions	Involved in decisions on husband's earnings Spends their own earnings Decides own health care Decides on visiting family Decided on large household purchases
Self-esteem ^b	Mothers' perception and experience of intimate physical violence or abuse	Beating justified if goes out without telling husband Beating justified if argues with husband Beating justified if refuses to have sex with husband Beating justified if food gets burnt
Health decision control ^b	Medical access decision control	Can go to a health facility Gets funds needed for treatment Decides who accompanies them to the health facility
Legal empowerment ^a	Ownership of property	Owned a house alone or jointly Owned land alone or jointly Owned land usable for agriculture Owned livestock
Child minimum dietary diversity scores (MDD)	Food groups used in calculating the score (≥5 of 8 food groups was optimum)	Currently breastfeeding; Roots and tubers; grains; flesh foods (meat, fish, poultry and organ meats); legumes and nuts; dairy products; vitamin A-rich fruits and vegetables; eggs; other fruits and vegetables (UNICEF, WHO & World Bank Group, 2021)
Child growth	Length-for-age z-scores (LAZ)	Stunting (less than -2 z-scores) underweight (less than -2 z-scores) to reflect that it covers all the indicators in the child growth assessment
	Weight-for-length z-scores (WLZ)	Wasting (less than -2 z-scores)
	Weight-for-age z-scores (WAZ)	Underweight (less than -2 z-scores)
Composite Index of Anthropometric Failure	Growth failure	Child who is wasted, stunted or underweight. Included children with a height and weight less than -2 z-scores and had any other anthropometric failure (Nandy & Svedberg, 2012).

^aOne item required for a score of '1', else score was '0'.

^bAll items required for a score of '1', else score was '0'.

self-esteem and health decision control, only women that had affirmative responses for all items received a score of '1', else a code of '0' was assigned. For legal and economic empowerment, women who achieved any one of the DHS items (Golub, 2010; Hallward-Driemeier et al., 2013) were coded as '1', else a code '0' was assigned.

2.4 | Conceptual framework

A conceptual framework (Figure 2) for possible pathways linking women's empowerment, child dietary diversity and child growth was adapted from previous frameworks (M. M. Black et al., 2020; Herforth & Harris, 2014; Petesch et al., 2005). Women's empowerment is mediated by physical factors such as economic empowerment and legal empowerment, then environmental factors such as

self-esteem and developmental factors including decision autonomy and health decision control. These three mediating factors influence childcare and household interactions, as well as the dietary diversity and health status of the child, culminating in child growth and survival (Bhutta et al., 2020). The women's empowerment measures as described in Table 1 were similar to the majority of domains also used by other investigators to describe women's empowerment (Charmes & Wieringa, 2003; Kishor, 2000; Kritz et al., 1997; Malhotra & Schuler, 2005).

2.5 | Child MDD

The dependent variables were child MDD and child growth. Children met MDD if they were given a minimum of five food groups (≥ 5 food

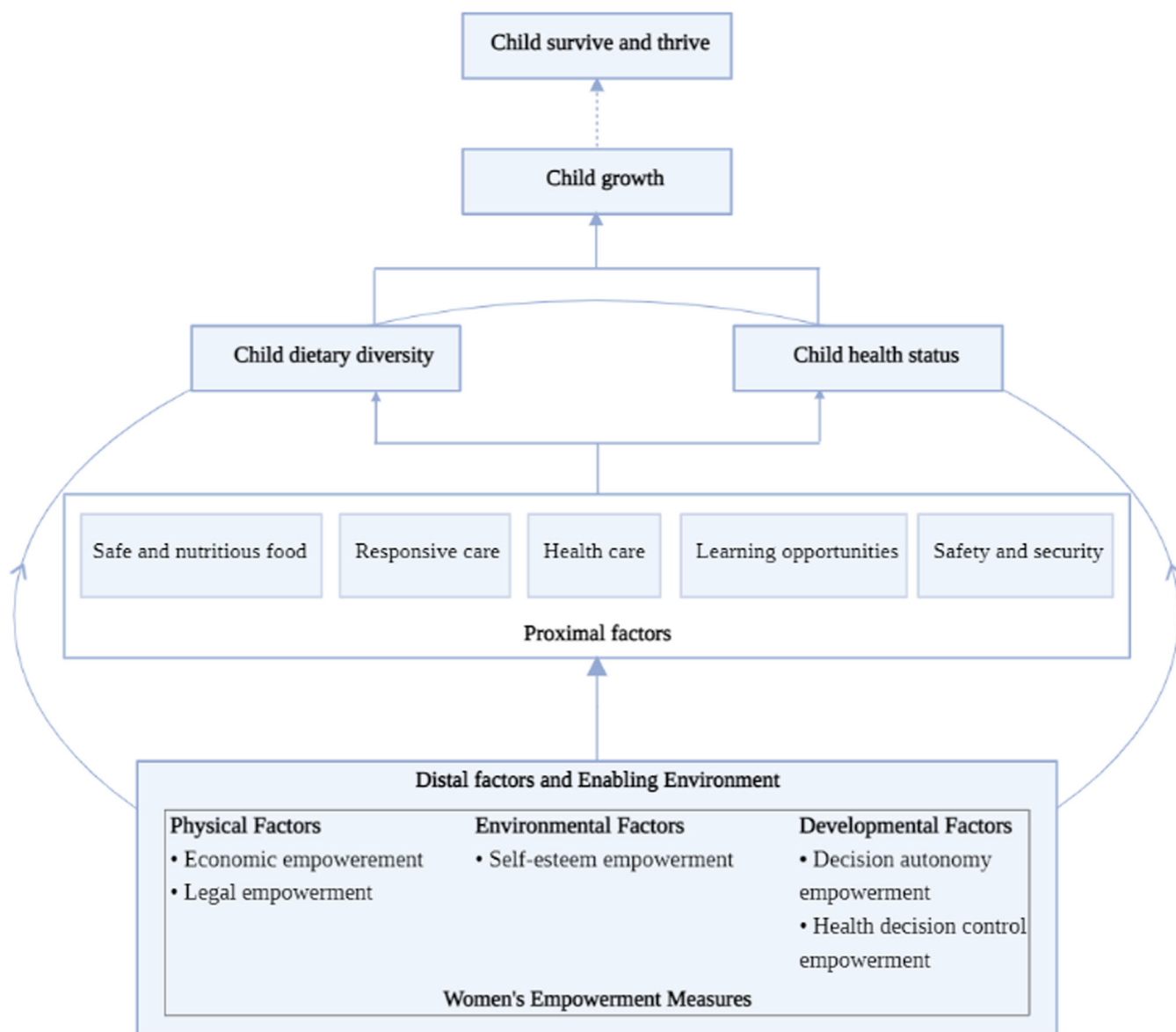


FIGURE 2 A conceptual framework on the associations among women's empowerment, child growth and minimum dietary diversity. Source: M. M. Black et al. (2020); Herforth and Harris (2014); Petesch et al. (2005).

groups out of 8) (Table 1) in the past 24 h as recommended by WHO (UNICEF, WHO & World Bank Group, 2021). Individual MDD scores were used to form binary variables; '0' represented suboptimal practices while '1' represented consuming at least five food groups.

2.6 | Child growth indicators

Child growth was defined using the WHO growth standards (De Onis et al., 2006) (Table 1). Child stunting, wasting and underweight were defined by lower than -2 z-scores for length-for-age, weight-for-length and weight-for-age, respectively. Further, child growth failure was assessed using the composite index of anthropometric failure (CIAF) (Nandy & Svedberg, 2012). CIAF was coded as 1 if the child displayed any or a combination of growth failure indicators by WHO standards and as 0 if the child was neither wasted, stunted, underweight alone or in any combination (De Onis et al., 2006; Nandy & Svedberg, 2012).

2.7 | Statistical analysis

Weighted descriptive statistics including percentages or sample means for parental, household and child characteristics, and for women's empowerment measures we calculated by country. Bivariate logistic regression analyses of each empowerment measure were determined for MDD and child growth by each country. Associations reaching $p < 0.10$ were included in the adjusted models. Multivariable analyses were adjusted for strata, cluster and for covariates including child's sex, age, had diarrhoea, maternal age, height, education, literacy, exposure to media, number of living children, household head, wealth index and paternal-maternal age difference (Bhutta et al., 2020; World Health Organization [WHO], 2020). Variance inflation factor and tolerance test were acceptable (below 10 and 0.2, respectively). Variables that maintained a $p \leq 0.05$ in the multivariable analyses were considered significant. Data analyses were performed using SAS, v. 9.4 (SAS Institute Inc.).

3 | RESULTS

3.1 | Descriptive characteristics

Parental, household and child characteristics are summarized by country in Tables 2 and 3, while the prevalence of women's empowerment measures is summarized in Table 4. Ethiopia had the highest proportion (63.6%) of women with no formal education compared with women among other analyzed countries in EA, which varied between 8.9% and 44.7%. Similarly, Ethiopian women had the highest illiteracy levels (75.2%) compared with other countries (17.3% and 37.4%). The proportion of mothers engaged in working outside of the home in all countries was more than half

(57.4% and 87.8%) except in Ethiopia where only 24.7% of mothers worked outside the home. Body mass index (BMI) of less than 18.5 kg/m^2 was reported for <17.5% of mothers in all countries except Ethiopia where 26.2% were classified as underweight.

The proportion of married women and those living together with their spouses ranged from 82.4% to 93.6%. Additionally, Kenya, Malawi and Uganda had a quarter or more (24.9%–28.2%) female-headed households while other countries had lower proportions of female-headed households ranging from 14.4% to 19.3%. Fewer than half ($\leq 49.3\%$) of the households in all countries were classified as poor except in Tanzania (74.5%). Most of the sampled households in all countries were in rural areas with a range from 56.0% to 91.9%. Nearly 85% of the husbands/partners in all countries had attained some level of formal education except for Burundi (34.9%) and Ethiopia (44.2%).

3.2 | Child characteristics, growth and growth failure

The proportion of female to male children was about half ranging from 49.3% to 52.3% in all countries, and the child mean age ranged from 12.3 ± 4.7 to 13.2 ± 5.2 in all countries (Table 3). The prevalence of stunting was highest in Burundi (55.5%) with other countries between 27.5% and 38.8%. Wasting among Kenyan, Rwandese and Malawian children was lowest (3.1% to 4.8%), while wasting was highest in Ethiopia at 13.1%. Burundian and Ethiopian children had a high prevalence of underweight (33.5% and 25.0%, respectively) while other countries ranged between 10.0% and 16.7%. Burundian (59.8%) and Ethiopian (49.0%) children experienced the highest CIAF. All other countries had CIAF ranging from 32.4% to 42.1%.

3.3 | Child dietary diversity scores

In all countries, 18.2%–45.2% of infants and young children consumed five and more food groups. The lowest prevalence of children that met MDD was in Ethiopia (18.2%) while Kenya had the highest proportion (45.2%) of children that met MDD (Table 3).

3.4 | Women's empowerment measures

The empowerment domains used in this study were economic, decision autonomy, self-esteem, health decision control and legal empowerment. The economic empowerment measure was indicated by either of the two items on household income generation shown in Table 1. Our results in Table 4 show that the proportion of women who were economically empowered was lowest in Ethiopia (37.1%). More than three-quarters (75.2%–83.2%) of the women in Uganda, Tanzania and Burundi were economically empowered. Tanzania had

TABLE 2 Selected parental and household characteristics among seven countries in Eastern Africa

	BURUNDI % (n = 1274)	ETHIOPIA % (n = 1087)	KENYA % (n = 1036)	MALAWI % (n = 1055)	RWANDA % (n = 791)	TANZANIA % (n = 1651)	UGANDA % (n = 878)
Maternal variables							
Education level							
No education	44.7	63.6	11.3	11.0	115	20.1	8.9
Literacy							
Cannot read at all	37.4	75.2	17.3	31.3	18.9	29.9	31.9
Maternal working status							
Working	87.8	24.7	57.4	67.4	83.8	76.9	76.4
Maternal BMI							
Normal	75.7	68.4	59.8	80.0	72.1	70.7	68.2
Underweight	17.5	26.2	9.3	6.1	5.4	9.2	9.8
Overweight and obese	6.8	5.4	30.8	13.9	22.5	20.1	22.0
Marital status							
Married/living together	90.5	93.6	83.2	84.8	82.4	82.6	84.7
Household variables							
HH head sex							
Female	19.3	14.4	28.2	27.5	21.0	17.6	24.9
Wealth Index							
Poor	45.3	46.1	38.0	49.3	48.7	74.5	49.1
Middle	20.7	22.8	15.9	19.7	17.9	18.6	20.3
Rich	34.0	31.1	46.0	31.0	33.3	33.9	40.6
Place of residence							
Rural	91.9	88.6	56.0	87.7	83.8	74.8	75.9
Paternal variables							
Partner's education							
No education	34.9	44.2	6.9	9.7	15.3	13.2	7.1

the lowest proportion (41.7%) of women with decision autonomy; however, in other countries more than half (51.6%–73.2%) of the women had the autonomy to make or participate in household decisions.

Women's self-esteem was measured through women's perceptions of freedom from intimate physical violence. In Malawi, more than three-quarters (75.6%) of mothers reported self-esteem while fewer women had self-esteem in Ethiopia (34.8%), Tanzania (41.5%) and Burundi (46.9%). In almost all countries included in this study, over three-quarters (78.0%–94.0%) of the women had control over decisions regarding their health; Ethiopia had the least proportion of women with health decision control in comparison to other countries in this study, yet, they were still represented by more than half (61.0%) of the sample. Women's proportion with legal empowerment was higher in Burundi and Ethiopia (52.8% and 40.5%, respectively) than in other countries where women with legal empowerment ranged from 21.6% to 29.7%.

3.5 | Women's empowerment and child growth

In all countries except Ethiopia, at least one women's empowerment measure was significantly associated with child growth after controlling for cofounders but not all of these were associated with benefits to the child. Women's empowerment measures were associated with child stunting in Burundi, Kenya and Rwanda (Table 5). Women who were economically empowered in Burundi were more likely to have stunted children (adjusted odds ratio [AOR] = 1.78; 95% confidence interval [CI]: 1.03, 3.06; $p = 0.039$), while, children of economically empowered Kenyan women were less likely to be stunted (AOR = 0.59, 95% CI: 0.35, 0.99, $p = 0.049$). Rwandese children of women with self-esteem were less likely to be stunted (AOR = 0.62, 95% CI: 0.40, 0.94, $p = 0.026$). Similarly, Burundian women with health decision control had children less likely to be stunted (AOR = 0.49, 95% CI: 0.28, 0.86, $p = 0.014$), even though, women with legal empowerment in

TABLE 3 Child growth, composite index of anthropometric failure, child dietary diversity scores of seven countries in Eastern Africa

	BURUNDI % (n = 1274)	ETHIOPIA % (n = 1087)	KENYA % (n = 1036)	MALAWI % (n = 1055)	RWANDA % (n = 791)	TANZANIA % (n = 1651)	UGANDA % (n = 878)
Child variables							
Sex of Child							
Female	49.9	52.3	52.2	49.3	51.6	52.3	50.3
Age (months) (mean±SD)	12.7 ± 4.9	12.3 ± 4.7	12.5 ± 4.9	13.0 ± 4.8	13.0 ± 5.0	12.6 ± 4.8	13.2 ± 5.2
WHO child growth indicators							
Stunted	55.5	38.8	27.5	35.8	36.1	37.7	32.6
Wasted	10.1	13.1	4.8	3.1	3.7	6.1	5.9
Underweight	33.5	25.0	10.4	10.0	11.4	16.7	13.0
Composite index of anthropometric failure (CIAF)							
Growth failure	59.8	49.0	32.4	38.1	40.1	42.1	37.2
Wasting only	0.5	4.5	1.7	1.2	1.1	1.2	1.5
Wasting and underweight	2.4	3.8	2.1	0.4	1.7	1.7	2.0
Wasting, stunting and underweight	7.2	5.4	0.9	1.5	1.0	3.2	2.4
Stunting and underweight	22.9	14.8	6.9	7.9	7.9	10.8	7.7
Stunting only	25.5	19.1	19.8	26.8	27.5	23.8	22.7
Underweight only	1.3	1.6	0.9	0.4	1.0	1.3	0.9
Child dietary diversity score							
Minimum ≥5 of 8 food groups							
Met	31.2	18.2	45.2	27.7	33.1	31.1	34.0
Did not meet	68.8	81.8	54.8	72.3	66.9	68.9	66.0

Abbreviation: SD, standard deviation.

TABLE 4 Prevalence of women's empowerment measures among seven countries in Eastern Africa

	BURUNDI % (n = 1274)	ETHIOPIA % (n = 1087)	KENYA % (n = 1036)	MALAWI % (n = 1055)	RWANDA % (n = 791)	TANZANIA % (n = 1651)	UGANDA % (n = 878)
Women Empowerment variables							
Economic empowerment							
Participates in income generation	83.2	37.1	60.5	67.1	68.2	78.0	75.2
Decision autonomy							
Controls/participates in decisions	63.0	73.2	51.8	53.0	64.9	41.7	51.6
Self-esteem							
Free from physical abuse	46.9	34.8	61.9	75.6	64.1	41.5	57.9
Health decision control							
Health service access	83.4	61.0	94.0	85.2	88.1	78.0	86.5
Legal empowerment							
Owned property	52.8	40.5	25.4	25.6	29.7	26.1	21.6

Burundi were more likely to have stunted children (AOR = 1.79, 95% CI: 1.22, 2.61, $p = 0.003$).

Specific women's empowerment measures were associated with child wasting in only Kenya and Uganda. Economically empowered

Kenyan women were less likely to have children who were wasted (AOR = 0.30, 95% CI: 0.11, 0.82, $p = 0.019$). Similarly, Uganda women with self-esteem had children less likely to be wasted (AOR = 0.38, 95% CI: 0.16, 0.93, $p = 0.033$).

TABLE 5 Significant associations between women's empowerment and child growth among seven countries in Eastern Africa

Women empowerment measures	Child growth indicators ^a			
	Unadjusted odds ratios		Adjusted odds ratios	
	OR	95% CI	AOR	95% CI
Economic empowerment				
Stunting				
Burundi	1.34	0.98–1.84	1.78	1.03–3.06*
Kenya	0.64	0.43–0.96*	0.59	0.35–0.99*
Wasting				
Kenya	0.52	0.26–1.05	0.30	0.11–0.82*
Underweight				
Burundi	1.40	0.98–1.97	1.87	1.01–3.45*
Malawi	1.68	0.96–2.95	2.53	1.23–5.18*
Growth failure ^b				
Burundi	1.32	0.98–1.79	1.84	1.08–3.13*
Kenya	0.62	0.43–0.89**	0.50	0.31–0.82**
Self-esteem				
Stunting				
Rwanda	0.73	0.54–0.98*	0.62	0.40–0.94*
Wasting				
Uganda	0.51	0.27–0.95*	0.38	0.16–0.93*
Underweight				
Tanzania	0.65	0.46–0.92*	0.60	0.38–0.93*
Uganda	0.51	0.33–0.79**	0.57	0.33–0.98*
Growth failure ^b				
Rwanda	0.70	0.53–0.94*	0.64	0.43–0.96*
Health decision control				
Stunting				
Burundi	0.82	0.59–1.13	0.49	0.28–0.86*
Growth failure ^b				
Burundi	0.80	0.57–1.13	0.52	0.30–0.95*
Legal empowerment				
Stunting				
Burundi	1.59	1.25–2.02***	1.79	1.22–2.61**
Underweight				
Uganda	1.93	1.20–3.10**	1.77	1.01–3.12*
Growth failure ^b				
Burundi	1.63	1.27–2.08***	1.87	1.28–2.75***

Note: Results from logistic regression controlled for child sex, age, recent diarrhoea; maternal age, height (for stunting & CIAF), highest education level, literacy level, listened to the radio recently; household number of living children, sex of head, wealth index, and mother and father age difference. Reference group for women's empowerment measure coded '0'.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

^aCoded 1 for stunted, wasted, underweight and CIAF; Coded 0 for adequate growth (>−2 z-scores).

^bComposite index of anthropometric failure (CIAF).

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

None of the women's empowerment measures were associated with child underweight in Ethiopia, Kenya and Rwanda. Women who were economically empowered in Burundi and Malawi were more likely to have children who were underweight (AOR = 1.87, 95% CI: 1.01, 3.45, $p = 0.046$ and AOR = 2.53, 95% CI: 1.23, 5.18, $p = 0.012$, respectively). Tanzanian and Ugandan women with self-esteem empowerment were less likely to have underweight children (AOR = 0.60, 95% CI: 0.38, 0.93, $p = 0.024$ and AOR = 0.57, 95% CI: 0.33, 0.98, $p = 0.041$, respectively). Differently, Ugandan women with legal empowerment were more likely to have underweight children (AOR = 1.77, 95% CI: 1.01, 3.12, $p = 0.047$). The detailed information by country on associations between women's empowerment measures and child growth are included as Supporting Information: Tables S1–S3.

3.6 | Women's empowerment measures and child growth failure

Significant associations between women's empowerment measures and the CIAF are presented in Table 5. Specific women's empowerment measures were associated with CIAF in only Burundi, Kenya and Rwanda. Women who were economically empowered in Burundi were more likely to have children with CIAF (AOR = 1.84, 95% CI: 1.08, 3.13, $p = 0.026$). However, in Kenya economically empowered women were less likely to have children with CIAF (AOR = 0.50, 95% CI: 0.31, 0.82, $p = 0.006$). Similarly, Rwandese women with self-esteem and Burundian women with health decision control were less likely to have children experiencing CIAF (AOR = 0.64, 95% CI: 0.43, 0.96, $p = 0.030$) and (AOR = 0.52, 95% CI:

0.30, 0.95, $p = 0.032$), respectively. In contrast, children of women who had legal empowerment in Burundi had a higher likelihood of CIAF (AOR = 1.87, 95% CI: 1.28, 2.75, $p = 0.001$). The detailed information by country on associations between women's empowerment measures and child growth failure are included as Supporting Information: Table S4.

3.7 | Women's empowerment measures and child dietary diversity

Significant associations between women's empowerment measures and child MDD were shown in Burundi, Ethiopia and Rwanda (Table 6). Women with economic empowerment were more likely to have children who met the MDD in Ethiopia (AOR = 3.02, 95% CI: 1.34, 6.78, $p = 0.008$). Differently, children of women who had economic empowerment in Burundi were less likely to have met MDD (AOR = 0.47, 95% CI: 0.26, 0.83, $p = 0.010$).

Mixed associations with MDD were related to decision autonomy. In Burundi, decision autonomy was positively associated with MDD (AOR = 1.55, 95% CI: 1.00, 2.41, $p = 0.049$), while decision autonomy was negatively associated with MDD (AOR = 0.60, 95% CI: 0.37, 0.97, $p = 0.037$) in Rwanda. Health decision control was positively associated with child MDD for Burundian women (AOR = 2.50, 95% CI: 1.35, 4.63, $p = 0.004$). Differently in Ethiopia, legal empowerment was negatively associated with MDD (AOR = 0.30, 95% CI: 0.11, 0.86, $p = 0.025$). Detailed information by country on associations between women's empowerment and MDD are included in Supporting Information: Table S5.

TABLE 6 Significant associations between women's empowerment measures and child minimum dietary diversity among seven countries in Eastern Africa

Women empowerment measures	Child minimum dietary diversity (MDD) ^a			
	Unadjusted odds ratios		Adjusted odds ratios	
	OR	95% CI	AOR	95% CI
Economic empowerment				
Burundi	0.92	0.63–1.35	0.47	0.26–0.83**
Ethiopia	1.89	1.13–3.15*	3.02	1.34–6.78**
Decision autonomy				
Burundi	1.59	1.20–2.10***	1.55	1.00–2.41*
Rwanda	0.99	0.73–1.34	0.60	0.37–0.97*
Health decision control				
Burundi	1.27	0.87–1.85	2.50	1.35–4.63**
Legal Empowerment				
Ethiopia	0.86	0.49–1.53	0.30	0.11–0.86*

Note: Results from logistic regression controlled for child sex, age, recent diarrhoea; maternal age, highest education level, literacy level, listened to the radio recently; household number of living children, sex of head, wealth index, and mother and father age difference. Reference group for women's empowerment measure coded '0'.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

^aCoded 1 for adequate MDD (≥ 5 of 8 food groups); Coded 0 for inadequate MDD (< 5 of 8 food groups).

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

4 | DISCUSSION

4.1 | Women's empowerment measures and child growth

This study showed mixed associations between different women's empowerment measures and child growth. Women with economic empowerment were more likely to have children experiencing stunting (Burundi), underweight (Burundi and Malawi) and CIAF (Burundi). These findings agreed with previous studies in Benin (Alaofè et al., 2017), and Ethiopia, Vietnam and Peru (De Silva & Harpham, 2007) that ascribed the increased likelihood of impaired growth to variations in population and environmental characteristics, and differences in attributes assigned to women's economic empowerment. Also, a study conducted in Kenya (Brunson et al., 2009) reported that women may be categorized as economically empowered, but still the lack of control of resources at household and societal levels reduces their capacity to supplement diets in their households for improved child growth. However, in our study, Kenyan women who were economically empowered had children who were less likely to experience child stunting and CIAF. The current findings were similar to a review of women's empowerment and food insecurity in sub-Saharan Africa (Assan, 2013) where women's economic empowerment improved food availability for household use and child growth due to increased resources for agriculture and livelihoods.

These mixed findings demonstrate that women's economic empowerment among countries in EA may be influenced by socioeconomic and cultural factors specific to varying geographic locations that may affect child growth between countries. For example, there often are discriminatory laws in low-income countries that hinder women's right to work and earn an income independent of their husband's permission. Such laws may restrict the use of earnings for personal and household needs as perceived by the woman rather than priorities insisted upon by the husband (Azmanova, 2016; Hallward-Driemeier et al., 2013; Huyer, 2016). Nevertheless, strategic policies and interventions toward women's control over household resources, similar income generation resources, and behavioural change programmes of equity and equality to men may potentially improve child growth (Bhutta et al., 2020; H. J. L. Malapit et al., 2015). Also, the evaluation of women's economic empowerment may be better addressed with a more comprehensive women's empowerment scale that has more diverse indicators to capture the majority of the economic determinants among women within EA. Assessing economic empowerment in EA may need to include more parameters involving agriculture, small and medium business enterprises, and casual labour. Possibly, the indicators used in our analysis were not sufficient to uniformly capture women's economic empowerment across individual local contexts in all seven countries in EA.

Children of women with self-esteem were less likely to be stunted or experience CIAF in Rwanda; neither were they wasted in Uganda nor underweight in either Uganda or Tanzania. Women with self-esteem may be more proactive in making better childcare decisions. They may

be more likely to take initiative in providing better nutrition for their children thus improving child growth (Arulampalam et al., 2016; Issala, 2013; Yaya et al., 2020). Further, the present study showed that Burundian women with health decision control had children who were less likely to be stunted or underweight, even though no significant associations were found between health decision control and child growth in other countries. These findings are consistent with studies in some developing countries (Arulampalam et al., 2016; Carlson et al., 2015; Kumar et al., 2018; Pratley, 2016; M. Shroff et al., 2009; M. R. Shroff et al., 2011) showing that health decision-making had the potential to improve child health and growth. Nonetheless, a study conducted on health-seeking behaviour in Senegal (Franckel & Lalou, 2009) explained that decisions related to health services access were not individualistic but were rather a process integrating inputs from several persons that support the woman. Therefore, an individual's capacity may not translate to increased health-seeking behaviour. In the current study, self-esteem and health decision control were the only women's empowerment measures that consistently showed beneficial associations with child growth for all countries in which they were significant. These findings on self-esteem and health decision control suggests increased expansion of nutrition-sensitive programmes (Bhutta et al., 2020) such as increasing women's awareness and assertiveness (Bishop, 2013); policy interventions targeting these distinct measures may result in better growth for children within the selected countries although situational differences need to be considered for higher impact on child growth across the countries included in our study.

In our study, women who were legally empowered were more likely to have children who experienced stunting, and CIAF in Burundi, as well as underweight in Uganda. These findings on women's legal empowerment may be explained by the variability and lack of comprehensiveness in legal empowerment across community settings. If traditional laws restrict women's access and full ownership of assets, ownership of property may not necessarily translate to property control (McKenna et al., 2019; United Nations, 2015). Such marginalizing and disempowering customary practices and laws, mostly in low-income countries (Hallward-Driemeier et al., 2013; Huyer, 2016), contribute to reduced self-esteem, poor maternal care and inadequate childcare affecting the nutritional status of both the mother and child. Furthermore, our study demonstrated that in Ethiopia none of the women's empowerment measures were associated with child growth. Nevertheless, studies in various countries have shown these empowerment measures to be positively associated with child health and growth (Bhagowalia et al., 2012; Fafchamps et al., 2009; Kadiyala et al., 2014; H. J. L. Malapit et al., 2015). A study in Kenya (Brunson et al., 2009) suggested that the variability in women's empowerment measures by setting makes it difficult to associate differences in societal characteristics with child growth.

Overall, our findings showed selective associations for different women's empowerment measures with child growth, and MDD in the seven countries analyzed in EA. Women's empowerment measures used were consistent with indicators in the definition of women's empowerment by the WHO (World Health Organization [WHO], 2008) and as used by previous studies (Alsop et al., 2004; Lee-Rife, 2010; United

Nations Population Fund [UNFPA], 2014). However, there may be a need to build on recently created scales such as the project-level Women's Empowerment in Agriculture Index (pro-WEAI) (H. Malapit et al., 2019) to include additional domains that widely assess women's empowerment outside of a specific project setting to contextualize more communal or habitual setting indicators. Also, while some of the variables used were similar to those used in the survey-based women's empowerment index (SWPER) (Ewerling et al., 2017, 2020), additional variables available from the DHS data for the countries in our study were included.

4.2 | Women's empowerment measures and child dietary diversity

Mixed associations between women's empowerment measures and child MDD were found only in Burundi and Ethiopia. Additional significant associations were shown in Rwanda. The other four countries examined did not show significant associations of women's empowerment with child MDD which may be explained by the complexity in cultural variations within local contexts regarding the role of women's empowerment measures on child growth and MDD (Carlson et al., 2015). In our study, children of economically empowered women in Ethiopia were three times more likely to meet MDD. Studies in Ghana (Davis et al., 2003) and Nepal (H. J. L. Malapit et al., 2015) reported that economically empowered women provided more diverse foods to their children which was attributed to increased control of income, reduced gender disparities and higher production diversity in the household. On the contrary, the present study also showed that children of Burundian women who were economically empowered and Rwandese women who had decision autonomy were less likely to meet the MDD. Similarly, legally empowered Ethiopian women were less likely to have children that met MDD. A study on selected sub-Saharan countries (Na et al., 2015) suggested that even though the majority of the women had an agrarian livelihood with a high production burden, the utility of the food produced for the household was not guaranteed as a result of lack of decision control. This discrepancy may offer some explanation for the variability of associations between women's empowerment domains and MDD. The lack of decision control on food produced from the land may not allow a focus household nutritional insecurity leading to an inability to meet the MDD. Additionally, our study findings showed Burundian women who had health decision control were more likely to have children that met the MDD. These findings were consistent with a study of developing countries using DHS data that reported maternal utilization of health services to be associated with better infant and young child nutrition, as well as reduced infant morbidity and mortality (Ahmed et al., 2010).

Several insights can be gained from the significant associations between women's empowerment measures and child growth and MDD among the specific EA countries. For example, economically empowered women may have the capacity to provide different high-quality foods in the household thus improving household dietary practices. The reverse associations on the same economic empowerment measure may indicate that it is not enough for women to be

only economically empowered. Women may also require additional forms of empowerment such as health decision control and self-esteem to effectively utilize the economic resources to improve child health and dietary practices. The balance of specific women's empowerment efforts may be promoted or modified through informing country-specific policies and programmes targeting improving IYCF practices, especially MDD.

Some of the women's empowerment measures in our study were different from other scales used in women's empowerment evaluations (H. J. L. Malapit et al., 2015; H. J. L. Malapit & Quisumbing, 2015; Stern et al., 2016). Our independent measures approach through factor analysis was based on variables available through the DHS and had notable differences from some of the recently developed women's empowerment tools. For example, the pro-WEAI (H. Malapit et al., 2019) often used to evaluate women's empowerment interventions in agriculture, focuses on three domains. Some variables used in the WEAI, such as membership of women in groups, were not collected in the DHS. Other variables such as work-time limits and access to credit also were not directly included in the DHS. Such differences between variables limited the use of the pro-WEAI in our study. Another scale, the summative index used for women's empowerment assessment has been challenged for discounting item-level distinctions in measuring women's empowerment (Alaofè et al., 2017) and has been shown to have high variability in measuring indicators based on individual associations (Ghuman, 2002) and therefore, was not used in this study. Also, while the SWPER (Ewerling et al., 2017, 2020) is a viable index for women's empowerment assessment, we included additional items available in DHS data sets from the seven countries in EA, precluding the use of the SWPER. These indicators, such as women's earnings from work, decisions on household purchases, and ownership of house or land, formed integral parts of specific domains used in this study and were consistent with evaluations used in previous studies (Alsop et al., 2004; Lee-Rife, 2010; United Nations Population Fund [UNFPA], 2014) of women's empowerment.

4.3 | Study limitations

The cross-sectional DHS data does not provide the depth of understanding of women's empowerment that might be provided with data collected through qualitative, longitudinal or mixed methods women's empowerment studies (Creswell & Clark, 2017). A qualitative study might help to explain the existing gaps or the reverse association between some of our women's empowerment measures, MDD and child growth. Further, the DHS survey questions may need to be expanded to adequately capture women's specific productive and economic influences on household health and nutrition. Questions addressing women's community leadership and women's rights to access and utilize food as a contributor to household nutrition may be needed in the DHS for future women's empowerment assessments. Questions about access and utilization of credit and financial services may also improve assessment of women's empowerment with DHS data. Also, questions on other forms of abuse to women such as emotional violence, for example,

questions targeting how a husband may belittle or devalue his wife could provide important data for assessment of emotional violence, and subsequently the self-esteem empowerment measure. Although recall or social desirability biases may have affected responses to indicators that inform women's empowerment, strengths of this study included the use of empowerment measures developed by factor analysis from several variables in the DHS data as well as the nationally representative samples from seven countries in EA. Future studies may consider investigating the strength of the women's empowerment measures and their effects on the severity of undernutrition in children across different regions.

5 | CONCLUSION

In specific EA countries, women's self-esteem and health decision control consistently showed beneficial associations with child growth and MDD, compared to the negative associations with legal empowerment, and mixed associations with economic empowerment. The beneficial associations between child growth and health decision control in Burundi and self-esteem in Rwanda, Uganda and Tanzania may support designing interventions aimed at reducing child undernutrition within those countries. Also, the positive associations between MDD and women's health decision control in Burundi and economic empowerment in Ethiopia have the potential to inform national-level programmes and policies targeting the dietary quality of children.

These indirect approaches aimed at improving child nutrition through women's empowerment strategies in EA have potential to transform individual behaviour, interpersonal relations, local institutions, the community and public policy in a social-ecological approach. Further, specific empowerment initiatives using a country-centred approach to improving child growth and MDD, especially within countries that showed significant positive associations, would prioritize country-level resources. Such area-specific planning would leverage meager resources, promote wider-scale interventions and potentially create sustainable improvements in child health.

AUTHOR CONTRIBUTIONS

The authors responsibilities were as follows: Joel J. Komakech, Christine N. Walters, Hasina Rakotomanana, Deana A. Hildebrand, Barbara J. Stoecker designed the study. Joel J. Komakech and Hasina Rakotomanana conducted statistical analysis. Hasina Rakotomanana, Deana A. Hildebrand, Barbara J. Stoecker advised on data analysis. Joel J. Komakech developed first draft of manuscript. Christine N. Walters, Hasina Rakotomanana, Deana A. Hildebrand, Barbara J. Stoecker critically reviewed and revised manuscript. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data used for this study is available at <https://dhsprogram.com/Data/>. Cleaned data sets can be made available by J. J. K.

ETHICS STATEMENT

Ethical approval for secondary analysis of this deidentified data was obtained from the DHS program. The approval for use of the survey data sets was initially provided on 8/27/2018 and reapproved on 10/22/2021.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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