

TANZANIA PUBLIC Health Bulletin



The United Republic of Tanzania
Ministry of Health



Volume 1, No 1 (Issue 8), March, 2022 | Registered as a Newspaper: ISSN 2665-0576



Nutrition Status Among Pupils Aged (5 – 19) Years in Public Primary Schools in Mainland Tanzania

Predictors Influencing Uptake of Cervical Cancer Screening Among Women of Reproductive Age in Mara Region

ESSENTIAL FEATURES

**Integrated
Disease
Surveillance and
Response (IDSR):
Cumulative
report for six
months, July –
September 2021
(WHO week 26
- 39)**

Page 4

**Improving
Infection
Prevention and
Control practices
in Referral
Hospitals in
Tanzania: A
Seven Months
Implementation
Report (June-
December 2021)**

Page 9

Nutrition Status Among Pupils Aged (5 – 19) Years in Public Primary Schools in Mainland Tanzania

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ABSTRACT

Background: Malnutrition in school-age children impacts their health, cognition, and subsequently their educational achievement. This study is the first countrywide survey that provides the benchmark of current nutrition status of school-aged children and adolescents aged between 5 and 19 years. Therefore, this paper reports the prevalence of stunting, thinness, underweight and overweight among school age children and adolescents (5-19) years in public primary schools in mainland Tanzania

Methods: A cross-sectional survey involved 68,147 pupils from 661 schools in all 26 regions and 184 councils of Mainland Tanzania was conducted between August and October 2019. Anthropometric measurements were calculated using World Health Organization (WHO) cut-off points. Anthropometrics are a set of noninvasive, quantitative body measurements used to assess growth, development, and health parameters. In this study we assessed stunting, wasting/thinness, underweight and overweight. Stunting is referred as impaired growth and development with low height for age, while underweight is when weight is low in relation for age; thinness is a state of insufficient flesh on the body, having a body weight less than skeletal and physical standards, and overweight is abnormal or excessive fat accumulation that may impair health. Data analysis was done using STATA® version 14 computer software

Results: Stunting, underweight, thinness and overweight were found to be 25.0%, 11.7%, 11.2%, and 5.1% respectively among surveyed pupils. Stunting was higher among boys (28.4%) than girls (21.6%) and increased with age. Prevalence of underweight was higher in boys (12.8%) than in girls (10.7%). Prevalence of underweight was higher in rural areas (12.6%) than in urban areas (9.6%). Thinness was more common in boys, older children, rural areas, Central zone and Lake Zone. Regions with the highest prevalence of thinness were Singida (21.9%), Manyara (20.8%), and Rukwa (17.4%). Overweight was more common in girls, urban areas and in younger children. There was higher prevalence of overweight among girls, 5.5%, than among boys, 4.6%. Pupils aged 5–9 years had a higher prevalence of overweight (6.6%) compared to other study participants. Pupils living in urban areas were more likely to be overweight (8.5%) compared to their counterparts living in rural settings (3.8%).

Conclusion: There are substantial rates of stunting, thinness, underweight, and overweight in primary schoolchildren in Mainland Tanzania. The results suggest the need for strengthening nutrition interventions to improve nutrition status in public primary school students, in mainland Tanzania.

INTRODUCTION

Malnutrition in children can manifest in more than one form, including stunting, wasting, underweight or overweight. Malnutrition poses numerous challenges to the health status and socioeconomic welfare of the population, particularly in low- and middle-income countries, including Tanzania. Their effects include poor health, school absenteeism and increased drop-out rates, diminished cognitive and physical development, reduced productive capacity, and increased risk of degenerative diseases, such as diabetes [1,2]. Childhood chronic malnutrition affects 150.8 million under fives children globally, out of these children, 58.7 million (30.3%) live in Africa [1].

In 2018, East Africa was ranked the highest among the five sub-regions, namely Northern, Sub-Saharan, Eastern, Middle, Southern and Western Africa; contributing 35.6% of global malnutrition cases [2]. According to the Tanzania National Nutrition Survey (TNNS) 2018 report, the overall rates for

children below five years were 31.8% for stunting, 14.6% for wasting, 3.5% for underweight, and 2.8% for overweight [3, 4] stunting has remained persistently higher and varying between regions. We analyzed Tanzania Demographic and Health Survey (TDHS).

In recent years, Tanzania has made notable progress in reducing forms of malnutrition among children U5, particularly regarding chronic malnutrition or stunting, from 34.0% in 2015 to 31.8% in 2018 [3,5]. Despite progress made in reducing undernutrition, overnutrition particularly overweight and obesity is on the rise in Tanzania [3].

This trend highlights the co-existence of these multiple forms of malnutrition. The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), through Nutrition Services Section, the Tanzania Food and Nutrition Centre (TFNC), and other collaborators, conduct national surveys to assess nutritional status in Mainland Tanzania. The most recent

TNNS from 2018 covered children U5 and women of reproductive age (between 15 and 49 years) [3]. The scope of the TNNS falls short in assessing nutrition information among other age groups, particularly school-aged children and adolescents aged between 5 and 19 years. This necessitated Nutrition Services to conduct the study in order to refine focus of nutrition interventions and guide decisions to curb malnutrition in Tanzania. Understanding the current magnitude and distribution patterns of malnutrition in the country is critical to optimally design and implement interventions targeting to address these health challenges. This paper reports the prevalence of stunting, wasting/thinness, underweight and overweight among school age children and adolescents (5-19) years in public primary schools in mainland Tanzania. Stunting is referred as impaired growth and development with low height for age, while underweight is when weight is low in relation for age; thinness is a state of insufficient flesh on the body, having a body weight less than skeletal and physical standards, and overweight is abnormal or excessive fat accumulation that may impair health.

METHODOLOGY

Study area, setting and period: This survey was conducted in all 26 regions and 184 councils of Mainland Tanzania between August and October 2019.

Study design and population: a cross-sectional study was employed in public primary school pupils. The study involved all pupils aged 5 to 19 years from public primary schools.

Sample Size and sampling techniques: 68,174 primary school pupils from 661 schools in all regions and councils were involved in this survey. Stratified sampling was used to select councils. For each council several strata were established based on the stratification variables. One primary school was selected in a single ward from each stratum. Since several administrative wards were scattered around stratum, one ward and a subsequent village/street hosting a school was selected randomly. A three-stage cluster sampling was used to select a representative school and ultimately pupils for the survey. Pupils were selected systematically by using class rosters and considering a 1:1 ratio of girls and boys from standards 1 through 7. Based on proportional allocation to the primary school population size, each school was assigned a specific number of pupils to be sampled.

Data collection methods: Data were collected using a pre-tested structured questionnaire and school identification form. A 4-day orientation workshop for field teams was conducted prior to actual data collection activity. Fieldwork was conducted by National Facilitators, National Supervisors, a regional field team (data collectors), and drivers. Data were collected by 184 field teams, with each team consisting of five people per council.

Data processing and analysis: Data entry was performed by trained Data Entry Clerks who were monitored and guided by Data Entry Supervisors by using Epi-data software version 3.1. Data cleaning was conducted by trained team of statisticians and epidemiologists. Microsoft Excel and STATA version 14-software were used for data cleaning and analysis.

Ethical Considerations: Ethical clearance for conducting this survey was obtained from the National Health Research Ethics Committee, (reference number NIMR/HQR.8a/vol. ix/3171).

RESULTS

Demographic Characteristics

The results revealed that 50.2% of the study participants were girls as presented in Figure 1.

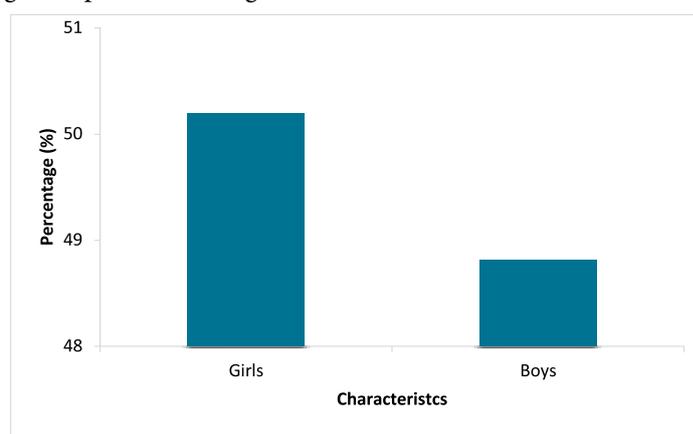


Figure 1: Demographic characteristics of respondents

Nutrition Status

Prevalence of Stunting by sex, age and residence

The results indicated that 25.0% of pupils aged between 5 and 19 years were stunted. Stunting was higher among boys (28.4%) than girls (21.6%). Percentage of stunting increased with age, reflected as 45.8% in pupils aged between 15 and 19 years, compared to the younger counterparts. A higher percentage of stunted children were recorded in rural settings (27.2%) compared with their urban counterparts (19.1%) (Figure 2).

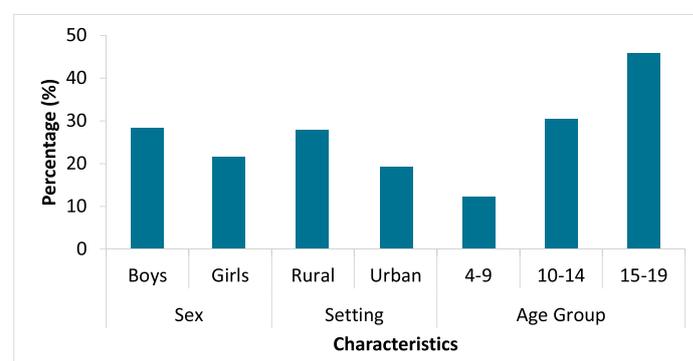


Figure 2: Percentages of stunted pupils aged between 5 and 19 years

Prevalence of Underweight by Sex and Residence

The results indicated that 9.6% children and adolescents aged 5-19 years were moderately underweight, and 2.1% were severely underweight. Prevalence of underweight was higher in boys (12.8%) than in girls (10.7%). Prevalence of underweight was higher in rural areas (12.6%) than in urban areas (9.6%). Underweight prevalence

was higher among those living in the high altitude (13.7%) than those living in the lowland (9.7%; Figure 3).

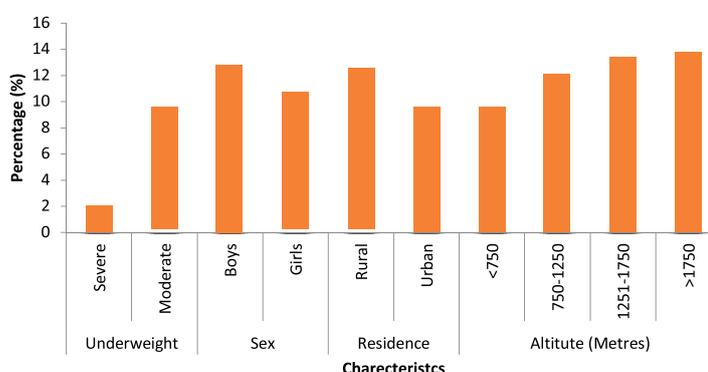


Figure 3: Percentage of underweight children and adolescents aged between 5 and 19 years

Thinness

Findings in the Table illustrates that the prevalence of thinness among pupils aged 5–19 years was 11.2%; 2.4% of the same pupils were severely thin. The prevalence of thinness was higher among older pupils aged 15–19 years (19.6%) as compared to their younger counterparts. The prevalence of thinness was higher among boys (12.5%) compared to girls (9.9%) and it was also higher (12.2%) among pupils in rural areas compared to those who reside in urban area (8.7%). The zones with the highest prevalence of thinness in pupils 5 to 19 years were Central (19.1%), Northern (14.3%), and Lake (12.1%). Regions with the highest prevalence of thinness in pupils aged 5 to 19 years were Singida (21.9%), Manyara (20.8%), and Rukwa (17.4%). Regions with the lowest

prevalence of thinness in pupils aged 5–19 years were Njombe (2.7%), Mbeya (4.3%), and Morogoro (5.7%). (Table).

Overweight and Obesity

The findings revealed that, the prevalence of overweight, body mass index for age z-score (BAZ >1 SD) and obesity (BAZ >2 SD) were 5.1% and 1.1%, respectively, in pupils aged 5–19 years. There was higher prevalence of overweight and obesity among female pupils 5.5% and 1.1%, respectively, than among boys 4.6% and 1.0%, respectively. Pupils aged 5–9 years had higher a prevalence of overweight (6.6%) compared to other study participants. Pupils living in urban areas were more overweight (8.5%) or obese (1.9%) compared to their counterparts living in rural settings (overweight 3.8% and obese 0.7%; Figure 4).

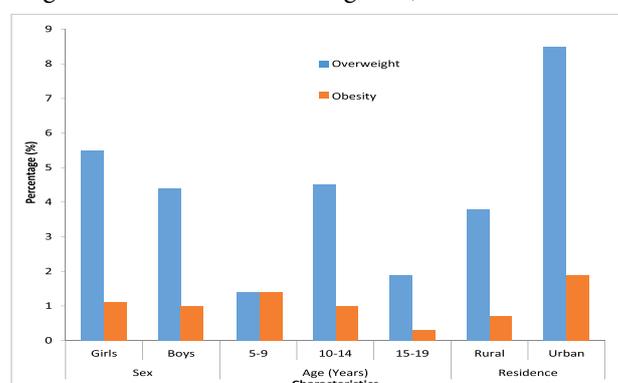


Figure 4: Prevalence of overweight and obese pupils aged between 5 and 19 years

Table 1: Prevalence of obesity and thinness among pupils (5–19 years)

Demographic Characteristics	BMI for Age (%)				Number of Children
	Overweight BAZ >1 SD	Obesity BAZ >2 SD	Thinness BAZ <-2	Severe Thinness BAZ <-3	
Age (in Years)					
5 to 9	6.6	1.4	7.2	1.8	23,851
10 to 14	4.5	1.0	12.7	2.6	39,714
15 to 19	1.9	0.3	19.6	4.2	4,202
Gender					
Girls	5.5	1.1	9.9	2.0	34,039
Boys	4.6	1.0	12.5	2.9	33,728
Types of Residence					
Rural	3.8	0.7	12.2	2.6	49,068
Urban	8.5	1.9	8.7	2.0	18,699
Geographical Zones					

Demographic Characteristics	BMI for Age (%)				Number of Children
	Overweight BAZ >1 SD	Obesity BAZ >2 SD	Thinness BAZ <-2	Severe Thinness BAZ <-3	
Central	3.2	0.9	19.1	4.3	7,534
Eastern	10.6	2.5	7.1	1.5	13,386
Lake	3.4	0.7	12.1	2.4	15,920
Northern	3.6	0.6	14.3	3.2	9,088
Southern Highlands	5.1	0.8	8.7	2.2	4,624
Southwest Highlands	5.2	1.1	9.6	2.9	6,485
Southern	4.5	1.0	6.2	0.8	2,829
Western	2.8	0.3	10.0	1.8	7,901
Regions					
Arusha	3.5	0.7	16.7	4.0	3,404
Dar es Salaam	13	3.2	7.3	1.7	8,686
Dodoma	5.1	1.8	16.0	3.9	2,957
Geita	3.1	0.7	14.3	3.8	2,098
Iringa	6.0	1.1	9.9	2.1	1,608
Kagera	3.7	0.6	9.1	1.8	3,406
Katavi	2.3	0.5	8.7	1.1	812
Kigoma	3.0	0.4	9.4	1.9	4,658
Kilimanjaro	3.9	0.6	15.0	3.9	3,190
Lindi	7.2	1.8	6.7	0.9	1,102
Manyara	1.6	0.2	20.8	4.0	2,976
Mara	2.3	0.9	14.3	2.6	2,541
Mbeya	6.8	1.0	4.3	0.6	2,163
Morogoro	6.8	1.3	5.7	1.0	3,321
Mtwara	2.8	0.5	5.9	0.8	1,727
Mwanza	5.2	0.9	10.7	2.2	3,879
Njombe	5.5	0.3	2.7	0.2	1,163
Pwani	4.7	0.7	9.6	1.7	1,379

Demographic Characteristics	BMI for Age (%)				Number of Children
	Overweight BAZ >1 SD	Obesity BAZ >2 SD	Thinness BAZ <-2	Severe Thinness BAZ <-3	
Rukwa	5.0	2.2	17.4	7.3	1,692
Ruvuma	3.9	0.9	11.3	3.7	1,853
Shinyanga	3.2	0.6	12.2	1.9	1,985
Simiyu	1.1	0.1	14.5	2.3	2,011
Singida	2.6	0.5	21.9	5.6	1,601
Songwe	4.6	0.6	9.1	2.4	1,818
Tabora	2.5	0.2	10.7	1.6	3,243
Tanga	3.2	0.6	9.9	1.4	2,494
Total	5.1	1.1	11.2	2.4	67,767

DISCUSSION

The findings from this survey indicate that stunting prevalence was higher in boys than girls and increased with an increase in age. A comparable observation was made from studies done in Tanzania and other African countries where boys were more likely to become stunted than girls and the likelihood of a child to be stunted increased as the age increase [6–9] data on adolescent nutritional status is limited in low-resource settings. Mid-upper arm circumference (MUAC). This might be explained by the fact that stunting is a chronic form of malnutrition and manifests more in late childhood because it becomes difficult to reverse the condition as the age of the child increases beyond the window of opportunity.

This survey identified a moderate prevalence (11.7%) of underweight among school children, which is slightly higher than underweight school-aged children aged between 6 and 14 years observed in Sudan (6.2%) [10] but lower than the prevalence observed in Ethiopia (19.0%) and South Africa (66.0%) [11] South Africa, were underweight or overweight. Method: A survey with quantitative and qualitative components was conducted amongst 120 participants between 10 years and 12 years of age. The participants were randomly selected from six public schools in an urban district of the province. A calibrated Goldline bathroom scale was used to measure body weight and a KDS Freo non-elastic measuring tape was used to measure height. A questionnaire consisting of open and close-ended questions collected demographic and lifestyle information. Body mass index (BMI).

Higher prevalence of underweight was seen among boys (12.8%) when compared to girls (10.7%). The differences

could be contributed by differences in lifestyle, feeding habits, education of the parents, and socioeconomic status. Children from the rural areas are more affected with underweight than their fellows in the urban areas. Although this is a different population, rural urban variation has been reporting similar trends even among younger children below five years of age in other studies [3,5,12].

In this survey, about 11.2% of school-age children 5–19 years were thin. These findings are nearly similar to the report from Pakistan where the prevalence of thinness was 10% [13]. However, the magnitude was lower compared to the study findings in Ghana (19.4%) [14], from Fogera, Ethiopia (21.4%) [15], Southeast Ethiopia (13.6%), Northern Ethiopia (26.1%), Nigeria (18.9 %) and West Bengal, India (28 %) (16–19) 10–19 years old. The discrepancy might be due to the time gap in data collection and implementation of nutritional programs.

The likelihood of thinness was higher among boys (12.5%) compared to girls (9.9%). This results were inline with the study findings in different parts of Ethiopia and Nigeria [16,17,20] 10–19 years old. The reason for higher prevalence of under-nutrition among males than females might be related to biological, behavioral, and sociocultural mechanisms. Thinness has been adopted recently as a more appropriate indicator than underweight in older children. It is indicative of relatively recent nutritional deprivation, such as insufficient dietary intakes of energy, protein, or several micronutrients, impaired absorption, or excess nutrient losses [21]. Thinness in school-aged children can result in delayed maturation, deficiencies in muscular strength and work capacity, and reduced bone density later in life [21].

This study established the prevalence of obesity in a

representative sample of primary school children in Tanzania. The results showed that the prevalence of overweight and obesity combined among pupils aged 5–19 years was low (6.2%). The prevalence of child obesity found in this study was comparable to that found in previous studies conducted in Tanzania. For example, in a study conducted in Dodoma and Kinondoni, showed that the prevalence of obesity among children aged 6–9 years was 5.6% and 6.3% respectively [22]. A similar low prevalence of child obesity (5.3%) was reported by Chillo et al. [23] in a study conducted in Dar es Salaam and Morogoro regions. Slightly higher prevalence of obesity among school children compared to that was reported in South Africa [24]. Higher prevalence of child obesity has been reported from North Africa (25) it also higher when the educational level of the parents is high. Obese children are more numerous not to have a breakfast, and to consume biscuit than normal weight children and eat more often high fat, high carbohydrates foods. Most of the children (84%, and other developing countries [26,27]. In this study, prevalence of child obesity was higher among girls than boys. This implied that females were more likely to be overweight or obese than male counterparts. Other studies conducted among children in Africa have reported similar gender difference in the prevalence of child obesity [24,25] This survey showed that lower age groups (5–9 years) were more likely to be overweight or obese than age groups 10–14 and 15–19 years. Concurrently, worldwide studies showed that the prevalence of overweight and obesity combined among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008, while in children aged 12 to 19 years, the prevalence increased from 5.0% to 18.1% in 2008 [28]. These findings suggest that the prevalence of overweight and obesity is on the rise. The possible explanations can be attributed to the increased lifestyle sophistication to which new generations are exposed.

Overall, the results should be treated with caution taking into account that the survey was cross-sectional and thus cannot establish a causal relationship. Longitudinal study could have enabled study subjects to be observed overtime. Assessment

MUHTASARI

Hali ya Lishe Miongoni mwa Wanafunzi Wenye Umri wa Miaka (5 – 19) Katika Shule za Msingi za Umma Tanzania Bara.

Ally Mohamed¹, Samweli Lazaro², Frank Chacky³, Grace R. Moshi⁴, Peter J. Kaswahili⁵ and Japhet J. Msoga⁶

Utangulizi: Utapiamlo (hali duni ya lishe) kwa watoto walio katika umri wa kwenda shule huathiri afya zao, utambuzi wao, na hatimaye mafanikio yao ya kielimu. Utafiti huu ni utafiti wa kwanza kufanyika nchi nzima ambao unatoa kigezo cha hali ya sasa ya lishe ya watoto walio na umri wa kwenda shule na vijana walio na umri wa kati ya miaka 5 na 19. Kwa hiyo, makala hii linaripoti ukubwa wa udumavu, wembamba, uzito mdogo na

of micro nutrient deficiencies could have been provided a full picture of nutrition status among school the survey population.

CONCLUSIONS

The current survey provides key highlights on the status of stunting, thinness, underweight and overweight among pupils aged between 5 and 19 years in public primary schools in Mainland Tanzania. In this regard, the country should use available evidence to develop culturally relevant nutrition prevention interventions targeted to combat the burden of stunting, underweight and overweight problems among school children and adolescents aged (5–19 years old) in Tanzania.

ACKNOWLEDGMENTS

The MoH would like to thank all individuals, institutions, and partners who contributed to ensure the success of this survey. The MoH acknowledges the UNICEF and the U.S. President's Malaria Initiative (PMI) for their financial and technical support. The MoH would also like to express its sincere appreciation to the hard work and commitment of experts from contributing institutions for their collaborative efforts to ensure successful implementation of this survey. The experts are Ally Mohamed, Samweli Lazaro, Frank Chacky, Fabrizio Molteni, Erik Reaves, Susan Rumisha, Prosper Chaki, Witness Mchwampaka, Pendael Machafuko, Stanslaus Mafung'a, Japhet J. Msoga, Grace Moshi, Peter Kaswahili, Saul Epimack, Adam Hancy, Felista Mwingira, and Fidelis Mgohamwende. Others are Severa Massawe, Samafilan Ainan, Stephen George, Munir Mdee, Julieth Silao, Bob Snow, Pili Kimanga, Shadrack Kibona, Lwidiko Edward, Bwire Wilson, Humphrey Mkali, Wiggins Aaron, Giovanni Ibada, and Abdallah Kajuna. Finally, the MoHCDGEC would like to express its sincere gratitude to the pupils of the selected schools for their voluntary participation in the survey.

AUTHOR DETAILS

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uzito kupita kiasi miongoni mwa watoto wenye umri wa kwenda shule na vijana (miaka 5-19) katika shule za msingi za umma Tanzania Bara.

Mbinu: Utafiti ulihusisha wanafunzi 68,147 kutoka shule 661 katika mikoa yote 26 na halmashauri 184 za Tanzania Bara ulifanyika kati ya Agosti na Oktoba 2019. Vipimo vya kutathimini hali ya lishe (kianthropometriki) vilikokotolewa kwa kutumia

vigezo vya Shirika la Afya Duniani (WHO). Vipimo vya kutathimini hali ya lishe ni seti ya vipimo vya mwili vinavyotumiwa kutathimini ukuaji, maendeleo ya ukuaji na vigezo vya afya. Katika utafiti huu tulitathimini udumavu, ukondefu, uzito pungufu na uzito uliozidi. Udumavu unahusisha kudhorota kwa ukuaji na maendeleo ya ukuaji wa mtoto ambapo urefu unakuwa pungufu kulinganisha na umri; wakati uzito pungufu hutokea wakati ambapo uzito ni mdogo kulinganisha na umri; ukondefu ni hali ya kuwa na uzito pungufu kulinganisha na urefu au kutokuwa na nyama ya kutosha mwilini, na uzito uliozidi ni hali ya kuwa na uzito mkubwa kulinganisha na umri, mara nyingi ni hutokana na mrundikano wa mafuta kupita kiasi hali ambayo huweza kuathiri afya. Uchambuzi wa data ulifanyika kwa kutumia programu ya kompyuta ya STATA® toleo la 14.

Matokeo: Utafiti ulibaini viashiria vya hali duni ya lishe kama ifuatavyo; udumavu ulikuwa asilimia 25, uzito pungufu asilimia 11.7, ukondefu asilimia 11.2 na uzito uliozidi ulikuwa asilimia 5.1 kati ya wanafunzi waliochunguzwa. Udumavu ulikuwa mkubwa miongoni mwa wavulana (asilimia 28.4) ukulinganisha na wasichana (asilimia 21.6) na uliongezeka sambamba na umri. Uzito pungufu ulikuwa juu miongoni mwa wavulana (asilimia 12.8) kuliko wasichana (asilimia 10.7). Ukubwa wa tatizo la wanafunzi wenye uzito pungufu lilikuwa juu zaidi (asilimia 12.6) maeneo ya vijijini kuliko mijini (asilimia 9.6). Ukondefu ulikuwa mkubwa zaidi miongoni mwa wavulana, wanafunzi wenye umri mkubwa, wanaoishi maeneo ya vijijini, wanaoishi kanda ya kati na kanda ya ziwa. Mikoa iliyobainika kuwa na tatizo kubwa la ukondefu ni Singida (asilimia 21.9), Manyara (asilimia 20.8) na Rukwa (asilimia 17.4). Uzito uliozidi ulijidhihirisha zaidi miongoni mwa wasichana, wanafunzi wanaoishi maeneo ya mijini na walio na umri mdogo. Utafiti ulionyesha kuwa kulikuwa na kiwango kikubwa cha uzito uliozidi miongoni mwa wanafunzi wa kike (asilimia 5.5) kuliko wavulana (asilimia 4.6). Wanafunzi wenye umri wa miaka 5-9 walikuwa na kiwango cha juu (asilimia 6.6) cha uzito uliozidi ikilinganishwa na washiriki wengine katika utafiti huu. Wanafunzi wanaoishi mijini wengi walikuwa na uzito uliozidi (asilimia 8.5) ikilinganishwa na wenzao wanaoishi vijijini (asilimia 3.8).

Hitimisho: Kuna viwango vikubwa vya udumavu, uzito pungufu, ukondefu, na uzito uliozidi kwa watoto wa shule za msingi Tanzania Bara. Matokeo yanaonyesha haja ya kuimarisha afya za lishe ili kuboresha hali ya lishe kwa wanafunzi wa shule za msingi za umma, Tanzania Bara.

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