Original Research Article

Predictors Associated with Double Burden of Malnutrition among Child-Mother Pairs in Kericho County, Kenya

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Abstract: In low-and middle-income nations, the double burden of malnutrition is a rising problem. It is unusual for an underweight child and an overweight mother to exist together in the same household because they both occupy a shared environment and have access to the same dietary patterns and habits. The aim of this study was to investigate the predictors associated with double burden of malnutrition among the child-mother pairs living in Kericho County. The research design employed was cross-sectional descriptive study. The target population was 346 comprising of a child- mother pairs within the six sub-counties within Kericho County. The research employed the multi-stage stratified cluster sampling method to obtain the target households. A pre-tested questionnaire collected data from socioeconomic demographic characteristics, nutrition status for mother (Body Mass Index,) child (BMI- Z-scores), food consumption and frequency. Data processing was done using Ms Excel, SPSS vs. 26.0 and Nutri survey 2005 software. Categorical variables were analyzed, while measures of central tendencies and dispersion were computed. The benchmark for the level of significance were at 0.05 alpha level (p<0.05. The results showed that majority of the respondents (57.6%) were between 36-49 years. The study findings also revealed that 18.9% of children were stunted, 11.5% wasted, 5.8% obese and 8.1% overweight. The study also found that 28.1% of mothers were overweight while 7.7% were obese and 16.9% were underweight. The variables: Weight of; mother's age, weight and height, child's age, gender and weight were significantly associated with double burden of malnutrition among child-mother pairs. The mother's weight, height and age, the child's weight, age and gender influences the nutritional outcomes which has an influence in controlling DBM. The study recommends that policy makers to review the Maternal, Infant and Young Child Feeding Nutrition (MIYCN) policy to take into consideration the double burden of malnutrition.

Keywords: Double Burden Malnutrition, socio-demographics, morbidity status and nutritional status.

INTRODUCTION

According to WHO (2020) up to 41 million young children worldwide are overweight or obese, 144 million are stunted, and 47 million are wasting. In contrast, 246 million women of reproductive age worldwide are overweight or obese, making up 1.9 billion adults worldwide. Around 45% of deaths in children under the age of five are attributed to nutrition-related variables (mostly under nutrition), whereas over nutrition is frequently connected to the majority of diet-related non-communicable diseases and mortality worldwide. While low- and middle-income (LMIC) nations are presently going through a transition as a result of a simultaneous rise in overweight and obesity as well as an increase in under nutrition (World Health Organization, 2018).

This complex shift produces a new triad referred to as the double burden of malnutrition which implies the presence of both under nutrition and over nutrition (overweight or obesity) either at the individual, household or population level. It may appear

at different levels: At individual level, as over- weight along with nutritional deficiencies; at household level, with underweight or stunted children and overweight adults; or at population level, with the coexistence of under nutrition and overweight. The double burden of malnutrition was initially documented in adults, but it has also been seen in children from Brazil, China, Russia and South Africa (Tzioumis & Adair, 2014).

Double burden of malnutrition is an emerging problem in the low- and middle-income countries (LMICs), including Asian countries (Bann *et al.,* 2018). In an attempt to investigate the socioeconomic inequalities in the burden of underweight and overweight among children in South Asia, Hossain, *et al.,* (2020) found that factors like maternal nutritional status were strongly associated with nutritional outcomes in children. In addition, the study provides evidence on socioeconomic disparities for the coexistence of under-nutrition and over-nutrition among children aged 24 to 59 months in South Asian countries.

A few studies examine the double burden in households by examining pairs of underweight infants and overweight mothers. According to Ihab, *et al.,* (2013), prevalence rates of the double burden problem within households in Sub-Saharan Africa ranged from less than 5% to 30%. According to Boakye-Agyemang (2018), non-communicable diseases linked to diet, such as obesity and under nutrition, are catastrophically expensive for individuals, communities, and the state-run healthcare systems in Malaysia.

In Nigeria, the coexistence of over nutrition and under nutrition is becoming a major public health issue. Senbanjo, Senbanjo, Afolabi and Olayiwola (2019), study sought to ascertain the prevalence of maternal obesity and overweight with children stunting and the related socio-demographic characteristics in rural and urban areas of Lagos State, Nigeria. According to the research, the prevalence of maternal overweight and obesity was substantially greater in urban than rural areas (50.7% vs. 41.3%; p=0.022), while the incidence of childhood stunting was significantly higher in rural than urban areas (43.3% 12.6%; p0.001). 31 (10.3%) mother-child pairs were found to have maternal obesity and overweight coexisting with childhood stunting, with the frequency being substantially greater in rural than urban settings (14.7% vs. 6.0%, p=0.014). This result showed that double-burden malnutrition is a concern in the community when it coexists.

Malnutrition is becoming a double burden in South Africa, which puts mothers and children at risk for poor medical complications. According to Modjadji and Madiba (2019), who performed research in the rural Dikgale Health and Demographic Site in Limpopo Province, South Africa, few studies have been done at the household level. Public health issues are raised in Rwanda by the twin burden of malnutrition. According to a study by Nyiraneza *et al.,* (2018), the prevalence of stunting among children under the age of five decreased over time from 51% in 2005 to 44% in 2010 and to 38% in 2015, creating a dual burden. On the other hand, rates of overweight and obesity among children under the age of five and women of reproductive age are also rising.

In Kenya, children under the age of 5 suffer from malnutrition twice as often as older children. Among low- income households in Nairobi, Kenya, research by Kimani-Murage *et al.,* (2015) discovered a 43% Double Burden rate. Kimani-Murage, *et al.,* (2015) conducted research on a depressed metropolitan environment with an emphasis on depressed households. The present study, however, examined respondents' socioeconomic characteristics from all social groups, including those from rural and urban settings who had access to food and those who did not. These findings by Kimani-Murage, *et al.,* (2015) confirmed an existing double burden of malnutrition characterized by a high prevalence of under nutrition particularly stunting early in life, and overweight/obesity in adulthood, particularly among women.

According to a UNICEF study from 2016, Kericho County is one of 28 counties in Kenya with a high prevalence of stunting and wasting, with rates ranging from 20 to 28%. According to a 2013 report from the Kericho County Government, the county's incidence of stunting was 28.7%, compared to the national average of 26.0%, while its rate of underweight was 12.4%, compared to 11.0% nationally (Kericho County Health at Glance, 2013). In Kericho County, there is currently no information on women who are overweight or obese, compared to a nationwide rate of 33% for both, and 9% for those who are underweight.

There are few researches examining the coexistence of under nutrition and over-weight/obesity among mothers and children living in the same households, particularly in Kenya's rural most underdeveloped counties. According to the national statistics KNBS (2015), it is evident that there is a coexistence of both under and over nutrition at the national level but no exact studies showing data of its coexistence in households in rural areas. This current study therefore aimed at determining predictors associated with double burden of malnutrition among child mother pairs in Kericho county Kenya.

Statement of the Problem

The prevalence of various forms of malnutrition among mothers and children has increased on a global scale. Up to 41 million children under the age of five are estimated to be overweight or obese globally, while 155 million are considered to be chronically undernourished, with stunting rates higher at 151 million and wasting rates close to 50 million.

Similar figures show that adult obesity is also quickly increasing and that over 672 million people are either overweight or obese. Importantly, 38% of children under five in Africa are stunted and 28% of children under five are moderately or seriously underweight (UNICEF, 2007; United Nations, 2012; World Health Organization, 2019).

According to recent data, there have been 222 million more people suffering from under nutrition in Sub- Saharan Africa in 2016 than there were in 2010 (Summary, 2018). Although stunting in the under 5's has reduced, the number affected still continues to soar while those wasted are at 13.8 million children, those overweight and obesity rose from 6.6 million to 9.7 million respectively (World Health Organization, 2018).

Despite improvements in eradicating poverty and empowering women, under nutrition is still a major problem in Kenya (El Kishawi *et al.,* 2016). Overweight and obesity rise in tandem with the rate of under nutrition. How severe the dual burden of malnutrition is in Kenya is a problem that is currently unknown.

Children's under nutrition has significantly decreased in Kenya, yet stunting rates remain over the WHO cutoff of 20%. Similar to this, over nutrition among Kenyan females has increased during 2003–2014 with respective increases of 23%, 25%, and 38%. The rate of double burdens is at 43% nationwide (Kimani-Murage, *et al.,* 2016). However, the focus of this study was on urban impoverished communities.

According to UNICEF (2016), stunting and wasting affect 28.7% of children in Kericho County, although this study only looked at the estates where tea is grown, which is not a real representation of the entire county. The consequences of the DBM are enormous; early life under nutrition is an underlying cause associated with about a third of young child deaths. Among the survivors who become stunted during the first two years of life, their capacity to resist disease, to carry out physical work, to study and progress in school, are all impaired across the life course (Shrimpton & Rokx, 2012).

The aforementioned research clearly illustrate that both under nutrition and over nutrition coexist on a national scale, but no precise studies that provide information on their prevalence in rural family settings have been conducted. This situation therefore necessitated the study to determine the predictors associated with double burden of malnutrition among child mother pairs in Kericho County.

RESEARCH OBJECTIVE

To determine the association between socio-demographic characteristics, morbidity status and

nutritional status of child-mother pairs in Kericho County.

EMPIRICAL REVIEW

Socio-Demographic Associated to Double Burden Malnutrition

In underdeveloped nations, maternal and child malnutrition is a serious public health issue. The coexistence of multiple forms of malnutrition in mothers and children has risen globally even as under nutrition in children has been steadily declining. It is critical to stress that DBM can exist at the level of the individual, household, and population (Shrimpton & Rokx, 2012). According to a few studies, the primary demographic factors that affect children's nutrition status are maternal age, marital status, household income, and educational attainment (Dessie *et al.,* 2019).

Age of the Child and the mother Related to Double Burden Malnutrition

Age of mother and child is a key consideration while evaluating double burden malnutrition. Kimani-murage (2013) investigated the double effects of malnutrition in rural South Africa. The results showed that at the household level, maternal age and household head age were associated with under nutrition in young children, while maternal age, household head education level, food security, and socioeconomic status were all associated with overweight/obesity and risk for metabolic disease among adolescents.

Similar to this, Sunuwar *et al.,* (2020) conducted a study to examine the coexistence of different types of malnutrition and related factors among mother-child pairs who lived in the same household. The findings showed that mothers over the age of 35 (AOR = 3.08, 95% CI: 1.20-7.86) and those who had completed at least a secondary education (AOR = 2.05, 95% CI: 1.03-4.07) were more likely to experience DBM. According to this, it was possible to estimate the household level of double-burden malnutrition using both the mother age and educational level.

Amugsi *et al.,* (2019) sought to investigate the correlates of the double burden of malnutrition (DBM) among women in five sub-Saharan African countries (Ghana, Nigeria, Kenya, Mozambique and Democratic Republic of Congo). It was found that the risk of being underweight, overweight, and obese in all countries was correlated with older age. This means that age appears to be correlated with a greater probability of DBM among women.

Household Income Associated to Double Burden Malnutrition

Children from low-income households had a higher likelihood of being underweight than those from families with steady income (Mukabutera *et al.,* 2016).

Compared to children from households with sufficient money, those from households with low finances were more likely to have wasted and underweight children. Low socioeconomic level makes it more difficult for someone to afford nutrient-rich foods, making them more likely to be undernourished as well as overweight and obese (WHO, 2019). In another research, Piernas *et al.,* (2015) conducted research to explore the burden of under- and over nutrition and nutrient adequacy among 2-12-year-old Chinese children. The results showed that overweight and obesity were more prevalent among children from urban areas and higher income households. In particular, 2-6-year-old children from urban areas and higher income households experienced the highest increase in obesity from 2009 to 2011 (P<0.05).

According to Hauqe *et al.,* (2019) there is little research on the association between socioeconomic status (SES) and the familial coexistence of maternal over and child under-nutrition (MOCU). Their results established that maternal overweight and MOCU prevalence is higher among the wealthier segment whereas prevalence of child under-nutrition is higher among the poorest segment of the households. Numerous research have looked at the relationship between socioeconomic status (SES) and the occurrence of dual malnutrition in various demographic groups, such as the coexistence of anemia and obesity in women and the coexistence of over- and under-nutrition in preschool children. This study aimed at establishing whether socioeconomic status will replicate the same findings in Kenya, especially in Kericho County.

Maternal Education Level Associated to Double Burden Malnutrition

Key factors of childhood nutritional status, including stunting and obesity, include household affluence and maternal education (Black *et al.,* 2013). In particular, Hossain *et al.,* (2020) found in their research that household education level was also positively connected with the prevalence of overweight in children. In Bangladesh (OR 2.1 (95% CI: 1.3 to 3.5), India (OR 1.2 (95% CI: 1.2 to 1.3), and Pakistan (OR 1.8 (95% CI: 1.1 to 2.9), households with higher education had increased odds of having overweight children compared to those without formal education.

According to Sunuwar *et al.,* (2020), mothers who attended at least a secondary level of education had a higher risk of experiencing a double burden of malnutrition. The explanation for this conflicting finding could be that mothers having a higher level of education may not necessarily be sufficient to adopt behavior change in a healthy lifestyle. In addition, various studies have also indicated that the double burden of malnutrition is associated with older mothers, mothers having short stature and a higher level of maternal education and wealth (Jehn & Brewis, 2009; Sekiyama *et al.,* 2015).

The correlates of the double burden of malnutrition (DBM) in women in five sub-Saharan African nations were studied by Amugsi *et al.,* in 2019. Their findings made it clear that in Ghana, Mozambique, and Nigeria, the number of years of formal education was linked to the risk of being overweight or obese, whereas in Kenya and Nigeria, it was linked to the possibility of being underweight. In every country, being underweight, overweight, or obese was connected with getting older. Living in wealthier households was likewise linked favorably to being overweight or obese, while underweight was found to be negatively correlated.

Maternal and Child Stature Associated to Double Burden Malnutrition

Health systems around the world, particularly in developing nations, continue to face significant obstacles from maternal morbidity and mortality. Specifically, mothers with short stature were three times more likely to have a child with short stature. This is because they are likely to provide a nutritionally restricted uterine environment; therefore, the fetus will have an inadequate supply of nutrients and restricted growth, which will result in low birth weight and short stature (Dewey & Begum, 2011).

Malnutrition has become a double burden in many developing nations. In order to determine the prevalence of DBM in rural Indonesia and Bangladesh, Oddo *et al.,* (2012) conducted research. They found that maternal short stature and older age were significant predictors of Maternal and child double burden (MCDB). Child characteristics such as older age and being female were associated with an increased odd of MCDB, whereas currently being breastfed was protective against MCDB. Moreover, a large family size and higher weekly per capita household expenditure predicted MCDB.

In Guatemala households with a stunted child and an overweight mother (SCOM), is a growing problem. Jounghee *et al.,* (2012) explored the magnitude of SCOM and the identification of socio-economic predictors associated with this malnutrition duality. The findings indicated that living in rural areas, having an indigenous mother, and lower economic level were associated with a higher prevalence of child stunting; urban residency, non-indigenous mother, and higher economic status were associated with a higher prevalence of maternal overweight. It was also established that socioeconomic and geographic disparities in child stunting were higher than in maternal overweight. The prevalence of SCOM was significantly associated with rural residency, indigenous mothers, and relatively low economic status.

In another research, Géa-Horta *et al.,* (2016) found that mother's short stature, child's vegetable intake on less than or equal to 4 d/week and inadequate

household were associated with child's short stature. Finally, the lack of breast-feeding was associated with maternal overweight. Besides, lower maternal educational level and inadequate household (non-masonry house) correspondingly were seen to associate with the double burden of malnutrition.

According to Melese *et al.,* (2019), children's nutritional status was impacted by the high prevalence rates of diarrheal illnesses. Other research has been done and found a strong correlation between under-five children's nutrition status and morbidity (Rahman *et al.,* 2016). There were minimal studies that investigated the interplay between morbidity and nutrition status among children aged 6-23 months old in Kericho County that would help in appropriate design required for interventions.

RESEARCH METHODOLOGY

The study design utilized a cross-sectional descriptive study with a population of 346 comprising of a child- mother pairs within the 6 sub-counties in Kericho County. It employed the multi-stage stratified cluster sampling method to get to the target households.

A pre-tested questionnaire collected data such as: socioeconomic demographic characteristics, nutrition status for mother (Body Mass Index,) child (BMI- Z-scores), food consumption and frequency. Data processing was done using Ms Excel, SPSS vs. 26.0 and Nutri survey 2005 software. Categorical variables were analyzed, while measures of central tendencies and dispersion used while regression model was run. The benchmark for the level of significance lies at 0.05 alpha level (p<0.05. The results were presented by tables.

RESULTS

Double Burden Malnutrition

Child mother pair of double burden of over- and under nutrition was defined as an overweight or obese and under nutrition mother with a stunted, underweight, or wasted child. Thus, the double burden of malnutrition (DBM) for this study has been defined by the coexistence of maternal underweight, overweight and obesity along with child under nutrition and over nutrition within the same household or community level. The results of DBM are summarized in Table 1.

Table 1: Descriptive Statistics of Double Burden of Malnutrition

Maternal BMI			Wasting (W/H)				Stunting (H/A)	
			Wasted SAM (-3 SD)	MAM (-2 SD)	Overweight (+2 SD)	Obese (+3 SD)	Severely Stunted (-3 SD)	Moderately Stunted (-3 SD)
Maternal BMI	<18.5kg/m2	% within BMI of mother	29.5%	29.5%	4.5%	6.8%	0.0%	20.5%
		% of Total	5.0%	5.0%	0.8%	1.2%	0.0%	3.5%
	25-29.9kg/m2	% within BMI of mother	1.4%	23.9%	11.3%	7.0%	1.4%	9.7%
		% of Total	0.4%	6.6%	3.1%	1.9%	0.4%	2.7%
		% within BMI of mother	5.0%	25.0%	25.0%	5.0%	5.0%	20.0%
		% of Total	0.4%	1.9%	1.9%	0.4%	0.4%	1.5%

The results in Table 1 shows that, there's prevalence of child underweight (6.6%) as compared to wasted children (0.4%), coexisting with overweight mothers. In terms of obese mothers, a prevalence (1.9%) cases of child underweight as compared to wasted children at 0.4%. Total prevalence of double burden malnutrition with respect to wasting was at 8.5%. The total prevalence of double burden malnutrition with respect to overweight and obese children was 5% and 2.3%, respectively. Furthermore, the finding indicates a relative rate of stunting (3.1%), in overweight mothers as compared to those coexisting with obese mothers at 1.9%. The total prevalence of DBM with respect to stunting stood at 5.0%. These outcomes imply that the prevalence rates differ remarkably by DBM definition. The rates are relatively low (5%) when child under nutrition is measured in terms of stunting. Household DBM rates are much higher (8.5%) when child under nutrition is measured in terms of wasting (SAM and MAM). This could be due to the fact that relatively few children in the study area suffer from stunting.

Association between Demographic and Socioeconomic Characteristics and Maternal Nutritional Status

The fifth objective of this study was to determine the association between socio-demographic characteristics, dietary intake, and nutritional status of child-mother pairs in Kericho County. Multiple linear regression models was used to test the relationship. The findings are presented in Table 2 and 3.

Table 2: Regression Analysis Results

	Adjusted Coefficients	
	Beta	P-value
Mother's Age	.074	0.019[*]
Relationship to HH	.015	0.647
Marital status	-.040	0.186
Education Level	-.023	0.515
Occupation	.044	0.202
Weight of mother	.885	.000[**]
Height of mother	-.212	.000[***]
Household income per month	.049	.149

*Statistically significant

In order for the investigator to decide whether results are statistically significant or not, p-value has to be calculated which is the probability of observing an outcome assuming that the null hypothesis is true. The null hypothesis is rejected if the p-value is less than the level significance i.e., in P< α, P<0.05 (Kothari, 2004). Table 2 showed that the mother's age, weight and height of mother are significant at 5% level, i.e., p<0.05. Hence there exist a linear relationship between the independent variables, mother's age, weight of mother and height of mother and the nutrition status, which implies that nutrition status is influenced by mother's age, weight and height. Hence, they influence nutrition status. Marital status, education level, occupation, household income, and gender and show no significance in the model, i.e., their p>0.05.

Association between Demographic and Socioeconomic Characteristics and Child Nutritional Status

Table 3: Regression Results

	Adjusted Coefficients	
	Beta	P-value
Weight of child	-.338	.000*
Height of child	-.050	.311
Child's Age	.913	.000**
Gender	-.178	.009***
Household income per month	-.088	.078

*Statistically significant

Table 3 showed that the child's age, weight, and gender are significant at 5% level, i.e., p<0.05. The result findings reported that nutrition status is influenced by child's age, weight and gender therefore influences nutrition status. Height of child and household income show no significance in the model, i.e., their p>0.05.

CONCLUSION

Since malnutrition can occur as a result of, maternal nutrition before and during pregnancy becomes important in the first year of life is to be prevented. The mother's age is also a determinant of the nutritional status of the child. The mother's weight, height and age, the child's weight, age and gender influences the nutritional outcomes which has an influence in controlling DBM. The high level of under nutrition and over nutrition in both mothers and children in this study against the national statistics is a concern. Thus concluding that there is prevalence of double burden of malnutrition in Kericho and is a rising health problem.

RECOMMENDATION

The study recommends that the caregivers utilize the available resources such as; livestock rearing and land utilization.

The study commends that the nutrition department in the county provide nutrition health education to households regularly, in the health facilities, out-reaches, men's barazas, clinical medical camps in remote areas and in schools.

The study commends that policy maker to review the Maternal, Infant and Young Child Nutrition policy to take into consideration of double burden of malnutrition.

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