# Maternal nutrition knowledge, attitude and practices of mothers on nutritional status of their children under-five years at Kenyatta National Hospital, Kenya: A comparative study of socio-economic income

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**Abstract :***Introduction : Mothers' nutrition knowledge, attitude and practices play an importantrole in childnutritional status1,2,3,4. Weexamined the linkbetweenmaternal nutrition knowledge, attitude and practices, demographiccharacteristics of mothers and nutritionaloutcomes (weight-for-age, height-for-age and weight-for-height Z-scores) of theirchildren (6-59 months). One particular focus is on the role of different types of mothers' demographiccharacteristics, nutrition knowledge, attitudes and practices in comparisonwithsocio-economicincome. The analysisbuilds on individuallevel data collected at Kenyatta National Hospital in Nairobi County, Kenya in 2017 and 2018. Variousregressionmodelsweredeveloped and estimated. Results show thatmaternal nutrition attitude score, age and educationallevelispositivelyassociatedwithchildstunting, aftercontrolling for otherinfluencingfactorssuch as socio-economicincome and generalmaternal nutrition practice, likewisetherewas a strong association between the mothers' age, age of child and childunderweight. The strongest positive association withchildstuntingisfound for mothers' education and maternal attitude about the nutritionalhealthconsequences of not followingrecommendeddietary practices. Thesefindings have direct relevance for nutrition and healthpolicies, especially for designing the contents of nutritionaleducationcampaigns and training programs.ResearchMethodology :ResearchMethods used were cross-sectional, comparative, descriptive, quantitative and qualitative in nature. Tenwards of pediatricdepartmentwereused to yield an exhaustive simple randomsampling of cases thatparticipated in the study of whom 126 (86%) werefromlowsocio-economicincome and 20 (14%) from middle socio-economicincome. Mothers' demographiccharacteristics, nutrition knowledge, attitude and practices and children'sdemographiccharacteristics and anthropometricmeasurements, thatis, weight and height data werecollectedusingstructured questionnaires. Food frequency questionnaires yielded data on dietarydiversityprovided at home for childrenbetween 6 months to 59 months. Descriptive and multivariateanalysisdistinguished key indicatorsrelatedwithnutritionalstatus of children. For chi-square test and t-test analyses wereutilized to conclude on the significance of distinction between proportions, whileAnalysis of Variance (ANOVA) wasutilized to test group difference of quantitative variables.Results: Data show that generally there are statistical significant differences between mothers' demographic characteristics, nutrition attitudes, practices and the nutritional status outcome of their children below five years of low and middle socio-economic income at Kenyatta National Hospital, Kenya. The children's mean age at the time of the study of middle socio-economic income was 25.8 months (SD 5.99) and 23.45 months (SD 12.68) for low socio-economic income. Some differences were noted in the following parameters:1. Mothers' demographic characteristics are not statistically significant from the two socio-economic income statuses along the identified background characteristic, with exception of child birth weight, mothers' educational status, number of children and mothers' age. Mothers of the low socio-economic income got children significantly at younger age (mean 26 years; SD 5.989) than those from middle socio-economic income status (mean 26 years; SD 3.675) (p=.019). Likewise, there is highly significant difference in number of children given birth to (p=.002) with parents from lower socio-economic status having high number of children (mean 2.35; SD 1.694), while those of middle socio-economic income low number of children (mean 2.21; SD 1.053). Mothers' from low socio-economic income had low education (mean 4.45; SD 1.142 ) while mothers from middle socio-economic income had high educational status (mean 5.00 ; SD 1.000 ) (p=.050).2. Child's age demographic characteristic was statistically significant different from between the two group of socio-economic income with respect to child age. Children's age had a high significant level (p=.000) to the nutritional outcome underweight, those of low*

*socio-economic income had the highest child age (mean 15.56; SD 8.532) while middle income had (mean 13.40; SD 5.177).3.        Based on multivariable analysis, the factors associated with weight for age among children below five years of Kenyatta National Hospital in the study included dietary diversity score slightly significance at (p=.056), child age (p=.001), number of children (p=.039), nutrition attitude slightly significant at (p=.097)4.        Child age, dietary diversity score and nutrition practices were associated with height for age among children in the study. Child age (p=.007), dietary diversity score (p=.031), nutrition practices (p=.024)5.        Child age and nutrition practices were the only factors that were associated with weight for height among children of below five years at Kenyatta National Hospital, Nairobi County. Child age (p=.000) and nutrition practices (p=.006).Conclusion: The study in its findings came to conclusion that there is a statistical significance difference in nutritional status among children from low and middle socio-economic income status. Child and mothers' socio-demographic characteristics, nutrition practices, attitudes and dietary diversity score are associated with nutritional outcomes in both low and middle socio-economic income. Even though Kenyatta National Hospital has provided standardized guideline for child feeding practices, it is not effected by the mothers hence child malnutrition. The recommendation based on the findings of the study is that Kenyatta National Hospital should do regular follow up to find out whether the nutritional counseling that is provided to mothers at the Hospital is practiced by mothers. Also the ministry of health should ensure that this is reinforced to help minimize child malnutrition. With the help of ministry of health, mothers should be empowered economically by the government of Kenya so that they can be able to have some source of income to support their children in improving their nutritional status. Since mothers are the ones who make independent decisions for their babies on food choices, this study also recommends creating awareness on the effect of poor dietary practices on underweight, stunting and overweight or obesity and associated health risks. This should aim at improving nutrition knowledge, positive attitudes and appropriate dietary practices.*

*Key Words: Maternal Nutrition knowledge, attitude, practices, socio-economic income, food diversity and association.*

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# I.    Introduction

Malnutrition affects young children physically, socially and psychologically. It interferes with their education and their work performance at a later stage[1,2]. No place is this more evident than in Kenya. Solution is required for this cycle, and it is urgent that we address it and set our objectives in life.

Health and nutrition are vital elements for the developing countries. There is big difference between developing countries and developed countries when it comes to nutrition; developed countries do badly in undernutrition while developed countries do badly in overnutrition. Maternal nutrition knowledge and health status of children under-five years are essential particularly amid lactation period. Notwithstanding health and nutrition, variables, for example, maternal age, the quality of nutrition is of serious concern.

Child malnutrition is now commonly recognized as problematic in developing countries in Africa resulting in high rates of child mortality[1,2,3,4].This is mainly attributed to the high rates of  nutrition knowledge deficiency, negative attitude and inappropriate practices on health dietary practices of the children.. The current study aims of the study is to contribute towards better understanding of the contribution made towards maternal nutrition knowledge, attitudes and practices of mothers on nutritional status of their children below five years at Kenyatta National Hospital, Nairobi County in Kenya.

# II.    Material And Methods

T This prospective comparative study was carried out on mothers with children aged 6 to 59 months attending nutrition counseling and child growth monitoring, constituted the universe population that yielded a simple random sample of 146 at the Department of Paediatrics at Kenyatta National Hospital, Nairobi County, Kenya from December, 2017 to January, 2018. A total of 146 mothers aged 18 years to 40 years were in this study and their children aged of 6 months to 59 months.

**Study Design:**Cross-sectional study, descriptive, comparative, quantitative and qualitative study in nature.

**Study Location**: The study was conducted at Paediatric Department of Kenyatta National Hospital (KNH) in Nairobi, County, Kenya. Nairobi County covers a region of 680 M squared. The hospital was established to satisfy the part of being a National Referral and Teaching Hospital, and in addition to give medical research environment. Built up in 1901 with a bed limit of 40, KNH became a State Company in 1987 with a Management Board and is at the apex of the referral framework in the Kenya Health Sector. Kenyatta National Hospital is the largest referral health facility in the Nairobi County with 50 wards, 20 out-patients clinics, 24 theaters and a total bed capacity 1,800. The normal bed occupy rate goes to 300% and at any given day the Health facility host in its wards in the vicinity is 2500 and 3000 patients. The health facility on average has over

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80,000 in-patients annually. It is located in Upper Hill Community area which is about 5km from Central Business District in Nairobi, Kenya. The hospital is a National Referral and Teaching in Hospital, and provides a medical research environment.

**Study Duration:** December, 2017 to January, 2018.

**Sample size:** 146 mothers attending mother and child clinic for child growth monitoring and vaccination.

**Sample size calculation:** The sample size was calculated using Fischer's formula on the basis of child undernutrition rate (11%) in Nairobi County. The target population from which we randomly selected our sample was mothers taking their children for growth monitoring at the Department of Paediatric. The sample size obtained for this study was 146 patients for each group of socio-economic income; middle socio-economic income and low socio-economic income.

**Subjects & selection method**: The study population was drawn from consecutive patients who presented their children for growth monitoring to Department of Paediatrics at Kenyatta National Hospital, Nairobi Countywho went with their children for growth monitoring December, 2017 and January, 2018.

**Inclusion criteria:**

1. Mother and child dyads attending mother and child clinic for child growth monitoring and nutrition counseling at the department of Paediatrics at Kenyatta National Hospital for nutrition counseling, child low birth weight, growth monitoring and immunization irrespective of the regions they reside in. Only children above six months and children below five years whose mothers voluntarily accepted to participate by signing the consent form after being explained to what the study entails and giving permission for their infants to be assessed nutritional status in the study were included.

**Exclusion criteria:**

1. Pregnant women;
**2.** A severely sick child did not participate as well as children below six months and children above five years old whose parents did not give consent. Infants accompanied by members of the family other than their mothers did not participate since most of the questions were directed towards biological.

**Procedure methodology**

After written informed consent was obtained, a well-designed pretested questionnaire was used to collect data of the recruited patients retrospectively. The questionnaire included socio-demographic characteristics such as age, gender, educational status, occupation and consanguineous marriage, nutrition knowledge, attitude, and practices. Anthropometric measurements (weight and height) of children were taken. Also children's demographic characteristics; date of birth, age, birth weight and gender were included in the questionnaire.

**Statistical analysis**

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Mother's and children's t-test were used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. In addition, paired t-test was used to determine the difference between Socio-economic income of mothers with the nutritional status of their children, and this was confirmed by the Wilcoxon test which wasa nonparametric test that compares two paired groups. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

## III. Result

The data collected allowed the analysis of Paediatric health department at Kenyatta National Hospital on nutrition knowledge attitudes and practices of mothers on the nutritional outcome of their children. The results are both quantitative and qualitative. Descriptive results have been presented in tables, and mainly give the information on the socio-demographic characteristics of the children, mothers and their socio-economic status. Thestudy sample was set at 146 mother and child dyads.

**Relationship of mothers' and children's socio-demographic characteristics on nutritional status-underweight of their children**

Table 1 presents results pertaining to mother and child socio-demographic characteristics, disaggregated by socio-economic income and nutritional status of children who are under-weight. The results show a comparatively high level of child nutritional status and socio-economic income measured based on monthly household income in the middle socio-economic income group compared to those from the lower socio-economic income. There was nosignificance difference in the sociodemographic characteristics of mother. There was high significant level of child age (p=.000), those of low socio-economic income had the highest child age (mean 15.56; SD 8.532) while middle income had (mean 13.40; SD 5.177).

**Table 1: Relationship of mothers' and children's socio-demographic characteristics on nutritional status-underweight of their children**

| Mother and child socio-demographic, characteristics | Weight for Age | | | | Test of Statistics | p-value |
|---|---|---|---|---|---|---|
| | Underweight N= 46 | | Normal N= 100 | | | |
| | *Low Income* | *Middle Income* | *Low Income* | *Middle Income* | | |
| | *n=41* | *n=5* | *n=85* | *n=15* | | |
| | *Mean; SD* | *Mean; SD* | *Mean; SD* | *Mean; SD* | | |
| **Mothers age** | **26.35; 5.989** | **26.00; 4.472** | **25.83; 6.169** | **26.47; 3.675** | **t=0.551; df=144** | **.019[a]** |
| Marital Status | 1.85; 0.654 | 1.60; 0.548 | 1.93; 1.163 | 1.73; 0.704 | t=0.421; df=144 | .065[a] |
| No. of Children | 2.44; 1.19 | 3.20; 1.924 | 2.09; 1.007 | 2.07; 1.580 | t=2.123; df=144 | .213[a] |
| Education | 4.24; 1.067 | 4.80; 0.837 | 4.55; 1.029 | 5.40; 1.121 | t=1.967; df=144 | .466[a] |
| Occupation | 4.73; 1.342 | 3.80; 1.304 | 4.36; 1.534 | 4.33; 2.440 | t=0.955; df=144 | .077[a] |
| Sex/Gender | 1.49; 0.506 | 1.40; 0.548 | 1.51; 0.503 | 1.53; 0.516 | t=0.354; df=144 | .778[a] |
| **Child Age** | **15.56; 8.532** | **13.40; 5.177** | **21.80; 11.77** | **26.80;12.746** | t=1.084; df=144 | **.000[a]** |
| Child birth Weight | 2.943; 0.596 | 2.920; 0.295 | 2.846; 0.560 | 2.760; 0.518 | t=3.715;df=144 | .782[a] |

[a]Independent t-test
*Significant results are highlighted in bold

**Relationship of mothers' and children's socio-demographic characteristics on nutritional status-stunting of their children**

Table 2 below presents results pertaining to mother and child socio-demographic characteristics, disaggregated by socio-economic income and nutritional status of children who are stunted. The results show a comparatively high level of child nutritional status and socio-economic income measured based on monthly household income of the middle socio-economic income group compared to those from the lower socio-economic income. There was a significance difference in the sociodemographic characteristics of mothers in terms of educational status of the low income mothers (mean 4.45; SD 1.142), while those of the middle income (mean= 5.00 SD= 1.000) (P=.050). Likewise there was a statistical significance difference on number of children that mothers had, of the low income (mean2.35; SD 1.694), while middle income (mean 2.21; SD 1.053) (P=0.002).

**Table 2: Relationship of mothers' and children's socio-demographic characteristics on nutritional status-stunting of their children**

| Mother - child socio-demographic, characteristics | Height for Age | | | | | | Test of Statistics | p-value |
|---|---|---|---|---|---|---|---|---|
| | Stunting | Normal | | | | | | |
| | N= 57 | | | N= 89 | | | | |
| | *Low Income* | | *Middle Income* | *Low Income* | | *Middle Income* | | |
| | *n=49* | *n=8* | | *n=77* | | *n=12* | | |
| | *Mean; SD* | | *Mean; SD* | *Mean; SD* | | *Mean; SD* | | |
| Mothers age | 26.27; 6.204 | | 25.50; 3.586 | 25.55; 5.873 | | 26.92; 3.777 | t=0.439; df=144 | .855[a] |
| Marital Status | 1.82; 0.858 | | 1.75; 0.463 | 1.96; 1.117 | | 1.67; 0.778 | t=0.685;df=144 | .244[a] |

| | | | | | |
|---|---|---|---|---|---|
| **No. of Children** | **2.24; 1.011** | **2.34; 1.085** | **2.35; 1.694** | **2.21; 1.053 t=0.310;df=144** | **.002[a]** |
| **EducationalStatus** | **4.45; 0.891** | **4.88; 1.126** | **4.45; 1.142** | **5.50; 1.000** t=0.471;df=144 | **.050[a]** |
| Occupational Status | 4.43; 1.429 | 4.63; 1.408 | 4.52; 1.518 | 3.92; 2.610 t=0.066; df=144 | .173[a] |
| Sex/Gender | 1.49; 0.505 | 1.63; 0.518 | 1.51; 0.503 | 1.42; 0.515 t=0.168;df=144.940[a] | |
| Child Age | 22.41; 10.868 | 29.88; 8.560 | 18.09; 11.049 | 19.17; 13.456 t=2.764;df=144 .823[a] | |
| Child birth Weight | 2.90; 0.644 | 2.94; 0.358 | 32.87; 0.524 | 2.71; 0.527t=0.624; df=144.387[a] | |

[a]Independent t-test
*Significant results are highlighted in bold

**Relationship of mothers' and children's socio-demographic characteristics on nutritional status-overweight of their children**

Table 3 presents results pertaining to mother and child socio-demographic characteristics, disaggregated by socio-economic income and nutritional status of children who are overweight. The results show a comparatively analysis of child nutritional status and socio-economic income measured based on monthly household income in the middle socio-economic income group compared to those from the lower socio-economic income. There was no significance difference in the sociodemographic characteristics of mothers and the children on the nutritional outcome of children based on obesity or overweight.

**Table 3: Relationship of mothers' and children's socio-demographic characteristics on overweight of their children**

| Mother and child socio-demographic, characteristics | Weight for Height | | | | Test of Statistics | *p-value* |
|---|---|---|---|---|---|---|
| | Overweight N= 28 | | Normal N= 118 | | | |
| | *Low Income* | *Middle Income* | *Low Income* | *Middle Income* | | |
| | *n=22* | *n=6* | *n=104* | *n=14* | | |
| | *Mean; SD* | *Mean; SD* | *Mean; SD* | *Mean; SD* | | |
| Mothers age | 25.55; 7.501 | 24.50; 3.619 | 25.88; 5.661 | 27.14; 3.527 | t=0.591; df=144 | .265[a] |
| Marital Status | 2.00; 1.069 | 1.67; 0.516 | 1.88; 1.017 | 1.71; 0.726 | t=0.310; df=144 | .605[a] |
| No. of Children | 2.14; 1.037 | 2.17; 1.941 | 2.22; 1.061 | 2.43; 1.651 | t=0.423; df=144 | .724[a] |
| Educational Status | 4.49; 0.854 | 4.83; 1.329 | 4.42; 1.086 | 5.43; 0.938 | t=0.440; df=144 | .500[a] |
| Occupational Status | 4.77; 1.270 | 4.33; 1.966 | 4.42;1.518 | 4.14; 2.349 | t=0.864; df=144 | .275[a] |
| Sex/Gender | 1.45; 0.510 | 1.50; 0.548 | 1.51; 0.502 | 1.50; 0.519 | t=0.439; df=144 | .513[a] |
| Child Age | 30.36; 10.445 | 34.50; 7.036 | 17.53; 9.963 | 18.71; 11.638 | t=6.411; df=144 | .823[a] |
| Child birth Weight | 2.83; 0.758 | 2.85; 0.378 | 22.89; 0.528 | 2.779; 0.516 | t=0.366; df=144 | .224[a] |

[a]Independent t-test
*Significant results are highlighted in bold

**Multivariate analysis of factors associated with under-weight in children**

Table 4 provides adjusted odds ratios for the association between different variables and weight for age among children below five years. Based on the multivariable analysis, the factors associated with weight for age among children in the study included age, birth weight, mothers nutrition knowledge, attitude, practices dietary diversity score. Based on the multivariate analysis, the factors associated with weight for age in the study included child age, number of children, dietary diversity score and nutrition attitude. The children who were being taken to clinic for check-up over two years were likely to be under-weight than their counterparts who were taken to clinic for checkup at younger age of below two years. Results showed that diversity score was

slightly associated with increased likelihood of children recording lower weight for age, after controlling for other variables included in the model. Nutritional negative attitude was also slightly associated with the increased likelihood of children recording lower weight for age, after controlling for other variables include in the model.

**Table 4: Multivariate analysis of factors associated with under-weight in children**

| Variables [a] | β | β SE | Wald Statistic | p-value | Adjusted Odds Ratio | Odds Ratio 95% CI |
|---|---|---|---|---|---|---|
| Constant | .777 | .178 | | | | |
| Child birth weight | .151 | .427 | .126 | .723 | 1.163 | .504 − 2.685 |
| **Child age** | **.080** | **.024** | **10.766** | **.001** | **1.083** | **1.033 − 1.136** |
| Mothers' occupational status | -.107 | .152 | .492 | .483 | .899 | .891 − 1.094 |
| **No. of children** | **−.318** | **.154** | **4.257** | **.039** | **.727** | **.537 − .984** |
| Mothers' age | -.017 | .050 | .117 | .732 | .983 | .891 − 1.084 |
| Mothers' educational level | .219 | .221 | .986 | .321 | 1.245 | .808 − 1.919 |
| Socio-economic income | .394 | .771 | .261 | .609 | 1.483 | .327 − 6.720 |
| Dietary diversity score | .316 | .165 | 3.653 | .056 | 1.371 | .992 − 1.896 |
| Nutrition Knowledge | .041 | .495 | .007 | .934 | 1.042 | .395 − 2.749 |
| **Nutrition Attitude** | **1.167** | **.702** | **2.762** | **.097** | **3.213** | **.811 − 12.725** |
| Nutrition Practice | -581 | .662 | .768 | .381 | .560 | .153 − 2.050 |

[a]Hosmer and Lemeshow test for model fit - $x^2$ ; DF ; p-value
ref-reference category
DF- Degree of Freedom; CI- Confidence Interval

**Multivariate analysis of factors associated with Stunting in children**

Child age, dietary diversity score and mothers' nutritional practices were associated with height for age among children below five years. Child age (p= .007), dietary diversity score (p= .031) and mothers' nutritional practices (p= .024) were associated with a higher likelihood of recording lower height for age, after controlling for other variables included in the model. Results from bivariate analysis that showed no significant association between socio-economic income and height for age remained the same in the logistic regression model.

**Table 5: Multivariate analysis of factors associated with Stunting in children**

| Variables [a] | β | β SE | Wald Statistic | p-value | Adjusted Odds | Odds Ratio 95% CI Ratio |
|---|---|---|---|---|---|---|
| Constant | .446 | .170 | | | | |
| Child birth weight | .112 | .380 | .087 | .767 | 1.119 | 1.031 − 1.894 |
| **Child age** | **-.049** | **.018** | **7.292** | **.007** | **.952** | **.919 - .987** |
| Mothers' age | .005 | .045 | .012 | .915 | 1.005 | .919 − 1.098 |
| Mothers' occupational status | .077 | .132 | .342 | .559 | 1.081 | .834 − 1.401 |
| No. of children | -.085 | .212 | .002 | .967 | .991 | .654 − 1.503 |
| Mothers' educational level | .145 | .200 | .544 | .461 | 1.159 | 783 − 1.716 |
| Socio-economic income | .298 | .628 | .225 | .635 | 1.347 | .393 − 4.612 |
| **Dietary diversity score** | **.335** | **.155** | **4.665** | **.031** | **1.398** | **1.031 − 1.894** |
| Nutrition Knowledge | -.964 | 651 | 2.193 | .139 | .389 | .106 − 1.366 |
| Nutrition Attitude | .744 | .582 | 1.635 | .201 | 2.104 | .673 − 6.584 |
| **Nutrition Practices** | **1.076** | **.477** | **5.081** | **.024** | **2.932** | **1.151 − 7.473** |

[a]Hosmer and Lemeshow test for model fit - $x^2$ ; DF ; p-value
ref-reference category
DF- Degree of Freedom; CI- Confidence Interval

**Multivariate analysis of factors associated with overweight in children**

Analyses of the correlates of nutritional outcome among children below five years were done. Child age and mothers nutritional practices were associated with the weight for age, meaning there was a statistical significant association with weight for age in the analyses of child's age (β= -118; SE = .027; DF = ; p = .000) and mothers' nutrition practices (β = -2.073; SE = .754; DF = ; p = .006) after controlling for other variables in the regression model. None of the factors remaining could predict statistical significance of obesity.

**Table 6: Multivariate analysis of factors associated with Overweight in children**

| Variables [a] | β | β SE Statistic | Wald value | Odds | p- | Adjusted 95% CI Ratio | Odds Ratio |
|---|---|---|---|---|---|---|---|
| Constant | .446 | .170 | | | | | |
| Child birth weight | -.473 | .608 | .606 | | .436 | .623 | .189 − 2.051 |
| **Child age** | **-118** | **.027** | **18.551** | | **.000** | **.889** | **.842 -.938** |
| Mothers' occupational status | -.097 | .190 | .258 | | .611 | .908 | .625 − 1.318 |
| Mothers' age | .088 | .071 | 1.542 | | .241 | 1.092 | .950 − 1.255 |
| No. of Children | .156 | .297 | .278 | | .598 | 1.169 | .653 − 2.092 |
| Mothers' education level | .152 | .354 | .184 | | .668 | 1.0164 | .581 − 2.331 |
| Socio-economic income | -.522 | .852 | .375 | | .540 | .593 | .112 − 3.150 |
| Dietary diversity score | -.013 | .240 | .003 | | .958 | .987 | .617 − 1.581 |
| Nutrition knowledge | .719 | .731 | .967 | | .325 | 2.052 | .490 − 8.593 |
| Nutrition attitude | -.522 | .852 | .375 | | .540 | .593 | .112 − 3.150 |
| **Nutrition practices** | **-2.073** | **.754** | **7.560** | | **.006** | **.126** | **.029 − .551** |

[a]Hosmer and Lemeshow test for model fit - $\chi^2$ ; DF ; p-value
ref-reference category
DF- Degree of Freedom; CI- Confidence Interval

# IV. Discussion

**Relationship of mothers' and children's socio-demographic characteristics on underweight of their children**

The results show a comparative analysis of child nutritional status and socio-economic income measured based on monthly household income in the middle socio-economic income group compared to those from the lower socio-economic income. Based on child underweight nutritional status, there was a significance difference in the sociodemographic characteristics of mother in terms of marital status of the low income mothers (mean 1.85; SD 0.654), while those of the middle income (mean= 1.93 SD= 1.163) (P=.065). Likewise the occupational status of mothers was slightly significant (p=077), low income mothers had high occupational status (mean 4.73; SD 1.342) while middle income had low socio-economic income (mean 4.36; SD 1.534). Likewise there was high significant level of child age (p=.000), those of low socio-economic income had the highest child age (mean 15.56; SD 8.532) while middle income had (mean 13.40; SD 5.177).This means that when a child is taken for nutritional health check up at the hospital at a younger age then the nutritional health of the child is likely to improve instead of being taken at a later stage when the child is past two years, likewise the occupational status of a mothers plays a significant role in enhancing child nutritional status[1, 2, 3, 7]. It is through occupational status that mothers are able to secure some income to sustain their families and even improve the nutritional health status of their children[5,10,11].

**Relationship of mothers' socio-demographic characteristics and child birth weight on stunting of their children**

The results show a comparatively high level of child nutritional status based on stunting and socio-economic income measured based on monthly household income of the middle socio-economic income group compared to those from the lower socio-economic income. There was a significance difference in the sociodemographic characteristics of mothers in terms of educational status of the low income mothers (mean 4.45; SD 1.142), while those of the middle income (mean= 5.00 SD= 1.000) (P=.050). Mothers educational status has a significance role in enhancing child nutritional status. This indicates that mothers had not received adequate educational status[5,13,14], since most of them only managed to reach upper-primary and secondary school. Likewise the number of children had s significance role in influencing the nutritional status of children when it comes to stunting, mothers from low socio-economic status had high number of children (mean **2.35; SD 1.694**), while mothers from middle socio-economic income had few children (mean **2.21; SD 1.053**) (p=**.002**). This is because mothers from low socio-economic status with no proper source of income are not able to feed their children due to insufficient funds and lack of employment hence stunting of children[12].

**Relationship of mothers' and children's socio-demographic characteristics on overweight of their children**

The results show a comparatively level of child nutritional status base on overweight and socio-economic income measured based on monthly household income in the middle socio-economic income group compared to those from the lower socio-economic income. There was no significance difference in the sociodemographic characteristics of mothers and the children on the nutritional outcome of children based on obesity or overweight. This was a positive result because most of the children were not overweight and also due to inadequate food from households very few children were overweight.

**Multivariate analysis of factors associated with under-weight in children**

Based on the multivariate analysis, the factors associated with weight for age among children and mothers in the study included child age, number of children, dietary diversity score and nutrition attitude. The children who were being taken to clinic for check-up passed two years were likely to be under-weight than their counterparts who were taken to clinic for checkup at younger age of below two years. Results showed that diversity score was associated with increased likelihood of children recording lower weight for age, after controlling for other variables included in the model. Nutrition attitude was associated with the increased likelihood of children recording lower weight for age, after controlling for other variables include in the model. Underweight or weight-for-age measure reflects both long term chronic malnutrition and recent food insecurity or illness. It can thus reflect prenatal under nutrition, infection and possibly inadequate childcare practices. A well-diversified diet is a sure way to achieve the important micronutrients of the body[1,14,15]. In this study the diets reflects poor diversity with low consumption of the micronutrient rich animal source foods and fruits and vegetables and high consumption of the energy- dense staples**.**

**Multivariate analysis of factors associated with stunting in children**

Child age, dietary diversity score and mothers' nutritional practices were associated with height for age among children below five years in the study. Child age (p= .007), dietary diversity score (p= .031) and mothers' nutritional practices (p= .024) were associated with a higher likelihood of recording lower weight for age, after controlling for other variables included in the model. Results from multivariate analysis showed no significant association between socio-economic income and height for age remained the same in the logistic regression model. The high stunting levels could have been due to micronutrient deficiency, which is evidenced by high consumption levels of carbohydrate based staples and the low consumption of vitamin and mineral rich fruits and vegetables. Additionally, the inadequate childcare practices (Early introduction of complementary foods, inadequate breastfeeding practices and exposure to unsanitary conditions), combined with the interaction of infection can lead to poorly nourished children. Recurrent infectious diseases reduce appetite, increase metabolic requirements, and increase nutrient loss[1, 2, 3].

It is therefore possible that more of the children have not been able to meet their requirements for energy over the years leading to growth faltering. The children's food consumption and dietary patterns reflect monotonous diet that is high in carbohydrates and low in nutrient rich foods such as fruits and vegetables. Child malnutrition is widespread in the community with more than half of the children being stunted. The high malnutrition levels are associated with poor hygiene practices, inadequate breastfeeding practices and inadequate complementary feeding practices[6,14,15].

**Multivariate analysis of factors associated with overweight/obesity in children**

Analyses of the correlates of nutritional outcome among children below five years were done. Child age and mothers nutritional practices were associated with the weight for age, meaning there was a statistical significant association with weight for age in the analyses of child's age (β= -118; SE = .027; DF = ; p = .000) and mothers' nutrition practices (β = -2.073; SE = .754; DF = ; p = .006) after controlling for other variables in the regression model. None of the factors remaining could predict statistical significance of obesity. This clearly indicates that children who are fed with more carbohydrates foods are likely to gain more wait. Mothers are the ones who make independent decisions for their babies on food choices[6,7,9,11], the results shows that poor dietary practices has an impact on overweight and obesity and associated health risks. Appropriate dietary practices awareness is lacking among mothers with children below five years, this calls for further probe to ascertain the reason behind the poor dietary practices despite given the appropriate knowledge in child feeding practices.

## V. Conclusion

From the study findings, the following were concluded;
1. Child birth weight influences the nutritional status of children
2. Socio-economic income status determines children's nutritional status
3. Mothers' nutrition knowledge, attitude and practices influence children's nutritional status.
4. Dietary diversity scores contribute towards children's nutritional status.
5.

## VI. Recommendations

The study and research by other scholars have revealed that food diversity promotes nutrient variety density hence good nutritional status. However findings from the study indicate that there is little nutritional knowledge, attitudes and practices, and socio-economic income status as evidenced by low dietary diversity score that has been seen. As a result, the following is recommended;

1. Nutrition counseling should be enhanced at Kenyatta National Hospital in Pediatric department to mothers who come for nutritional services. A follow up also needs to be done by the nutritionist and health staffs to reinforce mothers' nutrition practice on what they have been taught about nutrition.
2. The government through ministry of health has a duty to improve the socio-economic income of households by creating more employments for its citizens, this will help mothers to be able to provide for their families hence improve the nutritional status of their families.
3. Since mothers are the ones who make independent decisions for their babies on food choices, this study recommends creating awareness on the effect of poor dietary practices on overweight and obesity and associated health risks. This should aim at improving nutrition knowledge, positive attitudes and appropriate dietary practices.

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